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Original Research Article

INVESTIGATION OF CASES OF ACUTE ORGANOPHOSPHATES INSECTICIDE POISONING AT A MEDICAL COLLEGE HOSPITAL

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ABSTRACT

Background: In agricultural areas in particular, OP pesticide poisoning poses a serious threat to human health. Its extensive availability and high toxicity make it a major contributor to illness and death. Excessive cholinergic stimulation and severe clinical symptoms are the results of OP drugs' action via inhibiting acetylcholinesterase. The purpose of this research is to analyze the characteristics, treatment, and results of patients hospitalized to a medical college hospital with acute OP poisoning.

Materials and Methods: A year-long retrospective observational study was carried out at a hospital that provides tertiary care, medical college at Department of Forensic Medicine and Toxicology, ESIC Medical College, Sanathnagar, Hyderabad, India between February 2024 to January 2025. The medical records of patients were combed through for information on their demographics, clinical symptoms, biochemical markers, treatment plans, and results. For this study, we included all cases of verified OP poisoning; cases of mixed poisoning or unexplained hazardous intake were excluded. Descriptive statistics, such as percentages, means, and standard deviations, were employed to analyze the data.

Results: A total of 60 cases of acute organophosphate poisoning were recorded, with a male predominance (68.3%, n=41) and a higher incidence in the 20–40 years age group (58.3%, n=35). The most common presenting symptoms included miosis (83.3%, n=50), respiratory distress (73.3%, n=44), excessive salivation (68.3%, n=41), and altered mental status (53.3%, n=32). The majority of patients received standard treatment, including atropine (100%, n=60) and oxime therapy (75.0%, n=45), along with supportive care. The mean duration of hospital stay was 5.6 ± 2.1 days. In terms of severity, mild poisoning was observed in 17 patients (28.3%), moderate poisoning in 28 patients (46.7%), and severe poisoning in 15 patients (25.0%).

Conclusion: To increase survival rates, acute OP poisoning must be diagnosed early and treated promptly; it is a major medical emergency. In order to decrease mortality, the study stresses the need of raising public awareness, implementing stronger restrictions to limit the availability of OP, and improving critical care facilities. Assessing preventative measures and the long-term consequences of poisoning need additional investigation.

Keywords: Organophosphate poisoning, insecticide toxicity, acetylcholinesterase inhibition, cholinergic crisis, medical college hospital, case fatality rate, atropine therapy.

INTRODUCTION

A significant global health concern is the poisoning caused by organophosphate (OP) insecticides, which are widely employed for pest control in agricultural regions. Because of their great effectiveness against pests, OP chemicals are extensively used. However, there is a major public health concern over their hazardous consequences on humans. Ingesting, inhaling, and cutaneous absorption are some of the

ways in which acute poisoning can manifest. While occupational exposure is mostly unintentional, purposeful self-poisoning is nevertheless a major source of death and illness, especially in underdeveloped nations.[1-3]

An overabundance of acetylcholine at cholinergic synapses is the lethal impact of organophosphates, which are caused by the irreversible inhibition of the enzyme acetylcholinesterase (AChE). A classic "cholinergic crisis" is the outcome of this ongoing activation of nicotinic and muscarinic receptors. Miosis, bradycardia, bronchospasm, diarrhea, gastrointestinal distress, lacrimation, excessive salivation, and urine are all muscarinic effects. The malfunction of the neuromuscular junction causes respiratory paralysis, fasciculations, and weak muscles as a narcotic effect. Seizures, agitation, and coma are among central nervous system (CNS) consequences that can develop after OP poisoning.[4-6]

Clinical manifestations and serum cholinesterase levels determine whether OP poisoning is mild, moderate, or severe. In mild cases, symptoms like nausea, dizziness, and mild sweating may be present. On the other hand, consequences like acute respiratory distress syndrome (ARDS), cardiac arrhythmias, and multi-organ failure can develop in moderate to severe poisoning. Delays in hospital presentation and insufficient treatment facilities can lead to high fatality rates, even when medical therapies are used. Atropine and oxime treatment, when administered promptly, greatly enhance survival rates when combined with intensive supportive care.[5-7]

Continuous monitoring and assessment of poisoning cases is necessary because to the substantial burden of OP poisoning and its effects on public health. The objective of this research is to examine the frequency, symptoms, diagnosis, treatment, and prognosis of OP poisoning patients admitted to a medical college hospital that provides tertiary care. The results will shed light on the frequency and severity of OP poisoning, which will aid in the development of more effective treatments and prevention strategies.[6-8]

MATERIALS AND METHODS

Department of Forensic Medicine and Toxicology, ESIC Medical College, Sanathnagar, Hyderabad served as the site of this one-year retrospective observational study between February 2024 to January 2025. Acute organophosphate insecticide poisoning patients admitted to the emergency room during the study period were all included in the study. Information about the patient's demographics, clinical presentation, therapy, lab results, and outcomes was culled from their medical records.

Inclusion Criteria

- Patients of all age groups and genders diagnosed with acute OP poisoning, confirmed based on clinical features and history of exposure.
- Patients who received treatment at the study hospital within the study period.
- Cases with documented medical records, including clinical symptoms, biochemical findings, and treatment details.

Exclusion Criteria

- Patients with mixed poisoning involving multiple toxic substances.
- Cases of chronic OP exposure rather than acute poisoning.
- Patients who were brought dead or left against medical advice before initiation of treatment.
- Incomplete medical records with missing critical data.

Statistical Analysis: We used SPSS version 25.0 to evaluate the data that was entered into Microsoft Excel. Continuous variables were represented as mean ± standard deviation (SD), whereas descriptive statistics were employed to synthesize categorical variables (frequency and percentage). We used logistic regression and chi-square tests to find correlations between the variables, setting a significance level at $p < 0.05$.

RESULTS

For the purpose of the study, a total of sixty individuals who were suffering from acute organophosphate (OP) poisoning were involved. A presentation of the findings can be found in the tables that follow.

Table 1: Comparison of HeLD and OHIP-14 Scores Among Socioeconomic Groups

Variable	Number of Cases (n=60)	Percentage (%)
Gender		
Male	41	68.3%
Female	19	31.7%
Age Group (years)		
< 20	9	15.0%
20–40	35	58.3%
> 40	16	26.7%
Residence		
Rural	43	71.7%
Urban	17	28.3%
Intent of Poisoning		
Accidental	26	43.3%
Suicidal	34	56.7%

The highest frequency of OP poisoning was in the 20-40 age range (58.3%), and males accounted for 68.3% of the cases. There is a substantial correlation between agricultural pesticide use and the fact that the majority of cases (71.7%) were found in rural areas. The leading cause was poisoning, which resulted in 56.7% of cases.

Table 2: Clinical Presentation of OP Poisoning Cases

Clinical Feature	Number of Cases (n=60)	Percentage (%)
Miosis (pupil constriction)	50	83.3%
Excessive salivation	41	68.3%
Respiratory distress	44	73.3%
Muscle fasciculations	36	60.0%
Altered mental status	29	48.3%
Bradycardia (< 60 bpm)	18	30.0%
Seizures	9	15.0%

In terms of frequency, miosis (83.3%), respiratory discomfort (73.3%), and excessive salivation (68.3%) were the most often noted symptoms. Muscle fasciculations (60.0%) and impaired mental status (48.1%) were among the most commonly reported neuromuscular symptoms. As a sign of severe poisoning, seizures occurred in 15.0% of a smaller subset of individuals.

Table 3: Severity Classification and Treatment Administered

Severity Level	Number of Cases (n=60)	Percentage (%)
Mild	17	28.3%
Moderate	28	46.7%
Severe	15	25.0%
Treatment Administered	Number of Cases (n=60)	Percentage (%)
Atropine therapy	60	100%
Oxime therapy (Pralidoxime)	45	75.0%
Mechanical ventilation	19	31.7%

The majority of poisoning cases were moderate (46.7%), with mild cases coming in at 28.3% and severe instances at 25.0%. In order to reactivate acetylcholinesterase, all patients were given atropine therapy at 100% dose, while 75.0% were given oximes. Mechanical ventilation was necessary for 31.7% of patients, suggesting serious respiratory problems.

Table 4: Patient Outcomes and Mortality

Outcome	Number of Cases (n=60)	Percentage (%)
Full Recovery	44	73.3%
Complications	8	13.3%
Deaths	8	13.3%

Complications such as pneumonia, heart arrhythmias, and secondary infections affected 13.3% of patients, although 73.3% of those patients recovered completely. With a greater mortality rate in cases of severe poisoning, the case fatality rate came to 13.3%. On average, survivors stayed in the hospital for 5.1 days, but non-survivors stayed for 7.3 days, suggesting that their conditions were more severe and needed urgent care.

DISCUSSION

In areas where these pesticides are extensively used for farming, acute OP poisoning is still a major problem with public health. Here, we looked at 60 OP poisoning cases that ended up in a tertiary care hospital, breaking them down by demographics, clinical presentation, severity, treatment decisions, and results.[9,10] Consistent with other research indicating that men are more vulnerable due to occupational exposure in agricultural settings, the results show that men were more commonly impacted than females (68.3% vs. 33.0%). Like poisoning cases caused by occupational exposure, accidental ingestion, or purposeful self-harm, the largest frequency was recorded in the 20-40 year old age group (58.3%). A lack of stringent controls or preventive measures, along with the extensive use of OP pesticides in farming communities, is seen in the prevalence of cases from rural locations (71.7%).[11-13]

Surpassing unintentional occurrences, the alarmingly high percentage of suicidal intake stood at 56.7%. This trend highlights the critical need for more regulations on pesticide sales and awareness initiatives on proper handling and storage, as it implies that easily accessible OP pesticides contribute considerably to poisoning instances. It is possible that mental health interventions in rural regions are very important in lowering the number of cases of intentional self-injury.[14-16]

Miosis (83.3%), respiratory distress (73.3%), and excessive salivation (68.3%), the most prevalent cholinergic symptoms, were observed in the clinical presentation of patients. These results confirm the long-established harmful effects of OP chemicals,

which cause synaptic acetylcholine buildup by blocking acetylcholinesterase. Signs of central nervous system involvement, such as seizures, altered mental status, and muscle fasciculations, were observed in severe cases. Mechanical ventilation was required in 31.7% of cases due to respiratory problems, which were particularly prevalent. This emphasizes the potentially fatal consequences of OP poisoning, particularly in cases where patients arrive late or do not receive sufficient initial treatment.[17-19] Mild poisoning accounted for 28.3% of cases, moderate poisoning for 46.7%, and severe cases for 25.0%. Precise and prompt delivery of atropine (100%) and oxime (75%) therapy was critical in achieving patient stabilization. The anti-muscarinic characteristics of atropine make it the gold standard for treating opiate toxicity, whereas oximes like pralidoxime help reactivate acetylcholinesterase, especially when given early on. But the fact that almost a third of patients require mechanical ventilation shows how serious the respiratory failure is and how vital it is to have intensive care support in such circumstances.[20-22]

Complications such as pneumonia, heart arrhythmias, and secondary infections affected 13.3% of patients, whereas 73.3% made a full recovery. The 13.3% death rate is in line with earlier findings from comparable studies conducted in hospitals. Early diagnosis, rapid resuscitation, and intensive care measures are crucial because to the greater mortality rate among severe patients. Those who did not make it out of the hospital had a longer average stay (7.3 days) than those who did (5.1 days), suggesting that their critical illness was more severe and lasted longer before they passed away.[23-25]

Severe restrictions to limit the availability of OP chemicals, extensive instructional programs on pesticide handling, and early medical intervention are all emphasized by these results. Furthermore, OP poisoning-related suicide attempts could be mitigated with the incorporation of mental health services into healthcare programs serving rural areas. Assessing survivors' long-term neurological consequences, optimizing treatment regimens, and developing better antidotal treatments should all be priorities for future study.[26-28]

CONCLUSION

In agricultural regions, OP poisoning still causes much agony and death. Males (68.3%), notably 20–40-year-olds (58.3%), and rural residents (71.7%) dominated this survey. Since suicide poisoning (56.7%) was more common than accidental exposure, pesticide and mental health controls must be strengthened. The most prevalent symptoms were excessive salivation (68.3%), respiratory distress (73.3%), and miosis (83.3%), with 31.7% of severe patients requiring mechanical ventilation. Mild poisoning was the most common (46.7%), although timely atropine (100%) and oxime therapy (75.0%) treatment was most important. Despite these precautions, the death rate remained 13.3%, with the worst cases having the highest rate. These results demonstrate the need for stricter pesticide controls, public education regarding OP toxicity, and early medical care. Strengthening rural mental health services and critical care facilities can reduce mortality and improve patient outcomes. Future research should assess survivors' long-term neurological effects and improve treatment choices.

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