



PROGNOSTIC SIGNIFICANCE OF PSEUDOCHOLINESTERASE ESTIMATION AND QUANTITY OF POISON IN RELATION TO SEVERITY OF ORGANOPHOSPHORUS POISONING

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ABSTRACT

Organophosphates inhibit acetyl cholinesterase enzyme and causes accumulation of acetylcholine in myoneural junction and at synapses. Mortality ranges from 10-20%. Most of the deaths are due to acute respiratory failure due to central respiratory depression, respiratory muscle weakness or direct pulmonary effects. A detailed clinical examination of patients was done. In patients with respiratory failure, oxygen saturation using pulse oximeter, and with arterial blood gas analysis was done. Other relevant investigations available in the infrastructure was done wherever required. Grading of severity of poisoning was done according to clinical features and peradynia organophosphorus scale, and those who require ventilatory support and those who did not require ventilatory support were assessed. Incidence of mortality was significantly associated with lower pseudocholinesterase level ($P < 0.001$). Most of the moderate to severe degree of poisoning land up in respiratory distress where ventilator support is required which improves survival.

INTRODUCTION

Organophosphorus insecticides are used widely in agriculture, horticulture and veterinary medicine. As a result of widespread use and easy availability it has been estimated that the global annual incidence of acute pesticide exposure is of the order of three million with 3, 00,000 associated deaths most of them occurring in the developing world [1]. Organophosphorus poisoning is the most common poisoning in India because of its easy availability and accessibility, majority of patients of organophosphorus poisoning belong to the younger generation and self-intentional [2]. Organophosphates inhibit acetyl cholinesterase enzyme and causes accumulation of acetylcholine in myoneural junction and at synapses.

Mortality ranges from 10-20% [1]. Most of the deaths are due to acute respiratory failure due to central respiratory depression, respiratory muscle weakness or direct pulmonary effects. Early recognition and prompt ventilatory support may improve the survival rate [3].

METHODOLOGY

All adult patients with history of organo phosphorus compound poisoning who fulfill the inclusion and exclusion criteria admitted to the emergency medical wards. A detailed clinical examination of patients was done. In patients with respiratory failure, oxygen saturation using pulse oximeter, and with arterial blood gas analysis was done. Other relevant investigations available in the infrastructure were done wherever required. Grading of severity of poisoning was done according to clinical features and peradynia organophosphorus scale, and those who require ventilatory support and those who did not require ventilatory support were assessed.

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Those who required mechanical ventilatory support, were put on mechanical ventilator and data accumulated was analyzed with respect to above objectives. A detailed pretested proforma was used to include relevant details of each patient such as name, age, sex, occupation, address, nature of poison and symptoms, and treatment interval and hospitalization treatment received before admission. Depending on the severity of manifestations patients were classified into three grades as

mild, moderate and severe (peradynia organophosphorus poisoning scale).

Patients relevant past history, family history and personal history were also noted. Soon after admission in all patients included in this study, oxygen saturation using pulse oximeter and with arterial blood gas analysis were done. Patients who showed signs of respiratory failure were put on mechanical ventilation and monitored until patient recovered or till death.

RESULTS

Table 1. Age and sex distribution

Age (years)	No.	Male		Female		Total	
		%	No.	%	No.	%	
13-20	43	10.8	34	34	77	15.3	
21-30	190	47.5	37	37	227	45.3	
31-40	100	25	23	23	123	21.5	
41-50	45	11.2	3	3	48	9.4	
51-60	20	5	3	3	23	4.5	
60+	2	0.5	0	0	2	4	
Total	400	100	100	100	500	100	

p-value = 0.000, Highly significant

- The age group ranges from 13 years to 60 years.
- In this study mean age for both sexes, for males 31.7% and for females 27.7 years. Majority of the patients were in the age group of 21-30 years followed by 31-40 years.
- Out of 500 patients, 400 were males followed by 100 were females.
- Male to female ratio was 4:1.
- Majority of the patients were from rural areas. It may be due to their occupation agriculture and easy availability of organophosphorus compound to rural people.

Table 2. Name of Organophosphorus compound

Agents	No. of patients	Percentage	Cumulative percent
Dimethoate (Rogor)	159	31.8	54.6
Chlorparifos	114	22.8	22.8
Methylparathion	72	14.4	69
Quinolphos	28	5.6	74.6
Starchin powder	53	10.6	85.2
Others	74	14.8	100
Total	500	100	

$\chi^2 = 130.36$; $df = 5$; p-value = 0.000, Highly significant.

Among our patients, dimethoate (Rogor) was the most common agent encountered followed by chlorpyrifos and methyl parathion and starchin powder.

Table 3. Grading of severity of poisoning

Grading	No. of patients	Percentage
Mild	219	43.8
Moderate	210	42
Severe	71	14.2
Total	500	100

- 43.8% patients were under mild grading, 42% were moderate grading and
- 14.2% were severe poisoning grading



Table 4. Quantity of poison and its relation to severity of poisoning

Quantity poison (ml)	Mild		Moderate		Severe		Total	
	No.	%	No.	%	No.	%	No.	%
Upto 100	193	88.1	86	41	3	4.2	282	56.4
100-150	20	9.2	52	24.7	3	4.2	75	15
150-200	0	0	36	17.1	24	33.8	60	12
200-250	0	0	26	12.4	36	50.8	62	12.4
Not known	6	2.7	10	4.8	5	7	21	4.2
Total	219	100	210	100	71	100	500	100
p-value =	0.000, Highly significant							

Grading of severity of poisoning depends on the quantity of poison consumed

Table 5. Quantity of poisoning and its relation to outcome

Quantity poisoning (ml)	Expired		Improved		No.	Total %
	No.	%	No.	%		
Upto 100	2	3.1	280	64.2	282	56.4
100-150	0	0	75	17.3	75	15
150-200	21	32.8	39	8.9	60	12
200-250	35	54.7	27	6.2	62	12.4
Not known	6	9.4	15	3.4	21	4.2
Total	64	100	436	100	500	100
p-value =	0.000, Highly significant					

If quantity of poison increases mortality rate also increases.

Table 6. Treatment interval and its relation to severity of poisoning

Treatment (hours)	Mild		Moderate		Severe		Total	
	No.	%	No.	%	No.	%	No.	%
< 2	30	13.7	4	1.9	0	0	34	6.8
2 to 4	173	79	126	60	9	12.7	308	61.6
4 to 6	15	6.8	55	26.2	33	46.5	103	20.6
> 6	1	0.5	25	11.9	29	40.8	55	11
Total	219	100	210	100	71	100	500	100

p-value = 0.000, Highly significant

As the treatment interval increases, severity of poisoning also increases. This was statistical significant.

Table 7. Treatment interval and its relation to outcome

	Expired		Improved		No.	Total %
	No.	%	No.	%		
<10%	33	51.6	31	7.1	64	12.8
10 – 20%	23	35.9	71	16.3	94	18.8
20 -50%	8	12.5	300	68.8	308	61.6
>50%	0	0	34	7.8	34	6.8
Total	64	100	436	100	500	100

Incidence of mortality was significantly associated with lower pseudocholinesterase level (P<0.001)

DISCUSSION

Organophosphorus insecticides are used widely in agriculture, horticulture and veterinary medicine. Organophosphorus poisoning is the most common poisoning in India because of its easy availability and

accessibility. Majority of patients of organophosphorus poisoning, belong to the younger generation and self intentional [1]. For most of the youngsters, self poisoning seems to be preferred method of dealing with difficult



situations. Sociologists have suggested that the young have few support systems and are unable to cope with social and cultural demands [4].

Of various agents used suicidal attempts in India, organophosphate form a significant group. This is peculiar to developing countries like India [4].

Table 8. Comparing the age group with maximum incidence

Age group (years)	Present study	Gannur DG et al.[5]	Palimar et al.[6]
13-20	15.4%	30.9%	-
21-30	45.4%	45.62%	43.1%
31-40	24.6%	16.6%	-
41-50	9.6%	5.63%	-
51-60	4.6%	-	-
> 60	4%	-	-

In this study maximum incidence of poisoning was among the age group of 21-30 years of age 45.4% which are comparable to the studies done by Gannur DG et al.[5] and Palimar et al.[6]

Table 9. Sex ratio

Age group (years)	Present study	Palimar et al.[6]	Arun et al.[7]	Goel et al.[8]
Male	80%	75.1%	71.1%	72%
Female	20%	24.9%	28.9%	28%
M:F	4:1	3:1	2.46:1	2.57:1

In this study, the incidence was more common in males (80%) with male to female ratio of 4:1. This is comparable with the report by Palimar et al.[6] and Goel et al.[8]

Table 10. Comparing the commonly encountered organophosphorus compounds

Organophosphorus compounds	Present study	Swaminathan T[9]	Palimar V et al.[6]
Dimethoate (Rogor)	31.8%	55%	-
Chlorpyrifos	22.8%	18%	-
Methyl parathion	14.4%	-	37.9%
Starchin powder	10.6%	-	-
Quinolphos	5.6%	49.4%	-

Dimethoate is the commonest organophosphorus used in this study, whereas methyl parathion in a study by Palimar et al.[6] This may be due to regional differences.

Table 11. Severity of grading

Anupkumar Kundu			
Grading	Present study	Bhattarai et al [10]	Anupkumar et al [11]
Mild	43.8%	-	19.5%
Moderate	42%	26%	50.9%
Severe	14.2%	4%	29.6%

In the present study mild poisoning 43.8% had maximum incidence and moderate poisoning 42% which is comparable to study by Anupkumar *et al* [11].

CONCLUSION

In summary, POP scale and pseudocholinesterase levels at presentation appear useful in assessing the severity and need for ventilation.

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CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

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