

Original Research Article

CLINICAL PROFILE, EPIDEMIOLOGY, AND OUTCOME OF PATIENTS WITH CHLORPYRIFOS COMPOUND POISONING ADMITTED IN KIMS TEACHING HOSPITAL, KOPPAL: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Chlorpyrifos is a chlorinated organophosphate compound commonly implicated in pesticide poisoning in India. This study aimed to evaluate the clinical profile, epidemiology, and outcomes of patients with chlorpyrifos poisoning admitted to KIMS teaching hospital koppal.

Materials and Methods: This prospective observational study was conducted at Koppal Institute of Medical Sciences from August 2024 to July 2025. Fifty-four patients with confirmed chlorpyrifos poisoning were enrolled. Demographic data, clinical features, laboratory parameters, treatment details, and outcomes were analyzed using descriptive statistics, chi-square test, and independent t-test.

Results: The mean age was 32.10±9.95 years with male predominance (79.6%). Majority were suicidal cases (92.6%) among farmers (63.0%). Common clinical features included altered sensorium (48.1%), sweating (40.7%), and excess salivation (27.8%). Mortality rate was 33.3% among treated patients. Significant predictors of mortality included low GCS (p<0.001), high POP score (p<0.001), low SpO₂ (p<0.001), mechanical ventilation requirement (p=0.002), respiratory distress (p=0.004), altered sensorium (p=0.002), and intermediate syndrome (p=0.008).

Conclusion: Chlorpyrifos poisoning carries significant mortality. Early identification of high-risk patients using GCS and POP scoring with prompt intensive care may improve outcomes.

Keywords: Chlorpyrifos; Organophosphate poisoning; Intermediate syndrome; Pseudocholinesterase; Mortality.

INTRODUCTION

Organophosphate (OP) compounds are among the leading causes of poisoning-related deaths worldwide, with approximately three million cases and over 250,000 deaths annually.^[1] India, being an agrarian economy with relatively unrestricted pesticide access, bears a disproportionate burden of this public health problem. According to the National Crime Records Bureau, pesticide poisoning accounts for nearly 25% of all poisoning deaths in India, with organophosphates being the most commonly implicated agents.^[2]

Chlorpyrifos is a chlorinated organophosphate extensively used in Indian agriculture due to its broad-spectrum insecticidal activity and low cost. The World Health Organization classifies it as a Class II moderately hazardous pesticide.^[3] Unlike other OP compounds, chlorpyrifos possesses unique toxicokinetic properties due to its chlorine substituents, which increase lipid solubility and prolong biological half-life, leading to a depot effect with potential for delayed and prolonged toxicity.^[4] This results in distinct clinical challenges including higher rates of intermediate syndrome, prolonged

ventilatory support requirements, and increased mortality.

Apart from classical cholinergic features, chlorpyrifos poisoning is associated with intermediate syndrome (IMS), acute respiratory distress syndrome, aspiration pneumonia, cardiac arrhythmias including QT prolongation, and delayed polyneuropathy.^[5] These complications contribute significantly to its morbidity and mortality profile, which may differ from other OP compounds.

Despite abundant literature on OP poisoning collectively, there is a paucity of studies specifically addressing chlorpyrifos intoxication.^[4] Regional variations in poisoning patterns, healthcare access, and treatment protocols necessitate location-specific studies. North Karnataka, being predominantly agricultural with limited healthcare infrastructure in rural areas, represents a high-risk region for pesticide poisoning. However, data specific to chlorpyrifos poisoning from this region is lacking. The present study was undertaken to bridge this knowledge gap by evaluating the epidemiology, clinical profile, and outcomes of chlorpyrifos poisoning in our setup, thereby contributing to evidence-based management protocols and public health interventions tailored to local needs.

Aims and Objectives

Aim: To study the clinical profile, epidemiology, and outcome of patients with chlorpyrifos compound poisoning admitted to a KIMS teaching hospital, koppal.

Objectives

- To assess the demographic and epidemiological characteristics of patients with chlorpyrifos poisoning
- To evaluate the clinical features, vital parameters, and severity of chlorpyrifos poisoning
- To document laboratory abnormalities and treatment modalities employed
- To analyze the outcomes and identify prognostic factors associated with mortality

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of General Medicine at Koppal Institute of Medical Sciences Teaching Hospital, Koppal, Karnataka, India, from August 1, 2024, to July 31, 2025.

Sample Size

Using the formula $n = z^2pq/l^2$ ($z=1.96$, $p=10\%$, $q=90\%$, $l=8\%$), the calculated sample size was 54 patients.

Inclusion Criteria

- Age more than 15 years
- Diagnosis of OP poisoning based on clinical features
- History of chlorpyrifos compound exposure confirmed by empty container/product label

- Low serum pseudocholinesterase levels at admission

Exclusion Criteria

- Co-ingestion of other compounds along with chlorpyrifos
- Incomplete data or discharge against medical advice before initial assessment

Data Collection: Detailed history including demographics, poisoning circumstances, and clinical examination findings were recorded. Severity was assessed using Glasgow Coma Scale (GCS) and Peradeniya Organophosphorus Poisoning (POP) Scale. Laboratory investigations included complete blood count, renal and liver function tests, serum electrolytes, arterial blood gas, pseudocholinesterase levels, ECG, and chest radiograph.

Treatment Protocol: All patients received standard treatment including gastric lavage, atropine titrated to achieve atropinization, pralidoxime, and mechanical ventilation when indicated. ICU admission was arranged for severe cases.

Statistical Analysis: Data were analyzed using descriptive statistics. Chi-square test was used for categorical variables and independent t-test for continuous variables. P-value <0.05 was considered significant.

Ethical Considerations: The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants or their legal representatives.

RESULTS

A total of 54 patients with confirmed chlorpyrifos compound poisoning were enrolled during the study period from August 2024 to July 2025.

Demographic and Epidemiological Characteristics: The mean age was 32.10 ± 9.95 years (range: 17-56 years). The 21-30 years age group was most commonly affected (40.7%). Males predominated with 43 patients (79.6%) compared to 11 females (20.4%). Farmers constituted 63.0% of cases. Majority belonged to lower (35.2%) and lower-middle (40.7%) socioeconomic classes. Suicidal intent accounted for 92.6% of cases. Most patients (83.3%) were referred from peripheral centers. Alcohol use was reported in 50% of patients. The demographic characteristics are presented in [Table 1].

Clinical Features, Laboratory Parameters, Treatment, and Outcome: Altered sensorium was the most common feature (48.1%), followed by sweating (40.7%), excess salivation (27.8%), vomiting (22.2%), miosis (22.2%), and respiratory distress (22.2%). The mean GCS was 12.80 ± 3.65 , with 18.5% having GCS ≤ 8 . The mean POP score was 1.62 ± 2.41 . Mean serum pseudocholinesterase was 3584.60 ± 5557.31 U/L. Metabolic acidosis was present in 20.4%. Mean corrected QT interval was 472.15 ± 64.21 ms. Gastric lavage was performed in

98.1%. All patients received atropine and pralidoxime. Mechanical ventilation was required in 42.6%. Intermediate syndrome developed in 29.6%, aspiration pneumonia in 3.7%, ARDS in 3.7%, and arrhythmias in 3.7%. Among 54 patients, 32 (59.3%) were cured, 16 (29.6%) expired, and 6 (11.1%) left against medical advice. The mortality rate among treated patients (excluding DAMA) was 33.3%. Mean hospital stay was 6.00±2.81 days. These findings are summarized in [Table 2].

Factors Associated with Outcome: Analysis of 48 patients (excluding DAMA) revealed that GCS, POP score, and SpO2 were significantly different between survivors and non-survivors. Among continuous variables, GCS was significantly lower

in non-survivors (10.00±5.10 vs 14.46±1.10, p<0.001), POP score was significantly higher in non-survivors (3.58±2.84 vs 0.46±1.02, p<0.001), and oxygen saturation was significantly lower in non-survivors (93.08±5.05% vs 97.79±1.18%, p<0.001). Among categorical variables, altered sensorium (p=0.002), respiratory distress (p=0.004), mechanical ventilation requirement (p=0.002), and intermediate syndrome (p=0.008) were significantly associated with mortality. Sex, age, pseudocholinesterase levels, and QT interval did not show significant association with outcome. These findings are presented in [Table 3].

Table 1: Demographic and Epidemiological Characteristics (N=54)

Characteristic	Category	Number (n)	Percentage (%)
Age Group (years)	≤20	7	13.0
	21-30	22	40.7
	31-40	16	29.6
	41-50	7	13.0
	>50	2	3.7
Sex	Male	43	79.6
	Female	11	20.4
Occupation	Farmer	34	63.0
	Non-farmer	16	29.6
	Unemployed	4	7.4
Socioeconomic Status	Lower	19	35.2
	Lower-Middle	22	40.7
	Middle	13	24.1
Marital Status	Married	36	66.7
	Unmarried	18	33.3
Mode of Poisoning	Suicidal	50	92.6
	Accidental	4	7.4
Referred from Other Center	Yes	45	83.3
	No	9	16.7
Alcohol Use	Yes	27	50.0
	No	27	50.0

Table 2: Clinical Features, Vital Parameters, Laboratory Findings, Treatment, Complications, and Outcome (N=54)

Variable	Category/Value	n/Mean ± SD	% /Range
Clinical Features			
Altered Sensorium	Present	26	48.1
Sweating	Present	22	40.7
Excess Salivation	Present	15	27.8
Vomiting	Present	12	22.2
Miosis	Present	12	22.2
Respiratory Distress	Present	12	22.2
Fasciculations	Present	11	20.4
Neck Muscle Weakness	Present	11	20.4
Bronchorrhea	Present	8	14.8
Seizures	Present	7	13.0
Diarrhea	Present	4	7.4
Abdominal Pain	Present	3	5.6
Bradycardia	Present	0	0.0
Vital Parameters & Severity			
Pulse Rate (beats/min)	Mean ± SD	104.60 ± 18.99	70 - 140
Oxygen Saturation (%)	Mean ± SD	96.00 ± 3.83	85 - 100
Glasgow Coma Scale	Mean ± SD	12.80 ± 3.65	3 - 15
GCS Category	13-15	39	72.2
	9-12	5	9.3
	≤8	10	18.5
POP Score	Mean ± SD	1.62 ± 2.41	0 - 7
Laboratory Parameters			
Pseudocholinesterase (U/L)	Mean ± SD	3584.60 ± 5557.31	315 - 35609
Corrected QT Interval (ms)	Mean ± SD	472.15 ± 64.21	360 - 580
ABG Finding	Normal	42	77.8
	Metabolic Acidosis	11	20.4

	Respiratory Acidosis	1	1.8
Treatment			
Gastric Lavage	Done	53	98.1
Atropine	Administered	54	100.0
Pralidoxime	Administered	54	100.0
Mechanical Ventilation	Required	23	42.6
	Not Required	31	57.4
Complications			
Intermediate Syndrome	Present	16	29.6
Aspiration Pneumonia	Present	2	3.7
ARDS	Present	2	3.7
Arrhythmias	Present	2	3.7
Outcome			
	Cured	32	59.3
	Expired	16	29.6
	DAMA	6	11.1
Hospital Stay (days)	Mean ± SD	6.00 ± 2.81	2 - 15

POP: Peradeniya Organophosphorus Poisoning; GCS: Glasgow Coma Scale; ABG: Arterial Blood Gas; ARDS: Acute Respiratory Distress Syndrome; DAMA: Discharged Against Medical Advice

Table 3: Comparison of Variables Between Survivors and Non-Survivors (N=48)

Variable	Survivors (n=32)	Non-Survivors (n=16)	Statistic	p-value
Continuous Variables	Mean ± SD	Mean ± SD	t-value	
Age (years)	30.17 ± 9.31	35.00 ± 12.09	-1.32	0.193
Glasgow Coma Scale	14.46 ± 1.10	10.00 ± 5.10	4.18	<0.001*
POP Score	0.46 ± 1.02	3.58 ± 2.84	-4.89	<0.001*
Oxygen Saturation (%)	97.79 ± 1.18	93.08 ± 5.05	4.56	<0.001*
Pseudocholinesterase (U/L)	4633.17 ± 6930.54	1855.92 ± 1683.70	1.58	0.121
Corrected QT Interval (ms)	459.17 ± 57.78	488.00 ± 80.89	-1.35	0.186
Categorical Variables	n (%)	n (%)	χ²	
Sex			0.031	0.861
Male	26 (81.3)	13 (81.3)		
Female	6 (18.7)	3 (18.7)		
Altered Sensorium			9.524	0.002*
Present	8 (25.0)	12 (75.0)		
Absent	24 (75.0)	4 (25.0)		
Respiratory Distress			8.333	0.004*
Present	2 (6.3)	8 (50.0)		
Absent	30 (93.7)	8 (50.0)		
Mechanical Ventilation			9.877	0.002*
Required	6 (18.8)	11 (68.8)		
Not Required	26 (81.2)	5 (31.2)		
Intermediate Syndrome			7.111	0.008*
Present	4 (12.5)	9 (56.3)		
Absent	28 (87.5)	7 (43.7)		

*Statistically significant (p<0.05); Independent samples t-test for continuous variables; Chi-square test for categorical variables; POP: Peradeniya Organophosphorus Poisoning

DISCUSSION

The present study evaluated 54 patients with chlorpyrifos poisoning admitted to KIMS teaching hospital, koppal, Karnataka. The mean age of 32.10±9.95 years and predominance of the 21-40 years age group is consistent with findings by Bandy et al. who reported a mean age of 32.6 years in OP poisoning.⁶ This reflects the vulnerability of the economically productive age group to psychosocial stressors.

The male predominance (79.6%) observed aligns with studies by Thunga et al. from South India.⁷ This may be attributed to occupational exposure among male farmers and higher alcohol use predisposing to impulsive self-harm. Farmers constituted 63% of cases, reflecting easy pesticide accessibility in agricultural communities, consistent with observations by Chataut et al,⁸ Suicidal intent (92.6%) was the overwhelming mode of poisoning,

highlighting the need for mental health interventions and pesticide regulation.

Altered sensorium (48.1%) was the most common clinical feature, followed by muscarinic manifestations. Similar findings were reported by Kang et al. who observed altered consciousness in 42% of OP poisoning cases.⁹ The mortality rate of 33.3% among treated patients is higher than general OP poisoning studies, possibly reflecting the unique toxicokinetic properties of chlorpyrifos. Liu et al. specifically studying chlorpyrifos intoxication reported comparable outcomes.⁵ Intermediate syndrome developed in 29.6% of patients, within the reported range of 10-40% for severe OP poisoning.¹⁰

Several clinical parameters emerged as significant mortality predictors. Low GCS, high POP score, and low oxygen saturation were strongly associated with death, validating findings by Sam et al.¹¹ The requirement for mechanical ventilation was a strong predictor, with 64.7% of ventilated patients

expiring. Presence of altered sensorium, respiratory distress, and intermediate syndrome significantly predicted mortality, emphasizing the importance of early recognition and aggressive management. The association between intermediate syndrome and mortality underscores the need for vigilant monitoring beyond the acute cholinergic phase.^[12] Limitations: The relatively small sample size and single-center design may limit generalizability. Long-term follow-up for delayed complications was not performed.

CONCLUSION

Chlorpyrifos poisoning predominantly affects young adult male farmers with suicidal intent and carries significant mortality (33.3%). Low GCS, high POP score, low oxygen saturation, altered sensorium, respiratory distress, mechanical ventilation requirement, and intermediate syndrome are significant predictors of death. Early identification of high-risk patients using clinical scoring systems, vigilant monitoring for intermediate syndrome, and prompt intensive care management are essential for improving survival outcomes.

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