e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(8); 821-825

Original Research Article

Clinical Profile and Outcome of Acute Organophosphorus Poisoning: A Hospital-Based Cross-Sectional Study

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Received: 05-07-2026 / Revised: 29-07-2026 / Accepted: 11-08-2026

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Conflict of interest: Nil

Abstract

Background: Acute organophosphorus (OP) poisoning remains an important cause of poisoning-related morbidity and mortality, particularly in agricultural communities. Early assessment of clinical severity may help identify patients at increased risk of complications and poor outcomes.

Objective: To evaluate the clinical profile, severity, complications, ventilatory requirement, and in-hospital outcome of patients with acute organophosphorus poisoning.

Materials and Methods: This hospital-based cross-sectional study included 100 adult patients with acute organophosphorus poisoning. Demographic characteristics, clinical manifestations, electrocardiographic findings, complications, requirement for mechanical ventilation, and in-hospital outcomes were recorded. Severity at admission was assessed using the Peradeniya Organophosphorus Poisoning (POP) scale.

Results: The 20–29-year age group constituted 39% of patients, 72% were males, and 48% were farmers. Muscarinic manifestations alone occurred in 60%, while 40% had combined muscarinic and nicotinic manifestations; sinus bradycardia was observed in 70%. According to the POP scale, 47% had mild, 48% moderate, and 5% severe poisoning. Mechanical ventilation was required in 28%, respiratory paralysis occurred in 24%, intermediate syndrome in 6%, and overall mortality was 24%. POP severity was significantly associated with mechanical ventilation, complications, and mortality ($p<0.001$). Mortality increased from 2.13% in mild poisoning to 37.5% in moderate and 100% in severe poisoning.

Conclusion: Acute organophosphorus poisoning predominantly affected young males and was associated with considerable morbidity and mortality. Increasing POP severity was significantly associated with complications, mechanical ventilation, and mortality, suggesting its potential utility for early bedside risk stratification.

Keywords: Organophosphorus poisoning; Peradeniya Organophosphorus Poisoning scale; POP score; mechanical ventilation; respiratory paralysis; mortality.

DOI: 10.25258/ijcpr.18.8.127

Introduction

Organophosphorus (OP) compounds are widely used agricultural pesticides, particularly in low- and middle-income countries where agriculture remains an important source of livelihood. Their widespread availability, relatively low cost, and easy accessibility have made organophosphorus compounds an important cause of both accidental and intentional poisoning. Pesticide self-poisoning continues to represent a substantial public-health problem worldwide, with a disproportionate burden in developing countries and agricultural communities [1,2]. Acute organophosphorus poisoning occurs primarily through inhibition of acetylcholinesterase, resulting in accumulation of acetylcholine at muscarinic, nicotinic, and central nervous system synapses. Consequently, affected patients may present with a broad spectrum of manifestations including miosis, excessive salivation, sweating, vomiting, diarrhea, bronchorrhea, bradycardia, muscle fasciculations, weakness, altered sensorium, seizures, and respiratory failure. The severity of poisoning depends on several factors, including the specific compound and dose involved, route of exposure, time elapsed before treatment, and adequacy of initial resuscitation and antidotal therapy. India

continues to experience a considerable clinical burden from acute pesticide poisoning because organophosphorus compounds remain readily accessible in many agricultural settings. Intentional ingestion is frequently reported, particularly among young and middle-aged adults. Recent Indian hospital-based studies have demonstrated substantial morbidity and mortality among patients with acute OP poisoning, with severe poisoning frequently necessitating intensive care, ventilatory support, atropine therapy, and prolonged hospitalization [3,4]. Respiratory failure remains one of the most important life-threatening complications and may result from excessive bronchial secretions, bronchospasm, central respiratory depression, aspiration, and neuromuscular weakness.

Clinical severity at presentation has an important influence on subsequent outcome. Altered consciousness, shock, respiratory failure, requirement for mechanical ventilation, metabolic abnormalities, and evidence of multiorgan dysfunction have been associated with adverse outcomes in patients with acute pesticide or organophosphorus poisoning [3–5]. Recent studies have therefore emphasized early assessment and risk stratification using clinical findings, biochemical parameters, and severity scoring systems to identify patients requiring intensive monitoring and aggressive treatment [4–6].

Despite advances in emergency and critical care, the clinical presentation and outcome of organophosphorus poisoning may vary considerably according to geographical location, pesticide-use patterns, referral practices, availability of critical-care facilities, and delays in reaching hospital. Institution-specific data are therefore important for understanding the demographic and clinical spectrum of poisoning and identifying factors associated with poor outcomes.

The present study was undertaken to evaluate the clinical profile and hospital outcome of patients presenting with acute organophosphorus poisoning, with particular emphasis on demographic characteristics, circumstances of exposure, clinical manifestations, complications, treatment requirements, and final outcome.

Materials and Methods

Study Design and Setting: This hospital-based cross-sectional study was conducted in the Department of General Medicine at Farookh academy of Medical Education, Mysuru, Karnataka, over a period of 10 months from September 2025 to June 2026. A total of 100 patients with acute organophosphorus compound poisoning who fulfilled the eligibility criteria were included in the study.

Study Population: Patients aged >18 years admitted with acute organophosphorus compound poisoning were enrolled after obtaining written informed consent. Patients who had consumed other poisons along with an organophosphorus compound and those with a history of chronic neurological illness were excluded**.**

Data Collection and Clinical Assessment: A detailed history was obtained from each patient or accompanying relatives, followed by a comprehensive clinical examination. Demographic and clinical characteristics, including age, sex, occupation, presenting manifestations, and relevant clinical findings, were recorded using a structured proforma. Particular attention was given to muscarinic and nicotinic manifestations of organophosphorus toxicity.

The severity of poisoning at admission was assessed using the Peradeniya Organophosphorus Poisoning (POP) scale, and patients were categorized according to the clinical severity of poisoning.

Laboratory and other Investigations: Blood samples were collected at admission for relevant laboratory investigations. Routine investigations included complete hemogram, renal function tests, serum electrolytes, liver function tests, random blood glucose, and routine urine examination. A 12-lead electrocardiogram was also performed.

Outcome Assessment: Patients were followed throughout their hospital stay. The principal outcomes evaluated were development of complications, requirement for mechanical ventilation, and final in-hospital outcome (recovery or death). Major complications documented in the study included respiratory paralysis and intermediate syndrome. The relationship of POP severity with mechanical ventilation, complications, and mortality was evaluated. The resulting dataset contained 47 patients with mild, 48 with moderate, and 5 with severe poisoning according to POP grading.

Statistical Analysis: Data were summarized using descriptive statistics. Continuous variables were expressed as mean, standard deviation, median, and range, as appropriate, while categorical variables were presented as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. The independent-samples t-test was used for comparison of mean values between two groups where applicable. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee and written informed consent was obtained from eligible participants before enrolment.

Results

A total of 100 patients presenting with acute organophosphorus poisoning were enrolled and analysed in this study. The largest age group was 20–29 years (39%), males constituted 72%, and farmers represented the largest occupational group (48%).

Table 1: Demographic and occupational profile of the study participants (N=100)

Characteristic	Category	N	%
Age (years)	20–29	39	39.0
	30–39	31	31.0
	40–49	8	8.0
	50–59	10	10.0
	≥60	12	12.0
Sex	Male	72	72.0
	Female	28	28.0
Occupation	Farmer	48	48.0
	Student	23	23.0
	Business	18	18.0
	Housewife	11	11.0

Muscarinic manifestations alone were observed in 60% of patients, whereas 40% had combined muscarinic and nicotinic manifestations. Sinus bradycardia was present in 70%.

Table 2: Clinical manifestations and ECG findings among patients with acute organophosphorus poisoning

Parameter	Finding	N	%
Clinical manifestations	Muscarinic symptoms only	60	60.0
	Muscarinic + nicotinic symptoms	40	40.0
ECG findings	Sinus bradycardia	70	70.0
	Normal sinus rhythm	30	30.0

Out of total 47% mild, 48% moderate and 5% severe poisoning by POP score. Mechanical ventilation was required in 28%, while overall mortality was 24%. Complications consisted predominantly of respiratory paralysis (24%), followed by intermediate syndrome (6%).

Table 3: Severity, complications, ventilatory requirement and outcome of acute organophosphorus poisoning

Parameter	Category	n	%
POP severity	Mild	47	47.0
	Moderate	48	48.0
	Severe	5	5.0
Mechanical ventilation	Required	28	28.0
	Not required	72	72.0
Complications	Respiratory paralysis	24	24.0
	Intermediate syndrome	6	6.0
	None	70	70.0
Outcome	Recovered	76	76.0
	Death	24	24.0

There was a strong association between POP severity and ventilatory requirement: none of the mildly poisoned patients required ventilation compared with 47.92% of moderate and 100% of severe cases ($p<0.001$).

Table 4: Association between POP severity and requirement for mechanical ventilation

POP severity	Ventilation required, n (%)	Ventilation not required, n (%)	Total	p-value
Mild	0 (0.0)	47 (100.0)	47	
Moderate	23 (47.92)	25 (52.08)	48	
Severe	5 (100.0)	0 (0.0)	5	<0.001
Total	28 (28.0)	72 (72.0)	100	

Complications increased markedly with severity. All five patients with severe POP scores developed respiratory paralysis, compared with 37.5% of moderate and 2.13% of mild cases ($p<0.001$).

Table 5: Association between POP severity and complications

Complication	Mild (n=47)	Moderate (n=48)	Severe (n=5)	Total	p-value
Respiratory paralysis	1 (2.13%)	18 (37.50%)	5 (100%)	24 (24.0%)	
Intermediate syndrome	0 (0%)	6 (12.50%)	0 (0%)	6 (6.0%)	
No complication	46 (97.87%)	24 (50.00%)	0 (0%)	70 (70.0%)	**<0.001**
Total	47	48	5	100	

Mortality increased from 2.13% in mild to 37.5% in moderate and 100% in severe poisoning, p<0.001. Counts and the reported p-value are directly from the thesis; percentages in this second presentation are recalculated from those counts.

Table 6: Association between POP severity and in-hospital outcome

POP severity	Death, n (%)	Recovered, n (%)	p-value
Mild (47)	1 (2.13%)	46 (97.87%)	
Moderate (48)	18 (37.50%)	30 (62.50%)	
Severe (5)	5 (100%)	0 (0%)	**<0.001**

Discussion

In the present study, acute organophosphorus poisoning predominantly affected young adults, with the 20–29-year age group forming the largest proportion. Males constituted 72% of cases, and farmers were the most commonly affected occupational group. These findings are comparable with previous Indian studies [7, 8], where young males and individuals involved in agriculture represented the major proportion of OP poisoning cases, likely reflecting greater exposure and easy availability of pesticides. Sinha SN et al [8] similarly reported a predominance of young adults and substantial mortality among patients with acute OP poisoning.

Muscarinic manifestations alone were seen in 60% of patients, while 40% had combined muscarinic and nicotinic features. Sinus bradycardia was present in 70% of cases. These findings are consistent with the typical cholinergic manifestations of OP toxicity, resulting from accumulation of acetylcholine at muscarinic and nicotinic receptors. The coexistence of nicotinic symptoms is clinically important because neuromuscular weakness may contribute to respiratory failure [6, 9].

According to the Peradeniya Organophosphorus Poisoning (POP) scale, 47% had mild, 48% moderate, and 5% severe poisoning. Mechanical ventilation was required in 28% of patients and showed a strong association with POP severity; none of the mildly poisoned patients required ventilation, compared with 47.9% of moderate and all severe cases (p<0.001). Malaviya et al [10] and Kamath et al [11] also demonstrated that higher POP scores were associated with greater severity, ventilatory requirement, and adverse outcomes, supporting its usefulness as a simple bedside prognostic tool. Respiratory paralysis was the most frequent complication, occurring in 24% of patients, followed by intermediate syndrome in 6%. The frequency of complications increased significantly with severity, with respiratory paralysis occurring in all patients with severe poisoning. Respiratory failure is a major cause of morbidity in OP poisoning and may result from excessive secretions, central respiratory depression, aspiration, and neuromuscular weakness. Eddleston et al [12] similarly emphasized respiratory failure as an important determinant of outcome in acute OP poisoning.

Overall mortality was 24%. Mortality increased markedly with POP severity, from 2.13% in mild poisoning to 37.5% in moderate poisoning and 100% in severe poisoning (p<0.001).

Similar observations have been reported in earlier studies, where severe poisoning, delayed treatment, respiratory failure, and need for mechanical ventilation were associated with poor outcome. These findings indicate that early clinical severity assessment using the POP scale can help identify high-risk patients requiring intensive monitoring and timely ventilatory support [13, 14].

Limitations

This study has certain limitations. It was a single-center study with a relatively small sample size, particularly in the severe POP category, which may limit the generalizability and precision of severity-specific outcome estimates. Potential prognostic variables such as time from exposure to treatment, quantity and type of organophosphorus compound, serum cholinesterase levels, atropine requirement, and biochemical parameters were not incorporated into multivariable outcome analysis.

Conclusion

Acute organophosphorus poisoning predominantly affected young adults, particularly males and individuals engaged in farming. Respiratory paralysis was the major complication, and a substantial proportion of patients required mechanical ventilation. Increasing severity according to the Peradeniya Organophosphorus

Poisoning (POP) scale was significantly associated with complications, ventilatory requirement, and mortality ($p<0.001$). Mortality increased markedly from mild cases to moderate cases and 100% in severe poisoning. These findings support the POP scale as a simple and useful bedside tool for early risk stratification, enabling timely intensive monitoring and ventilatory support in high-risk patients.

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