

PROGNOSTIC VALUE OF GLASGOW COMA SCALE, POISONING SEVERITY SCORE AND SERUM ACETYLCHOLINESTERASE LEVELS IN ORGANOPHOSPHORUS POISONINGShashank Tripathi¹**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Organophosphorus poisoning is the most common medico toxic emergency in India. Respiratory failure is the most common complication of OP compound leading to death. Early recognition and prompt ventilation may improve survival. The aim of the study was to correlate between the clinical score described by Peradenya Organophosphorus Poisoning (POP) scale, glasgow coma scale (GCS) and serum Pseudocholinesterase level at presentation, ventilator requirement and the outcome. This sectional study conducted at tertiary care centre, Nagpur from October 2011 to September 2013. 40 patients fulfilled the inclusion criteria and included in the study. Majority of patients were in younger age group with male preponderance. Agriculture is the most common occupation found in the patients in the study. Mortality was found in 17.5% patients and mortality was found to be higher in patients with severe grade of Paradeniya poisoning scale (score > or = 7) and severe grade of Glasgow coma scale (score < or = 8). Patients with normal cholinesterase levels showed significantly higher chances of survival as compared to those with less than 10% of the normal cholinesterase levels. Patients with severe grade of POP scale and GCS needed ventilatory support more frequently than patients with mild to moderate grade. Thus GCS, POP scale and Pseudocholinesterase levels can very well be used in assessing prognosis and mortality of patients of OP poisoning.

KEYWORDS: Organophosphorus Poisoning, GCS (POP) scale, serum cholinesterase.

INTRODUCTION: Organophosphorus (OP) compounds have been widely used for a few decades in agriculture for crop protection and pest control, thousands of these compounds have been screened and over one hundred of them have been marketed for these purposes.¹ OP compounds constitute a heterogeneous category of chemicals specifically designed for the control of pests, weeds or plant diseases. Their application is still the most effective and accepted means for the protection of plants from pests, and has contributed significantly to enhanced agricultural productivity and crop yields.²

Organophosphorus compounds were first developed by Schrader shortly before and during the Second World War. They were first used as an agricultural insecticide and later as potential chemical warfare agents.³ Its widespread use and easy availability has increased the likelihood of poisoning with these compounds.

Acute Organophosphorus compound poisoning is an important indication for emergency admission in most hospitals throughout India.³ Their common availability renders OP insecticide poisoning a worldwide health problem affecting millions of patients. Organophosphorus compound poisoning is primarily a problem of the developing countries.⁴

Organophosphorus compound poisoning is the most common medico toxic emergency in India since it is a tropical country where agriculture forms the backbone of the nation. Although

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poisoning can result from occupational exposure or accidental ingestion, in most cases there is suicidal intent.

Owing to limited availability of resources, all OP poisoning patients are not managed in ICUs in Indian setup. It is therefore important that clinical features and criteria to predict the need for ventilator support to be identified at initial examination.

Peradeniya OP poisoning scale is a poisoning severity score that has not been studied much in Indian scenario. The Peradeniya Organophosphorus Poisoning (POP) scale assesses the severity of the poisoning based on the symptoms at presentation and is simple to use. In a study by Senanayeke et al, patients with a high score on the POP scale had a high rate of morbidity and mortality.⁵

It could be a simple and effective system to determine the need for ventilatory support early on in the course and similarly Glasgow coma scale can also help in determining the severity of poisoning on the basis of clinical parameters. Serum cholinesterase levels are easier to estimate and usually depressed after OP poisoning. The higher the score on the POP scale, the higher was the degree of derangement in the serum cholinesterase levels.⁶

Hence this study was undertaken to assess the severity and to assess the prognosis of organophosphorus compound poisoning both clinically by using Peradeniya scoring, Glasgow coma scale and by estimating serum cholinesterase levels.

AIMS AND OBJECTIVES:

- Evaluation of poisoning severity score (Peradeniya OP Poisoning Scale) in organophosphorus poisoning.
- Evaluation of Glasgow coma scale in organophosphorus poisoning.
- Estimation of serum acetylcholinesterase levels in acute organophosphorus poisoning.
- Correlation to evaluate the prognostic value of Glasgow coma scale, poisoning severity score (Peradeniya OP Poisoning Scale) and serum acetylcholinesterase levels in acute organophosphorus poisoning.

MATERIALS AND METHODS: This was a prospective cross sectional study conducted at tertiary care centre, Nagpur from October 2011 to September 2013 after taking permission from ethical committee. There were 70 patients of op compound poisoning admitted to the department of medicine during the study period. After applying inclusion and exclusion criteria, 40 patients who fulfilled all criteria were chosen as study subjects. (n = 40).

Inclusion Criteria:

- All Patients who are coming to Medicine OPD/IPD/ Casualty with H/o consumption of Organ phosphorus Compounds within previous 24 hours with characteristic clinical manifestations of OP poisoning.
- All Patients who are willing to participate in the study.
- All patients above 12 years of age.

Exclusion criteria:

- Patients with h/o mixed poisoning with other substances.
- Patients with h/o alcohol consumption and drug abuse.
- Patients with h/o serious systemic illness.

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Patients were evaluated for Peradeniya OP poisoning scale, Glasgow coma scale and serum cholinesterase levels for assessment of severity of poisoning. Serum cholinesterase levels and Peradeniya OP poisoning scale were studied to predict the need for ventilatory support. The results were analyzed using chi-square test.

RESULTS: In the present study of 40 patients results were as follows: Majority, i.e. 13 (32.5%) of patients were in the age range of 21-30 years, followed by 12 (30%) patients in the age range of 31-40 years. Most of the patients were males [29 (72.5%)], while 11 (27.5%) were females. 19 (47.5%) patients included in the study had agriculture as the main occupation, while 10 (25%) cases were females and housewives. 34 of the patients i.e. 85% consumed poison with suicidal intent. Total mortality was 17.5% in the present study.

Symptoms	No.	Percentage (%)
Bronchorrea	9	22.5
Headache	1	2.5
Increased Sweating	36	90
Increased Lacrimation	7	17.5
Nausea	40	100
Vomiting	40	100
Breathlessness	13	32.5
Increased Salivation	13	32.5
Diarrhea	8	20

Table 1: Number of patients showing different symptoms

Table 1 shows the number of patients showing different types of symptoms. All 40(100%) cases had both Nausea and Vomiting, followed by 36 (90%) cases with sweating. There were 13 (32.5%) patients showing breathlessness and increased salivation, while 9(22.5%) cases had bronchorrea. Diarrhea was reported by 8 (20%) patients.

Signs	No.	Percentage (%)
Bradycardia	25	62.5
Cyanosis	3	7.5
Fasciculations	23	57.5
Neck muscle weakness	10	25
Altered Consciousness	16	40
Tachypnea (RR> 20)	15	37.5

Table 2: Number of patients showing different signs

Table 2 provides the number of patients showing different signs. Maximum i.e. 25 (62.5%) showed sign of Bradycardia, followed by 23 (57.5%) showing Fasciculations. There were 15 (37.5%) cases of Tachypnea, while 10 (25%) cases showed neck muscle weakness.

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There were 26 (65%) of the cases with mild POP score, while 9 (22.5%) cases showed moderate POP score. Only 5 (12.5%) patients had score above 7 with Severe POP category. The study shows that majority i.e. 27 (67.5%) cases had mild GCS score, while 7 (17.5%) cases had severe GCS score. There were 6 (15%) patients showing moderate GCS score.

Majority i.e. 23 (57.5%) patients had normal cholinesterase levels [5400 – 13200 IU]; followed by 7 (17.5%) cases with severe levels [less than 10% of normal levels (540 – 1080 IU)]. There were 6 (15%) cases with mild levels [20-50% of normal (2160 – 5280 IU)].

The study showed statistically significant (p value 0.0005) association between POP scale and the outcome. Those with mild POP scale showed significant chances of survival as compared to those moderate and severe POP scales similarly association between GCS scoring system and the outcome showed association between the two was statistically significant with P-value < 0.0001 (simulated), using Chi-square test. Those with mild GCS score showed significantly higher chances of survival as compared to those with moderate to severe scores.

The association between the cholinesterase levels with the outcome was statistically significant with P-value of 0.0001 as obtained using Chi-square test. Those with normal cholinesterase levels showed significantly higher chances of survival as compared to those with less than 10% of the normal cholinesterase levels.

There was also significant association between POP scale (p value <0.0001), Glasgow coma scale (<0.0001) and need for ventilatory support. Those with mild GCS scores did not require any support, while those with moderate to severe scores majorly required the ventilation support.

GCS Score	Ventilatory support		Total
	Yes	No	
Mild (13-15)	0	27	27 (67.5)
Moderate (9-12)	5	1	6 (15)
Severe (≤ 8)	7	0	7 (17.5)
Total	12 (30)	28 (70)	40
Chi-square: P-value	< 0.0001		

Table 3: Association between GCS score and ventilation support

POP Scale	Ventilation support		Total
	Yes	No	
Mild (< 4)	0	26	26 (65)
Moderate (4-7)	7	2	9 (22.5)
Severe (7 <)	5	0	5 (12.5)
Total	12 (30)	28 (70)	40
Chi-square: P-value	< 0.0001		

Table 4: Association between POP scale and ventilation support

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Cholinesterase Levels	Ventilatory support		Total
	Yes	No	
≤ 10%	6	1	7 (17.5)
10% - 20%	3	1	4 (10)
20% - 50%	2	4	6 (15)
Normal	1	22	23 (57.5)
Total	12 (30)	28 (70)	40
Chi-square: P-value	< 0.0001		

Table 5: Association between cholinesterase levels and ventilation support

The association of cholinesterase levels and the need for ventilation support is shown in Table 5. Chi-square test with simulated p-value resulted into P-value < 0.0001 indicating statistically significant association between the cholinesterase levels and the need for ventilation support. It is evident that those with normal levels did not require the support, while as the levels reduced from the normal levels, the need for ventilation support increased significantly.

DISCUSSION:

AGE AND SEX: In our study majority of patients were in the age group 21 – 30 (32.5%). 67% of the patients were within 40 years of age. This is in comparison to studies done by Kavya ST et al,⁶ Hasan et al,⁷ Rehiman et al.⁸ Study revealed a male preponderance (72.5%), female accounting for 27.5% of cases. This corresponds to gender distribution reported by Hasan et al⁷, Kavya ST et al⁶, Shah Harsh D et al.⁹

OCCUPATION: In our study, majority of patients had agriculture as main occupation (47.5%), followed by housewives who constituted 25% of cases. This is similar to findings by Shah Harsh D et al⁹ where farmers constituted 78% and housewives 14%. Hasan et al⁷ reported in their study that 47% of patients were farmers. Farmers had maximum incidence in our study as agriculture is the main source of income in this region of Maharashtra and easy accessibility of OP compounds to farmers.

MODE OF POISONING: In our study, maximum number of patients 34 (85%) had consumed poison with suicidal intent. As OP compounds are generally available ready hand as pesticides and open access to these compounds at pesticide shops may be the reason for OP compounds to be used as a common mode of suicidal attempt.

CLINICAL PRESENTATION: In the present study nausea and vomiting was present in all patients, followed by increased sweating in 90% of patients. Breathlessness as well as increased salivation was present in 32.5% patients. This is in comparison to Kavya et al⁶ who found that abdominal pain, nausea and increased secretions were main presenting symptoms, Rehiman et al⁸ also found vomiting in 80% of cases and increased salivation in 32% of cases. Average stay of patients in the hospital in our study was 5 days and none of the patient found to have intermediate syndrome.

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The commonest clinical sign observed was miosis which was present in all patients. Others were bradycardia (62.5%), fasciculations (57.5%). These results are comparable to studies of Hasan et al⁷ who found pupillary manifestation as most common sign (93%), Rehiman et al⁸ also found bradycardia and miosis as most common and consistent clinical findings.

MORTALITY: Our study had a mortality of 17.5% which is in comparison with Hasan et al⁷ (18%), Kavya et al⁶ (18%), Reihman et al⁸ (14%), Das. B.W. et al¹⁰ (13.3%), Arup Kumar Kundu et al¹¹ (13.3%), Noiura et al¹² (10%). Most deaths in our study occurred within 24 hours of admission to hospital. Delay in hospitalization and higher POP score with lower GCS accounted for mortality.

All the patients with mild grade of GCS i.e. 13 – 15 survived. All 7 patients who expired had GCS of less than 8 i.e. severe grade. This is in accordance to Hasan et al⁷ who found that mortality gradually increased as GCS decreased from 13 to 7 with 100% fatality in patients with GCS score < 7. Similar study was done by Davies et al¹³ showed that patients presenting with GCS 14 or 15 had mortality of 2.7% compared to fatality rate of 50.3% if GCS was < 13 at presentation.

100% of patients with mild grade of poisoning according to POP scale survived. 5 out of 7 patients (71%) who expired had severe grade and 2 patients had moderate grade poisoning according to POP scale. Similar findings were observed by Kavya et al⁶ who found that POP scale directly correlated with death outcome (p value < 0.001), Shah Harsh D et al⁹ also found that 75% patient who died had severe POP score on admission.

Majority of patients (57.5%) had subclinical poisoning with their serum cholinesterase (pseudocholinesterase) levels being > 50% out of which none had expired. Patients with PChe levels < 50% had more mortality compared to patients with PChe levels >50% (p value = 0.0001). This is in accordance with findings of Kavya et al⁶ who found significant correlation between deranged PChe levels and mortality as well as morbidity of patients. Namba et al¹⁴ found definitive correlation between PChe levels and severity of poisoning and considered it a valid marker of severity and to prognosticate patients with OP poisoning.

GLASGOW COMA SCALE AND VENTILATORY SUPPORT: In our study all patient with moderate and severe grade of GCS needed ventilatory support. None of the patients with GCS of 13 – 15 needed ventilatory support. Similar results were found by Davies et al,¹³ A Goel et al¹⁵ and Grmec S et al.¹⁶ Chan et al¹⁷ reported that an initial GCS score of 8 or less was found to be a useful guideline for intubation when used within specific clinical context (sensitivity = 90%, specificity = 95%).

PAREDENIYA OP POISONING SCALE AND VENTILATORY SUPPORT: None of the patients with mild grade of poisoning needed ventilatory support. All of the 12 patients who were ventilated had moderate to severe grade of poisoning according to POP scale. This is statistically significant in predicting the need of ventilatory support (p value <0.0001). Kavya et al⁶ also found significant correlation between moderate to severe grade of poisoning according to POP scale and need for ventilatory support.

Shah Harsh D et al⁹ also found significant correlation between severe POP score and need for ventilatory support. Rehiman et al⁸ also found good correlation between POP score and the need for mechanical ventilation and total dose of atropine.

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Our study has also found that patients with mild POP score and mild GCS score at presentation had pseudocholinesterase levels within normal range. More number of patients with moderate to severe grade poisoning according to GCS and POP scale had lower pseudocholinesterase levels. This correlation is statistically significant with p value = 0.0009 for GCS and p value = 0.0002 for POP scale. Similar finding was found by Kavya et al⁶, Shah Harsh D et al.⁹ Rehiman et al⁸ found that higher the score of POP scale, the higher was the degree of derangement in serum cholinesterase level.

In this study Glasgow Coma Scale, Paradeniya OP poisoning scale and serum PChe levels all have sensitivity 95% and specificity 95% and positive predictive value of 95% in predicting the outcome of the patient in the form of mortality. But studies with a large sample size and a heterogeneous population have to be conducted to confirm the results.

OBSERVATION AND CONCLUSION: OP poisoning is one of the most common modes of suicides in this part of India and in our study it accounted for 17.5% mortality. Most of the patients consumed poison with a suicidal intent.

In the study majority of the patients were in younger age group. There was male preponderance amongst the patients and majority of patients had an occupation related to agriculture.

Route of intake of poison was oral in majority of patients. Mortality was least amongst the patients who presented to the hospital early as compared to those who presented late. Patients who had consumed more amount of poison had higher mortality.

The most common symptom reported by patients in our study was nausea and vomiting followed by increased sweating. The most commonly found clinical sign was miosis followed by bradycardia and fasciculations.

Patients who had severe grade poisoning as per GCS <8 or POP score > 7 were found to have significant mortality as contrast to mild grade as per GCS 13-15 and POP score < 4. Thus grade of poisoning decided by these two scales can predict the mortality. Also the Pseudocholinesterase levels were found useful in predicting the mortality.

Glasgow coma scale, POP scale and Pseudocholinesterase levels all showed significant association in predicting the need for ventilatory support. Lower grade of poisoning according to both clinical scores and normal PChe levels had better outcome whereas higher grade of poisoning and lower PChe levels had poorer outcome.

Thus GCS, POP scale and Pseudocholinesterase levels can very well be used in assessing prognosis and mortality of patients of OP poisoning.

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AUTHORS:

1. Shashank Tripathi

PARTICULARS OF CONTRIBUTORS:

1. Post Graduate Student, Department of Medicine, N.K.P. Slave Institute of Medical Sciences.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Shashank Tripathi,
HO Hostel, Room No. 38,
CMH, Nagpur.
E-mail: as_u_wish29@yahoo.com

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