

# Organophosphorus Compound Poisoning and Its Outcome: Experience from a Teaching Hospital of Bangladesh

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## Abstract

**Background:** Household and agricultural products containing organophosphorus compound (OPC) pesticides are easily available allowing opportunities for easy source of poisoning throughout the world. Bangladesh is no exception. This study was aimed to find out some epidemiological and demographic profile and immediate outcome of OPC poisoning cases.

**Methods:** This cross-sectional study was done at Rajshahi Medical College Hospital from January to December 2007 and consecutively selected 100 patients with OPC poisoning were studied.

**Results:** Half of the patients belonged to age group 16-25 years, 60% were male, 60% were married, 36% were illiterate and 25% were housewives. Suicidal attempt (85%) was the main intention and the commonest cause was familial disharmony (42%). Gastrointestinal (91%) and pupillary (90%) features were predominant. Most (65%) cases received initial treatment at local hospitals within 30 minutes of ingestion of poison and severity was mild. Forty percent patients required less than 50 ampules of atropine and 75% required 0-3 ampules of pralidoxime. Full recovery was achieved in 82% cases, 8% developed intermediate syndrome and 10% died (6/10, 60% within 24 hours of admission). Hospital stay was <5 days in 83.3% cases.

**Conclusion:** OPC poisoning severity and time lapse between OPC poisoning and hospitalization is an important factor in determining outcome of OPC poisoning.

**Key words:** Bangladesh; organophosphorus compounds; poisoning; suicidal attempt

(*BIRDEM Med J* 2016; 6(2): 74-78)

## Introduction

Organophosphorus compound (OPC) poisoning is a major clinical and public health problem in many parts of the world.<sup>1,2</sup> Although most deaths occur in rural areas of developing countries; OPC poisoning is still a

problem in the developed countries, where it may account for a significant proportion of death from self poisoning. The case fatality of self poisoning in developed countries is estimated as 10-20%, but for OPC it may be as high as 50-70%.<sup>2,3</sup>

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**Received:** May 19, 2015

**Accepted:** November 30, 2015

The time interval between the exposure to OPC poison and onset of symptoms varies with the route and degree of exposure. Following massive ingestions, the symptoms appear within minutes. However, in most instances symptoms appear within 30 minutes of exposure and almost always within 12 hours. Local effect on eyes and respiratory tract may appear within minutes. After ingestion of OPC, the initial symptoms are gastrointestinal and other symptoms depend on organs affected.<sup>1,4-6</sup>

The degree of severity of poisoning is dependent on type and quantity of poison ingested and time elapsed

before treatment starts and the degree of inhibition of synaptic cholinesterase which can be indirectly assessed by serum cholinesterase activity. Assessment of OPC poisoning patients is better done by use of peradeniya organophosphorus poisoning (POP) scale, clinical manifestation and estimation of red blood cell (RBC) cholinesterase.<sup>7-10</sup>

The common nature of poisoning in Bangladesh is suicidal, homicidal and accidental. The method of poisoning varies from country to country and in a single country in different locations. Estimated case load of poisoning in hospitals of Bangladesh is around 7% of total admissions and among them almost 90% are due to OPC.<sup>11</sup> The objectives of this study were to find out nature of poisoning, treatment modality and outcome of OPC poisoning in patients admitted to a teaching hospital.

#### Methods

This cross sectional study was carried out at Rajshahi Medical College Hospital (RMCH) in 2007 and included consecutive 100 patients with OPC poisoning as per eligibility criteria. Inclusion criteria were OPC poisoning with acute cholinergic crisis or with evidence of brought specimen, pungent garlic odour in mouth or gastric aspirate of OPC. Patients aged below 15 years, pregnant women and patients suffering from any concomitant serious illness, e.g. diabetes with acute complication, cardiovascular disease, hypertensive encephalopathy, disease of airflow obstruction were excluded from the study.

All cases of OPC poisoning were evaluated by detailed history (from attendants, family members and patient as applicable), physical examination and clinical data after admission. Severity of poisoning was assessed by POP scale: mild (POP 0-3), moderate (POP 4-7) and severe (POP 8-11).<sup>9</sup> All poisoning cases were treated with atropine, pralidoxime and other supportive measures as indicated. The dose of medication varied depending on severity of poisoning. Outcome of patients were recorded as full recovery, development of intermediate syndrome and death.

All data were recorded on predesigned questionnaire and analyzed using computer based software (SPSS 10.1).

#### Results

Total patients were 100 including 60 male. Half of the patients were in 16-25 years age group. One-third of the patients were illiterate and other socio-demographic status are presented in Table I.

**Table I.** Socio-demographic characteristics of the study subjects (n=100)

Variables	Number	Percentage
<b>Age (years)</b>		
16-25	50	50.0
26-35	32	32.0
36-45	12	12.0
> 46	6	6.0
<b>Gender</b>		
Male	60	60.0
Female	40	40.0
<b>Education</b>		
Illiterate	36	36.0
Primary	32	32.0
Secondary and Higher Secondary	20	20.0
Graduate	10	10.0
Masters or above	2	2.0
<b>Occupation</b>		
Housewife	25	25.0
Student	20	20.0
Service	12	12.0
Farmer	12	12.0
Business	10	10.0
Day labourer	9	9.0
Others	6	6.0
Unemployed	6	6.0
<b>Marital status</b>		
Married	60	60.0
Unmarried	35	35.0
Divorced	3	3.0
Widow	2	2.0

Suicidal attempt (85%) was the most common nature of poisoning and familial disharmony (42%) was the most common cause (Table II). Two-thirds of patients received some treatment at local hospitals before reaching RMCH. Nearly half of the patients reached RMCH within 30 minutes and two-thirds were mild poisoning cases (POP scale). Clinical features are presented in Table II.

**Table II.** Characteristics of organophosphorus compound poisoning (n=100)

Parameters	Number	Percentage
Nature of poisoning		
Suicidal	85	85.0
Accidental	11	11.0
Homicidal	4	4.0
Cause of poisoning (n=89)		
Familial disharmony	42	42.0
Intentional/Ego problem	21	21.0
Accidental	11	11.0
Failure in love affair	11	11.0
Academic poor performance	10	10.0
Loss in business	5	5.0
Treatment history		
Local hospital	65	65.0
None	35	35.0
Time interval between ingestion of poison and hospitalization		
<30 minutes	47	47.0
30 60 minutes	17	17.0
>1 2 hours	13	13.0
>2 4 hours	16	16.0
>4 hours	7	7.0
Severity of poisoning (POP scale)		
Mild	65	65.0
Moderate	23	23.0
Severe	12	12.0
Clinical manifestations*		
Gastrointestinal	91	91.0
Pupillary	90	90.0
Glandular	78	78.0
Respiratory	75	75.0
Central nervous system	32	32.0
Cardiovascular system	30	30.0
Urinary	20	20.0

\*All patients presented with more than one clinical manifestation

Specific treatment of the patients included pralidoxime and atropine and their dose varied from patient to patient. Details are presented in Table-III.

**Table III.** Treatment summary (n=100)

Treatment	Number	Percentage
Atropine (ampoules)		
<50	40	40.0
50 100	33	33.0
101 200	15	15.0
201 300	10	10.0
>300	2	2.0
Pralidoxime (ampoules)		
0 3	75	75.0
4 6	17	17.0
7 9	5	5.0
>9	3	3.0

Death occurred in 10 patients and 6 patients expired within 24 hours. Treatment outcome and hospital stay are presented in Table IV.

**Table IV.** Treatment outcome

Parameters	Number	Percentage
Treatment outcome (n=100)		
Full recovery	82	82.0
Developed intermediate syndrome	8	8.0
Expired	10	10.0
Hospital stay (days) (who survived, n=90)		
<5	75	83.3
5 8	12	13.3
>8	3	3.4
Time of death (n=10)		
<24 hours	6	60.0
2nd day	2	20.0
3rd day	1	10.0
4th day	1	10.0

The OPC poisoning severity and treatment outcome shows that mild poisoning had a good outcome (Table V). Case fatality increased with OPC poisoning severity (Table V). It was also seen that time between poisoning and treatment initiation is important in determining outcome (Table VI).

**Table-V.** Relation of severity of OPC poisoning with treatment outcome

recovery	n	Complete syndrome		Expired		Intermediate Severity	
		No.	(%)	No.	(%)	No.	(%)
Mild	65	60	(92.3)	5	(7.7)	0	
Moderate	23	19	(82.6)	1	(4.4)	3	(13.0)
Severe	12	3	(25.0)	2	(16.7)	7	(58.3)
Total	100	82		8		10	

**Table VI.** Relation of time interval between OPC poisoning and hospitalization and treatment outcome

Time lapse	n	Complete recovery		Intermediate syndrome		Expired	
		No.	(%)	No.	(%)	No.	(%)
<30 minutes	47	45	(95.8)	1	(2.1)	1	(2.1)
30 60 minutes	17	14	(82.3)	2	(11.8)	1	(5.9)
>1 2 hours	13	10	(76.9)	2	(15.4)	1	(7.7)
>2 4 hours	16	10	(62.5)	2	(12.5)	4	(25.0)
>4 hours	7	3	(42.9)	1	(14.2)	3	(42.9)
Total	100	82		8		10	

## Discussion

Organophosphorus poisoning for suicidal purpose is common in developing countries where these agents are more readily available and cheaper than the more sophisticated agents used in the west.<sup>2</sup> The environmental protection agency of the United States estimated that 3,000 hospitalizations per year were for insecticide poisoning with a fatality rate of 50% in the paediatric age group and 10% in adult.<sup>6</sup> OPC poisoning is a common medical emergency in Bangladesh. Begum *et al.* in their study carried out in four hospitals of Chittagong division observed OPC poisoning as leading cause of morbidity and mortality due to poisoning.<sup>12</sup>

Young adult patients of 16-35 years mostly suffered from OPC poisoning in present series. Khan *et al.*<sup>13</sup> and Ahmed *et al.*<sup>14</sup> reported highest incidence of OPC poisoning among 10-30 years age group (88.3%), Faiz *et al.*<sup>15</sup> reported it among 11-30 years age group (76%). Our finding is more or less similar to the findings of others.

In our study majority victims were male, which is similar to the finding of Ahmed *et al.*<sup>12</sup> In the series of Faiz *et al.*<sup>15</sup> and Karim *et al.*<sup>16</sup> male female ratio was 2.21:1 and 1.5:1, respectively.

OPC poisoning was highest among illiterate and very few in masters or above. Ahmed *et al.*<sup>14</sup> also observed highest prevalence of OPC poisoning among illiterate group (53.2%).<sup>21</sup> Occupational variation of OPC poisoning was highest among housewives (25%), followed by students (20%), service holder and farmer (12% each), businessmen (10%), day labourers (9%), unemployed and others (6% each). Trend of OPC poisoning was highest among married people (60%), followed by unmarried (35%), divorced (3%) and widow (2%).

In this study, patients were treated with atropine <50 ampules (40%), 50-100 ampules (33%), 101-200 ampules (15%), 201-300 ampules (10%) and >300 ampules (2%). Our study is supported by Karim *et al.*<sup>16</sup>

There is wide variation in the use of atropine for the treatment of OPC poisoning. In the treatment of OPC poisoning, we administered pralidoxime 0.3 ampules in 75%, 4.6 ampules in 17%, 7.9 ampules in 5% and >9 ampules in 3% cases.

Severity of OPC poisoning showed some effect on treatment outcome in this study. Full recovery was achieved in 92.3% cases of mild poisoning, 82.6% cases of moderate poisoning and 25% cases of severe poisoning. Death was highest (58.3%) among severe poisoning cases.

Our study revealed time interval between OPC poisoning and hospitalization played a great role in treatment outcome. Full recovery was achieved in maximum number of cases when admission was within 30 minutes of ingestion of OPC. Similarly, mortality rate also increased with delayed admission.

In a study carried out in Sri Lanka, case fatality was 27.7%.<sup>17</sup> In Bangladesh, one study showed fatality rate as 27.7%<sup>12</sup> and yet another showed it as 16.7%.<sup>15</sup>

### Limitation

It was not possible to confirm identity of pesticides used with chemical analysis. Poisoning with carbamate compounds have similar clinical features like OPC poisoning and sometimes pyrethroids poisoning mimics OPC poisoning clinically. Carbamate compound poisoning is very common in Bangladesh. It has been shown in Bangladesh there is tendency to treat all poisoning cases as OPC when clinical judgment used as sole criteria for diagnosis. Therefore it was possible some of the included patients might be due to poisoning than OPC.

### Conclusion

Early diagnosis and hospitalization have an impact on achieving better outcome in OPC poisoning cases.

**Conflict of interest:** None.

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