

Original Research Article


# A study of 50 cases of Organophosphorus poisoning and its complications

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## Abstract

**Background:** In developing countries, the widespread use of organophosphorus compounds (OPCs) has been accompanied by increasing incidence of poisoning with these agents, both suicidal and accidental. This is attributed mainly to their easy availability, indiscriminate handling, storage and lack of knowledge about the serious consequences of poisoning. Of the various substance used for suicidal attempts in India, OPCs form a significant group. Since the clinical manifestation of OPC poisoning is diverse ranging from mild symptoms to fatal complications in the course of time, we need proper management of the situation.

**Materials and methods:** We studied 50 patients of organophosphorus poisoning. We checked vital parameters, general examination and systemic examination. We also checked for various parameters on like cholinesterase level, complete blood counts, renal function test with electrolytes, liver function test.

**Results:** In this study majority of patients fell in 20-30 years of age group with male predominance from lower and middle socio-economical class and most common reason was suicidal. Precipitating event were domestic problem, marital friction and financial problem. Most common clinical features were vomiting, miosis and giddiness. Majority of the patients belonged to mild grade. The average S.cholinesterase level was low as severity increases. More doses of PAM and atropine are required in severe poisoning. Most common complication was respiratory paralysis. Death was more in severe poisoning.

**Conclusion:** OPC is one of the most common poisoning in India. Reason for poisoning is most commonly suicidal. It is common in male with low socio-economical class mainly due to domestic

problems, financial issue and unhappy married life. In patients of OP poisoning presenting symptoms and S.ChE level directly correlated with severity. Therapeutic required dose of PAM and atropine are different in different grade of severity. Survival amongst patients is definitely better if atropine and PAM are being given with Mechanical ventilator support in cases of respiratory insufficiency.

## **Key words**

Organophosphorus compounds, Poison, Cholinesterase level, Atropine, Pralidoxime, Respiratory paralysis, Intermediate syndrome.

## **Introduction**

Poisons are known to mankind since the immemorial. The word 'poison' is derived from the Latin word 'Potio' meaning – 'a drink'. Poison is a substance that being in solution in the body either destroys life or impairs seriously the function of one or more organ of the body. Apart from naturally occurring poisons, rapid progress in industrial and agricultural fields has added many man-made chemicals in the environment that if handled improperly can prove to be lethal [1]. The organophosphorus poisoning helped greatly in the green revolution as a boom but also has added to the risk of poisoning by such compounds. Since the discovery of Parathion by Schroeder in 1944 organophosphorus have developed into the largest and most versatile group of pesticides in use today. The WHO estimates that each yearly nearly 1 million serious accidental and nearly 2 million suicidal attempts involving pesticides occur worldwide. In developing countries, the widespread use of organophosphorus compounds (OPCs) has been accompanied by an appreciable increase in incidence of poisoning with these agents, both suicidal and accidental. This is attributed mainly to their early availability, indiscriminate handling, storage and lack of knowledge about the serious consequences of poisoning. Of the various substance used for suicidal attempts in India, OPCs form a significant group [2, 3]. This seems to be peculiar to India as in the Western countries, 80% of suicidal attempts; sedatives attempts; sedatives, antidepressants and other such drugs are used. Since the clinical manifestation of OPC poisoning are diverse ranging from mild symptoms which may develop to fatal complications in the course of time, we

need prompt laboratory diagnosis an addition to clinical features which help considerably in proper management of the situation. In addition proper history regarding the type of poisoning is not always available. In the present study 50 cases of OPC poisoning were studied, various factors in identifying final outcomes were studied and also studied that whether plasma cholinesterase level do have any clinical correlation with it or not.

## **Materials and methods**

We studied 50 patients of organophosphorus poisoning admitted in SMS Hospital, Dr. MK Shah Medical College from November 2017 to November 2018.

### **Inclusion criteria**

- All patients with history, sign and symptoms suggestive of organophosphorus poisoning.

### **Exclusion criteria**

- Patients with mix poisoning with more than one poison compounds were not included in this study.

Clinical diagnosis of organophosphorus poisoning was established by detailed clinical examination, circumstantial history and smell of organophosphorus compound from body parts, clothes, breath and gastric aspirate obtained from stomach wash. All cases were medico legal cases. Patients were initially stabilized and vitals were monitored. Ryle's tube insertion and lavage was done initially in each patient. Contaminated clothes were removed and skin was washed. Ryle's tube sample was taken for sample seal and blood sample was taken for plasma

cholinesterase level and other routine blood investigations. A detailed clinical examination was done in each patient. Before specific therapy was started, blood for plasma cholinesterase level estimation (ChE level) was sent to laboratory. Then standard treatment of organophosphorus poisoning management was continued. Normal values of plasma cholinesterase level 2700-5800 IU/L. In mild poisoning plasma cholinesterase level is 20%-50% of normal value (ChE level: 2160-5280). In moderate poisoning plasma cholinesterase level is 10%-20% of normal value (ChE level: 1080-2180). In severe poisoning plasma cholinesterase level is less than 10% of normal value (less than 1080). According of all clinical symptoms and plasma ChE level, grading was done and patients were treated accordingly. Treatment of all the patients was guided by the clinical symptoms and the value of plasma cholinesterase level. Patients were categorized according to clinical severity in emergency medical ward. Stable patients managed at emergency medical ward. Critical patients according to clinical severity were shifted to medical intensive care unit for further management. Atropine and pralidoxime were given to stable patients. They were observed for complication. Serial cholinesterase level estimation was done according to need. If clinical improvement was observed, they shifted to medical ward. Psychiatric evaluation was done. Patients with respiratory muscle involvement were given ventilatory support in medical intensive care unit. Atropine and pralidoxime were given in each patient [11]. Complications and vitals were continuously observed. Serial cholinesterase level estimation was done. If death occurred during hospital stay in patients of organophosphorus poisoning postmortem examination performed for cause of death. If clinical improvement was observed, patient was shifted to medical ward and was observed for delayed complications.

## Results

Total 50 patients admitted in our institute with alleged history of consumption or inhalation of

organophosphorus compound have been included in the present study. Results were depicted as per **Table – 1 to 21** and compared with various authors [4-10].

**Table - 1:** Age wise distribution of OPC poisoning cases.

Age in years	Number	%
12-20	10	20
21-30	28	56
31-40	7	14
41-51	3	6
>51	2	4
Total	50	100

**Table - 2:** Sex wise distribution observed in present study.

Sex	Married	Unmarried	Cases	%
Male	26	4	30	60
Female	12	8	20	40

**Table - 3:** Mode of intoxication.

Mode of intoxication	No. of patients	%
Ingestion	48	96
Inhalation	2	4
Mix	0	0

**Table - 4:** Reasons for poisoning.

Intention/Reasons for poisoning	Male	Female	Total	%
Suicidal	27	19	46	92
Accidental	1	1	2	4
Occupational exposure	2	0	2	4
Total	30	20	50	100

**Table - 5:** Socio-economic status of the patients.

Socio-economic class	Total	%
Lower	30	60
Lower middle	14	28
Upper middle	6	12
Upper	0	0
Total	50	100

**Table - 6:** Precipitating factors in OP poisoning.

Factors	Cases	%
Social and domestic problem	20	40
Marital friction	12	24
Financial stress	10	20
Love affair	5	10
Job problem	8	16
Chronic illness	1	2
Accidental exposure	2	4

**Table - 7:** Clinical manifestations in case of OPC poisoning.

Signs and symptoms	No. of patients	%
<b>Muscarinic</b>		
Vomiting	42	84
Miosis	32	64
Excessive secretions (salivatory/ respiratory/ lacrimation)	28	56
Hypotension	6	12
Bradycardia	5	10
Respiratory manifestations (significant crepitations, rhonchi, pulmonary edema)	12	24
Cyanosis	2	4
<b>Nicotinic</b>		
Tachycardia	18	36
Hypertension	3	6
Fasciculations	16	32
<b>CNS manifestation</b>		
Altered sensorium	14	28
Giddiness	28	56
Convulsion	7	14

**Table - 8:** Influence of body mass index on outcome of mechanically ventilated patients.

Body mass index (Kg/m <sup>2</sup> )	No. of patients	Recovered	Expired
<25	4	3	1
25-30	3	2	1
30-40	3	1	2
>40	4	1	3

## Discussion

This was a study of total 50 cases of OPC poisoning admitted in Civil Hospital, Ahmedabad from 2014-2016. In this study, majority of patients fell in 20-30 years of age group. Among total 50 patients, 30 were male and 20 were female. Organophosphorus

poisoning was higher in male which is statistically significant (p value: 0.03). The most common reason of poisoning was suicidal. Precipitating event were domestic problem, marital friction and financial problem. Majority of patients were from lower and middle socio-economical class. Most common clinical features were vomiting, miosis and giddiness. Grading of patients done according to clinical signs, symptoms and S.cholinesterase level. Majority of the patients belonged to mild grade. The average s.cholinesterase level was 1420Iu/l in mild, 475Iu/l in moderate and 3280Iu/l in severe grade of patients. Requirement of average atropine in different grades were mild-50 mg, moderate-124 mg, severe-164 mg. Requirement of average pralidoxime in different grades were mild-8 gm, moderate-17 gm, severe-23 gm. Complications that observed during the study most commonly seen were respiratory paralysis, intermediate syndrome and aspiration pneumonia. One patient from mild grade, three from moderate and ten patients of severe grade put on ventilator. Out of which one patient of moderate grade and six patients of severe grade expired. Overall mortality was 14% among them 12% from severe grade and 2% from moderate grade. Plasma ChE level was correlating with patient's symptoms at the time of admission. Plasma ChE level are reliable diagnostic markers with reference to severity of OPC poisoning.

## Conclusion

OPC is one of the most common poisoning in India. Reason for poisoning is most commonly suicidal. It is common in male with low socio-economical class mainly due to domestic problems, financial issue and unhappy married life. In patients of OP poisoning presenting symptoms and s.ChE level directly correlated with severity. Therapeutic required dose of PAM and atropine are different in different grade of severity. Survival amongst patients is definitely better if atropine and PAM are being given. Mechanical ventilator support in cases of respiratory insufficiency is equally important for better outcome of the patients.

**Table - 9:** Plasma Cholinesterase level (ChE level).

Clinical severity grading	S.cholinesterase Level	Srinivas (2012) [5]		Present study	
		Recover (%)	Expired (%)	Recover (%)	Expired (%)
Mild	>50% of normal value	94	6	100	0
Moderate	20% to 50% of normal value	78	22	98	2
Severe	<10% of normal value	00	100	40	60

**Table - 10:** Atropine therapy in OPC Poisoning.

Grading of patients	Total atropine required (average)	Average plasma ChE level on admission (Iu/L)
Mild	50 mg (42 ampoules)	1420
Moderate	124 mg (103 ampoules)	475
Severe	164 mg (137 ampoules)	280

**Table - 11:** Pralidoxime (PAM) therapy in Organophosphorus poisoning.

Grading of patients	Average total PAM required	Average plasma ChE Level on admission (Iu/L)
Mild	8 gm.	1420
Moderate	17gm	475
Severe	23 gm	280

**Table - 12:** Final outcome.

Grade	No. of patients	No. of survived patients	%	No. of expired patients	%
Mild	34	34	100	0	0
Moderate	6	5	83.33	1	16.67
Severe	10	4	40	6	60

**Table - 13:** Incidence of various complications observed in case of OPC poisoning.

Complication	Total	Percentage (%)
Respiratory paralysis	6	12
ARDS	2	4
Cardiac arrhythmia	5	10
Aspiration pneumonia	4	8
Intermediate syndrome	4	8

**Table - 14:** Incidence of patients on ventilator management.

Grading of patients	No. patients put on ventilator	Recovered	Expired
Mild	1	1	0
Moderate	3	2	1
Severe	10	4	6

**Table - 15:** Age wise distribution in cases of OPC poisoning in various study.

Author study	Age group	Percentage (%)
Gupta (2006) [10]	21-30	63
Joshi (2013) [9]	21-30	43.81
Biswas (2013) [8]	15-24	70.17
Present study	21-30	56

**Table - 16:** Sex wise distribution in various studies.

Author series	Male (%)	Female (%)
Prasad (2013) [4]	65.7	34.3
Gupta (2013) [10]	66	34
Patel (2011) [7]	56	44
Joshi (2013) [9]	55.10	44.9
Present study	60	40

**Table - 17:** Socio-economical status of patients in various studies.

Author series	Lower	Lower middle	Upper middle	Upper
Patel (2011) [7]	48.95	28.81	Not mention	22.24
Joshi (2013) [9]	65.05	31.98	Not mention	2.95
Present study	68	28	12	0

**Table - 18:** Reasons for poisoning observed in various studies.

Author name	Suicidal (%)	Accidental (%)	Occupational (%)
Patel (2011) [7]	86.60	13.40	Not mention
S. Biswas (2013) [8]	100	-	Not mention
Joshi (2013) [9]	93.81	4.83	1.36
Present study	92	4	4

**Table - 19:** Clinical manifestation in case of OPC poisoning comparisons to previous study.

Signs and symptoms	DRM Prasad (2013) [4]	D. Patel (2013) [7]	S. Biswas (2013) [8]	Present study
Vomiting	94	88.18	82.20	84
Miosis	88	80	82.20	64
Excessive secretions	80	69	82.20	56
Altered sensorium	Not mention	21	7.93	32

**Table - 20:** Clinical severity grades observed in OPC poisoning in different studies and outcome (no. of patients in percentage %).

Clinical severity grading	Srinivas (2012) [5] (%)	Present study (%)
Mild	45	68
Moderate	50	12
Severe	5	10

**Table - 21:** Average plasma ChE level in different grade of patient.

Grading of patients	T.J. Mehta (2014) [6]			Present study			
	No. of patients (%)	Average plasma ChE level (Iu/L)	Recovery in days	No. of patients (%)	Average plasma ChE level (Iu/L)	Recovery in days	No. of death (%)
Mild	60	1478	3+/-1	68	1420	3+/-2	0
Moderate	28	475	5+/-1	12	475	5+/-2	16.67
Severe	20	280	10+/-2	20	280	10+/-2	60

For the diagnosis of organophosphorus poisoning, we use clinical severity guidelines and plasma ChE level when less than 50% of normal. In severe grade of poisoning complications are more and mortality is high.

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