

Original Article

**DEMOGRAPHIC PROFILE AND CLINICAL OUTCOMES OF ALUMINUM PHOSPHIDE POISONING:
A PROSPECTIVE STUDY**SAJJAD HUSSAIN¹, SHWETA SAROJ^{2*}, V. PAL³

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ABSTRACT

Objective: To analyze the demographic distribution, clinical presentation, and outcomes of ALP poisoning cases admitted to a tertiary care hospital in Bhopal, Madhya Pradesh.

Methods: A prospective observational study was conducted on 44 patients diagnosed with ALP poisoning over a one-year period. Data were collected on age, gender, domicile, clinical symptoms, and outcomes.

Results: The majority of cases occurred in the 21–30 age group (56.82%), with males (56.82%) slightly more affected than females (43.18%). Rural and urban populations were equally affected (50% each). Common symptoms included nausea (38.64%), vomiting (34.09%), and diarrhea (22.73%). Mortality was high, with (72.73%) of patients succumbing to the poisoning.

Conclusion: ALP poisoning continues to be a serious public health issue in both rural and urban India. The high fatality rate underscores the need for tighter control on its sale and improved clinical management strategies.

Keywords: Aluminum phosphide poisoning, Demographic profile, Phosphine toxicity

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INTRODUCTION

Aluminum phosphide (ALP) is a widely used pesticide and fumigant in many developing countries due to its effectiveness in protecting stored grains and its low cost. However, its high toxicity upon exposure to moisture, which leads to the release of phosphine gas, makes it a major cause of acute poisoning, especially in agricultural regions of South Asia and the Middle East [1].

Phosphine gas exerts its toxic effects by inhibiting cytochrome c oxidase, disrupting oxidative phosphorylation, and leading to cellular hypoxia, metabolic acidosis, and multi-organ dysfunction [2, 3]. Because there is no specific antidote, treatment remains largely supportive, and mortality rates can be as high as 70% in severe cases [4]. ALP poisoning is most often intentional and has emerged as a preferred method of suicide in several parts of India, Pakistan, and Iran due to its easy availability and lethal potential [5]. The ingestion is typically followed by rapid onset of gastrointestinal and cardiovascular symptoms, including vomiting, hypotension, arrhythmias, and shock [6]. Despite numerous retrospective studies highlighting the clinical presentation and high case fatality of ALP poisoning, there remains a need for prospective observational data that can identify demographic patterns, clinical predictors, and outcomes more clearly [7]. Understanding these parameters can help formulate targeted prevention strategies and guide early clinical interventions to reduce mortality. This prospective study was undertaken to evaluate the demographic characteristics, clinical manifestations, and outcomes of patients admitted with aluminum phosphide poisoning at a tertiary care center in northern India [8].

MATERIALS AND METHODS**Study design and setting**

This was a prospective, observational study carried out at Gandhi Medical College and Hamidia Hospital, a tertiary care center located in Bhopal, Madhya Pradesh, India. The duration of the study spanned one year, from January 29, 2015, to January 28, 2016. During this period, a total of 44 patients with a confirmed diagnosis of aluminum phosphide poisoning were enrolled after obtaining informed consent.

Inclusion criteria

Patients aged 12 y and above, presenting to the Emergency Department of Hamidia Hospital with a confirmed or suspected history of aluminum phosphide ingestion, along with clinical features such as miosis, salivation, or other characteristic cholinergic symptoms, were included in the study.

Exclusion criteria

- Patients below 12 y of age.
- Patients presenting with causes such as snake bites, insect bites or other toxic agents.

Ethical considerations

The study received ethical clearance from the Institutional Ethics Committee of Gandhi Medical College and Hamidia Hospital, Bhopal. Approval was granted under reference number 13415-16/MC/7/2015 dated June 11, 2015.

Table 1: Distribution of cases according to age

Age in years	Number of cases	Percentage (%)
<20	9	20.45
21–30	25	56.82
31–40	3	6.82
41–50	6	13.64
>50	1	2.27
Total	44	100

Table 2: Distribution of cases according to gender

Gender	Number of cases	Percentage (%)
Male	25	56.82
Female	19	43.18
Total	44	100

Table 2 shows Males (56.82%) were slightly more affected than females (43.18%)

Table 3: Distribution of cases according to domiciliary status

Domicile	Number of cases	Percentage (%)
Rural	22	50.00
Urban	22	50.00
Total	44	100

Table 3 shows interestingly, an equal number of patients came from rural and urban areas (50% each), suggesting a widespread use and availability of ALP beyond agricultural settings

Table 4: Distribution of cases according to clinical manifestation

Clinical manifestation	No. of cases	Percentage (%)
Nausea	17	38.64
Vomiting	15	34.09
Grimness	6	13.64
Salivation	7	15.91
Diarrhea	10	22.73
Pain in abdomen	8	18.18
Headache	7	15.91
Convulsions	2	4.55
Hallucinations	1	2.27
Miosis	2	4.55

Table 4 shows the most common symptoms were nausea (38.64%) and vomiting (34.09%), followed by diarrhea (22.73%), pain in abdomen (18.18%), and salivation (15.91%). Less frequent symptoms included convulsions (4.55%), miosis (4.55%), and hallucinations (2.27%)

Table 5: Distribution of cases according to outcome

Outcome	Number of cases	Percentage (%)
Death	32	72.73
Discharge	12	27.27
Total	44	100

Table 5 shows the outcome was poor in a majority of cases, with 32 patients (72.73%) succumbing to poisoning. Only 12 patients (27.27%) were discharged after treatment table 5.

RESULTS

Table 1 Shows the majority of patients (56.82%) were between 21–30 y of age, followed by those under 20 y (20.45%)

DISCUSSION

In line with findings from Chugh SN and Mehrpour O and Singh S [9], the current study shows that ALP poisoning most commonly affects young adults aged 21–30 y. This reflects the emotional and psychological stressors prevalent in this age group Mehrpour O and Singh S. The male predominance observed is similar to reports by Wahab A, Zaheer MS, Wahab S, Khan RA [10, 11], possibly due to higher occupational and social stress among males.

Interestingly, the present study observed an equal distribution of ALP poisoning cases between rural and urban populations. This aligns with recent reports by Harish R, Rajkumar MG, Shashidhar KN [12, 13] suggesting that urban access to ALP is increasing due to its unregulated sale. The study conducted by Saroj S, Singh P, Kulshrestha V, Bhatnagar S [14] highlights significant morbidity and mortality among both rural and urban victims, especially in the 21–30 age group, emphasizing that unregulated ALP distribution contributes to widespread risk across geographies.

The clinical features noted-nausea, vomiting, diarrhea and abdominal pain-are consistent with those reported by Sarkar MK, Ghosh N,

Rakesh U [15]. Symptoms like convulsions and hallucinations, though less common, were also observed and should alert clinicians to severe toxicity. The mortality rate in this study is alarmingly high, which resonates with earlier studies by Hassanian-Moghaddam H, Shahnazi M, Zamani N [16], emphasizing the lethal nature of ALP and the lack of specific antidotes.

Efforts such as early ICU referral, aggressive supportive therapy, and timely fluid and electrolyte correction can improve survival [17]. Policy measures such as restriction of over-the-counter sales and enhanced poison control infrastructure are urgently needed [18].

CONCLUSION

Aluminium phosphide poisoning remains a significant health concern in India, now affecting both rural and urban populations equally. Young adults are most vulnerable, and the high case fatality rate underscores the need for early diagnosis, rapid intensive care, and strict regulations on pesticide sales. Public awareness campaigns and mental health interventions could help reduce the incidence of such poisonings.

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AUTHORS CONTRIBUTIONS

The author Dr. Sajjad Hussain and Dr. Shweta Saroj, was principal investigator of the study, and involved in the design, conduct, and analysis, and Dr. V Pal, was contributed in report writing, editing, and review of the manuscript.

CONFLICTS OF INTERESTS

The author declares that they have no conflicts of interest.

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