

Organophosphorus Poisoning: A Clinical Study in a Tertiary Care Hospital

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Abstract

Exposure to organophosphorus (OP) compounds can be accidental or suicidal and associated with significant mortality and morbidity. This study was planned to study the clinical profile of organophosphorus poisoning cases admitted to our medical college and associated hospital. Patients of OP poisoning from January 2011 to December 2016 were included in this study. A total of 390 cases were admitted during this period. Majority of cases were male (55.12%) in the age group of 21 - 30 years. Most common reason for organophosphorus exposure was suicidal (91.79%). Most of the cases were exposed by oral route (97.18%). Most common compound responsible for poisoning was malathion (22.5%), followed by dimethoate (18.2%), diazinon (15.89%). Among clinical manifestations, most common was miosis (89%) followed by diaphoresis (61.5%), excessive secretions (53.5%), fasciculations (39%) and altered sensorium (32%). Most of the cases were in grade II severity (50.25%); higher grade of severity was associated with higher duration of hospital stay and higher mortality.

Key words: Organophosphates, toxicity, poisoning.

Introduction

Organophosphorus compounds are used as pesticides. Exposure to these compounds is quite common in our country. Accidental or suicidal exposure to organophosphorus compounds is a major clinical problem and associated with significant mortality and morbidity. Easy accessibility of these compounds plays important role in choice of these compounds as a self poison. The incidence of self poisoning is higher in young economically active group, with a case fatality ratio of 4 - 30%^{1,2,3}.

Exposure to these pesticides can occur before spraying because of easy access for children, lack of adequate labeling and during mixing, spraying and after spraying. Spraying persons and bystanders can be affected. Suicidal poisonings are common as pesticides are cheap and easily available in the market⁴.

Organophosphorus insecticides inhibit cholinesterase and pseudocholinesterase irreversibly. The inhibition of cholinesterase activity leads to accumulation of acetylcholine at synapses leading to cholinergic manifestations. After an exposure to these agents the clinical manifestations pass through three well defined phases. Initial cholinergic phase, intermediate syndrome and delayed polyneuropathy phase. Severity of organophosphorus poisoning is classified according to modified Dreisbach clinical criteria.

Material and methods

Cases of organophosphorus poisoning presented to SN Medical college, Agra between the period from January 2011 to December 2016 were included in this study. A total of 390 cases were admitted during this study period. Patients who were giving history of exposure to an entirely different poison were excluded from the study. All the patients were admitted in the emergency department where treatment was started in the form of gastric and skin decontamination. The diagnosis of organophosphorus poisoning was made on the basis of history and clinical examination. All cases were treated with intravenous atropine and oximes wherever indicated.

Observations and results

Table I: Age and sex distribution of cases.

Age group in years	SEX		Total
	Males	Females	
< 20	22	36	58
21 - 30	105	78	183
31 - 40	60	49	109
> 40	28	12	40
Total	215	175	390

Age and sex distribution of cases.

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Out of total 390 cases, 215 cases (55.12%) were males and 175 cases (44.88%) were females. This data shows that incidence of organophosphorus poisoning was more common in males than females in this study. Most common age group affected was 21 - 30 years (46.9%) in both gender groups.

Table II: Distribution as per reason of poisoning.

Reason	Number of cases	Percentage
Suicidal	358	91.79
Accidental	29	7.44
Homicidal	3	0.77
Total	390	100.0

Table III: Modes of exposure.

Modes of exposure	Number of cases	Percentage
Oral	379	97.18
Skin contamination	11	2.82
Total	390	100

In our study, the principal reason for majority of the patients was suicidal and only 7.44% had accidental exposure. Most common route of poisoning was oral (97.18%) followed by cutaneous contamination (2.82%).

Table IV: Distribution of cases according to educational qualifications.

Educational qualification	Number of cases	Percentage
Illiterate	153	39.23
Primary school	76	19.48
High school	140	35.90
Graduate	21	5.39
Total	390	100

Table V: Distribution of cases according to severity of poisoning.

Severity	Number of cases	Percentage
Grade I	92	23.60
Grade II	196	50.25
Grade III	102	26.15

Most common compound responsible for poisoning was malathion (22.5%), followed by dimethoate (18.2%), diazinon (15.89%).

The majority of cases in our study belonged to grade II severity (50.25%). The duration of hospital stay was directly

proportional to the severity of poisoning. The mortality rate was highest in cases of most severe grade of poisoning (29.41% mortality in grade III of poisoning). It was also been observed that mortality increased with increased delay in arrival.

Table VI: Distribution of cases according to the compound consumed.

Compound	Number of cases	Percentage
Chlorpyrifos	39	10.0
Diazinon	62	15.89
Dichlorvas	17	4.36
Dimethoate	71	18.2
Fenthion	9	2.31
Malathion	86	22.05
Metacid	50	12.82
Monochrotophos	37	9.5
Quinolpos	19	4.87
Total	390	100.0

Table VII: Relation of severity of poisoning with duration of stay and mortality.

Clinical severity	Cases	Percentage	Duration of stay (days)	Number of deaths	Percentage
Grade I	92	23.60	4	4	4.34
Grade II	196	50.25	5	27	13.77
Grade III	102	26.15	10	30	29.41

The most common clinical manifestation was miosis (89.1%), followed by diaphoresis (61.5%), excessive secretions (53.5%), fasciculations (39.1%), altered sensorium (32.1%), abdominal pain (29.1%), diarrhoea (28.75%), fever (28.5%), respiratory failure (24.5%) and seizure (2.5%).

In this study, maximum mortality was seen (78.37%) with cases of monochrotophos poisoning.

Discussion

Carbamates and organophosphates are usually used as pesticides. Toxicity of these compounds may result in significant mortality and morbidity. The clinical manifestations may range from cholinergic syndrome to flaccid paralysis and altered sensorium. About 99% of fatal cases occur in developing countries, especially in agricultural workers⁴. Mortality rate has been reported from 10 to 22%⁴.

Table VIII: Organophosphorus compounds and associated mortality.

Compound	Number of cases	Number of deaths	Percentage
Chlorpyrifos	39	1	2.56
Diazinon	62	3	4.83
Dichlorvos	17	6	35.2
Dimethoate	71	21	29.57
Fenthion	9	0	0
Malathion	86	1	1.16
Metacid	50	0	0
Monochrotophos	37	29	78.57
Quinolphos	19	0	0
Total	390	61	15.64

In our study, 390 cases were included in the age group of 16 - 70 years. Majority of cases were in the age group of 21 - 30 years with mean age of 26.7 years. These findings are similar with the study of Guven *et al*⁵ in which mean age was 24.1 years in age group of 21 - 30 years. T Dassanayake *et al*⁶ of Sri Lanka, found that 91.9% of the cases were under the age of 30 years. In our study male patients (55.12%) were affected more than the female patients (44.88%) in a ratio of 1.22:1. These findings are similar with the study conducted by Murat *et al*¹ (male 51% and female 46%).

With the easy availability of OP compounds, the use of these compounds for suicidal attempts has emerged as the commonest mode of suicidal poisoning. This observation was also seen in our study in which suicidal cases accounted to 91.79%. It was also reported to be 67% by Saadeh *et al*⁷. Murat *et al*¹ reported that 68% cases were suicidal.

In our study, malathion accounted for 22.05% of poisoning cases, followed by dimethoate (18.2%) and diazinon (15.89%). Murat *et al*¹ showed that dichlorvos accounted for 51.1% of cases followed by ethyl parathion (10.6%) and

fenthion (8.5%). Dassanayake *et al*⁶, showed that dimethoate was most common OP compound consumed in Sri Lanka. The use of a specific OP compound in a particular area reflects the easy availability of that compound.

The severity of poisoning was classified by using modified Dreisbach criteria. Most of the patients (50.25%) belonged to grade II group, followed by 26.15% of the patients being in grade III group and rest 23.60% of patients were in grade I group. Arup *et al*⁸ reported mild grade in 14% of the cases, moderate in 50.9% cases and severe grade in 29.6% of cases. It was also seen in this study that prognosis had proportionate relation with severity grade. The mortality rate increased with severity of poisoning; mortality rate was 4.34% in grade I group, 13.77% in grade II group and increased to 29.4% in grade III category. The overall mortality rate was 15.64% while the study conducted by Murat *et al*¹ showed mortality rate of around 21.25%¹.

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