

Original Paper

Sociodemographic and Clinical Profile of Aluminium Phosphide Poisoning in Jaipur, Rajasthan

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ABSTRACT

Aluminium phosphide pellets are inexpensive and widely available for grain fumigation and preservation. Their free availability has led to an epidemic-like situation in some parts of India due to its intentional (suicidal or homicidal) or accidental ingestion. There is a steady year-wise increment in the number of deaths due to this poison, and it is the single most frequent suicidal agent in Jaipur, Rajasthan.

Eighty nine patients with acute aluminium phosphide poisoning were studied in SMS Hospital Jaipur, during the period September 2009 to September 2010. Out of these, 74 patients died (83.15%). The sociodemographic and clinical profile of aluminium phosphide poisoning are discussed in this paper.

Key Words: Aluminium phosphide; Jaipur

Introduction

Suicidal deaths in India have been on a rise over the last several decades. More than one lakh individuals (1,25,017) in the country lost their lives by committing suicide during the year 2008 alone.¹ The number of suicides in the country during the decade (1998–2008) has recorded an increase of 19.4%. These data reveal that the leading means adopted for committing suicide has been poisoning for over a decade (about 40%). Insecticides constitute a majority of the total poisoning (about 20%). Aluminium phosphide (ALP) is a solid fumigant which has been in extensive use since the 1940s. It has rapidly become one of the most commonly used grain

fumigants because of its properties which are considered to be near ideal.²

The present study conducted in Jaipur, Rajasthan is only a representation of the National Statistics at the State Capital level. During the one-year study period from September 09 to September 10, a total of 89 cases of aluminium phosphide poisoning were studied, who were brought to the Emergency Room of SMS Hospital, Jaipur for treatment, or to the Mortuary directly for medicolegal autopsy.

Materials and Methods

The present study was conducted at SMS Hospital Jaipur, Rajasthan. This is an observational study. Eighty nine cases of aluminium phosphide (ALP) poisoning admitted in the medical wards, were studied during the study period; from September 09 to September 10. Patients who were received dead, or declared dead before shifting to the ward, were also included in the study if they fulfilled the inclusion criteria.

Patients with alleged history of consumption of aluminium phosphide (ALP) were included in the study. History was elicited from the patient if he/she was conscious, or from the patients' relatives or attendants. Further confirmation of the diagnosis was done by the silver nitrate filter paper test. All patients who came from the emergency room were admitted in the medical ward after thorough gastric lavage. Samples of gastric lavage were preserved for chemical analysis for medicolegal purposes, and for silver nitrate filter paper test for the study. Detailed

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history pertaining to the present condition, and history of previous illnesses were noted. The patients' sociodemographic details were elicited. Detailed history about the time of consumption of ALP and amount ingested if known, freshness of tablets, etc., was noted. History of immediate vomiting, and other symptoms such as abdominal pain, thirst, dizziness, restlessness, presence of garlicky smell, and period of onset of symptoms after ingestion and pre-hospitalisation were elicited. Immediate symptoms and status of patient when he/she was taken to the nearest hospital were noted, in secondary presentations. Manner of exposure was also elicited. A thorough physical examination was done.

General investigations of the patient were undertaken as per routine, and the patient was started on supportive treatment without any delay.

On death of the patient, further history was elicited from the relatives and attendants of the deceased. Autopsy was done after completion of routine formalities at the mortuary. The data thus obtained was recorded in the form of a master chart in Microsoft Excel format, and subjected to computer-aided analysis. Results thus obtained was tabulated and charts prepared. Resultant data were also subjected to statistical analysis, and mean \pm SD (Standard Deviation) was calculated by using student's Chi square test; difference between means was statistically significant when $P < 0.05$. The means of the quantitative data were compared using "t-test".

Results

The study group comprised 89 victims, of whom 42 (42.19%) were in the age group of 20-29 years, followed by 17 (19.10%) patients in the age group 30-39 years (**Table 1**). Majority of them were male (73.03%) and married (65.17%). 41.57% of the victims were educated, while 35.95% were self employed (35.95%). Most of them belonged to rural background (56.18%), and most of the cases were observed in the months of February to April.

Majority of the patients presented with vomiting (91.01%), followed by dizziness (53.93%) and epigastric pain (20.22%) (**Table 2**). Only 28 (31.46%) patients presented with a single complaint, whereas the rest presented with a combination of more than one symptom. Most of the patients (60.67%) were drowsy at the time of examination and were disoriented. 43.82% of patients were in a state of shock with blood pressure not recordable by routine methods. 12 (13.48%) patients were clinically stable at the time of examination, with systolic BP more than 100mmHg. 8 out of 89 patients had tachycardia with pulse rate more than 100/min, whereas 38 patients (42.70%) had un-recordable pulse. The average pulse rate was 91.98/min. 13 patients (14.60%) had bilateral added breath sounds in the form of crepitations on auscultation. 5 cases also had history of consumption of alcohol along with ALP, and two patients were pregnant at the time of the incident. Most of the cases were suicidal in nature (91.01%).

Table 1

Age Group (Yrs)	Gender		Total
	Male	Female	
10-19	7	2	9
20-29	28	14	42
30-39	13	4	17
40-49	12	2	14
≥ 50	5	2	7
Total	65 (73.03)	24 (26.97)	89 (100.00)

Mean \pm Sd (Male) = 30.63 \pm 10.64; Mean \pm Sd (Female) = 28.92 \pm 8.69

Of the total number of patients who died, 17 patients died within 3 to 6 hours of ingestion of the ALP. Two cases of suspected homicidal poisoning were observed, both of whom died within 3 hours of ingestion of the poison. The duration of time between ingestion and death was highly variable, from a minimum of 90 minutes to a maximum of about 4 days.

Seventy four of the 89 cases died in the current study (mortality rate of 83.15%). Mortality was higher in males (52-70.27%) when compared to females (22-29.73%). Mortality was observed to be more among suicidal cases (68-91.9%) when compared to accidental or homicidal cases. However this could be due to more number of cases of suicidal poisoning when compared to the other modes.

Table 2

Presenting Symptoms	Number of Cases
Vomiting	81
Epigastric Pain	18
Thirst	4
Dizziness	48
Restlessness	15
Garlicky Smell	4
Others	2

Discussion

The study covered 89 subjects, of whom 42 patients (42.19%) were in the age group of 20-29 years followed by 17(19.10%) patients in the age group 30-39 years. Mean age was 30.63 + 10.64 years in male population, and 28.92 + 8.69 years in the female population. Other studies also report a predominance in the age group 20-30 years.³⁻⁷

In the present study, we observed 65 male cases and 24 female cases, with a male female ratio of about 2.6:1. A similar male preponderance was observed by various other workers.^{4,5,7} The literate population comprised a majority in the present study, comprising 41.57% (37 cases) of the total study group. Kochar SR (2004) observed that maximum number of cases were educated in his survey (89.53%), and predominantly matriculate or below 132 (55.23%), followed by undergraduate or graduate 77 (32.21%).⁴

With regard to the occupational status of the cases, maximum number of cases were found in the self-employed group (35.95%), followed by students (28.09%). Housewives constituted 24.72% of the study population. Bajaj et al (1988),⁸ reported that students were the most vulnerable group. Gupta et al (2005)⁹ observed that the incidence of overall poisoning was common in farmers (28.8%) and the unemployed.

Regarding the marital status of the cases, maximum numbers of cases were found among married subjects (65.17%) when compared to unmarried (32.58%). This is in accordance with other recent studies.^{9,10}

On observing the residential status of the cases, it is noted that maximum number of cases were found among people residing in rural area (56.18%) as compared to urban area (43.82%). This is similar to most of the studies by various authors. In the present study, more number of cases (29 cases) were observed during the months of February to April 2010.

Majority of the patients in the present survey presented with vomiting (91.01%) followed by dizziness (53.93%) and epigastric pain (20.22%). Vomiting has been reported by almost all researchers in all cases of ALP poisoning. Other than vomiting, burning epigastric pain^{3,11} nausea, restlessness, excessive thirst, and garlic odour in breath^{4,11} have also been observed.

Most of the patients (60.67%) were drowsy at the time of examination and were disoriented. Only 15 patients (16.85%) were conscious and oriented at the time of examination. 43.82 % of patients were in a state of shock with blood pressure not recordable by routine methods. Similar findings have been reported by others.⁸ In the present study, out of the 89 cases, 81 (91.01%) were suicidal cases, whereas 6 (6.74%) were due to accidental exposure (inhalation/ ingestion), and the remaining 2 cases were alleged to have been given ALP with homicidal intent (2.25%). Suicidal poisoning was more common in the 20-19 years age group (38 cases), and in the male sex (58 cases). Many earlier researchers have observed a similar pattern with intentional ingestion constituting a majority of the cases.^{3,4,7,10}

Seventy four cases out of the 89 in the present survey died, resulting in a mortality rate of 83.15%. Mortality was higher in males (52) when compared to females (22). Mortality was observed to be more among suicidal cases

(68) when compared to accidental or homicidal cases. Mortality rate has been variable in earlier studies ranging from 29.4%,⁶ to 72.8%.⁴ Majority of the cases were brought for treatment to the nearest available hospital within 30 to 60 min. 20 patients were taken to hospital within 30 minutes of ingestion of ALP. Kochar observed that the time interval between intake of ALP and hospital arrival varied from less than half an hour to more than three hours.⁴ 17 patients (22.97%) died within 3 to 6 hours of ingestion of the ALP, while 10.81% patients died within 3 hours of exposure to ALP. Two cases of suspected homicidal poisoning were observed, both of whom died within 3 hours of ingestion of the poison. The duration of time between ingestion and death was highly variable in earlier studies, ranging from a minimum of 90 minutes to a maximum of about 4 days.³

In the current study, accurate history regarding the amount and nature of ALP consumed was not elicitable in most of the cases. One such case was due to accidental inhalational exposure, where the amount of exposure could not be quantified. In both the homicidal cases, history about the amount of ALP could not be elicited. Where history was available, 16 patients had consumed less than 4 gm (one tablet or few grams in a sachet of ALP), and 16 patients had consumed 4 to 7 gm (1 to 2 tablets). 8 patients had consumed more than 7 gm (more than 2 tablets or a full sachet), out of whom 7 patients died during treatment. Of the patients who gave reliable history, majority of them (25 cases) had consumed new, fresh and unexposed ALP as compared to 12 patients who had consumed, old and exposed ALP. Of the 25 patients who had consumed new, unexposed ALP, 21 patients died, whereas 4 patients left the hospital against medical advice. Mortality varied with the quantity of ALP consumed, but it was not statistically significant ($P > 0.05$); however mortality varied significantly with the quality of ALP consumed.

Saraswat et al (1985)³ observed that more than 70% of cases had consumed one or less than one tablet. Chopra et al (1986)¹² reported that the only factor which clearly distinguished survivors from non-survivors was the higher prevalence of ingestion of 'exposed' tablets in the former group ($P < 0.05$). The commonly consumed dose was 1 to 2 tablets.⁸ The quantity of ALP consumed varied from ½ tablet (1.5gm) to 8 tablets (24gm) with an average of 3.01gm or 2.4 tablets in the study done by Kochar.⁴ Average amount of ALP tablets ingested was 1.56 ± 0.90 tablets and the number of tablets consumed by cases

varied from 1 to tablets as per Mehrpoor et al.⁷ In the study by Jaiswal et al, 33 patients had taken fresh tablets, and 7 patients had taken exposed tables.¹¹

Authors Recommendations:

1. Despite various Government norms and reforms, ALP pellets and tablets are still available in clandestine markets. This should be curbed to protect the common man from the toxic effects of ALP.
2. The State Government should create awareness about the toxic effects of ALP through the media.
3. The United Nations Organisation and its associated agencies (WHO and FAO) in consultation with State Governments of India should quickly take appropriate steps to control this undeclared epidemic, and prevent further loss of lives due to liberal sale leading to easy availability of ALP across the counter.
4. In case of ALP poisoning, once the diagnosis of ALP ingestion is confirmed, gastric lavage should be performed if the victim is seen within a few hours of the ingestion.
5. When patients develop acute respiratory distress syndrome (ARDS), adequate support and assisted mechanical ventilation must be provided. Special care must be taken to ensure that the lung injury should not be worsened due to inappropriate medical interventions. The ventilator should be operated in pressure control mode with low tidal volume (6ml/kg). This reduces the lung inflammation and atelectasis. Lower tidal volumes reduce injurious lung stretch and release of inflammatory mediators. Studies suggest that lower tidal volume reduce mortality in ARDS and acute lung injury.¹³

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