

Aluminum Phosphide Poisoning, an Institutional Experience: Case Series

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ABSTRACT

Background: The growing concern over pesticide use has been linked to self-harm and suicide especially in agricultural countries like Nepal. Pesticides like organophosphorus and aluminum phosphide cause the majority of deaths. Although organophosphorus poisoning is common means for suicide, Aluminum phosphide poisoning is also encountered occasionally. Our case series aims to look after the intent of poisoning and the outcome of the patients following Aluminum phosphide poisoning.

Methods: This hospital record-based study includes Aluminum phosphide poisoning patients presenting to the emergency department of Scheer Memorial Adventist Hospital from first January 2017 to 31st December 2020. Data were analyzed using SPSS version-22.

Results: Out of 25 total poisoning cases, most of them were female (60%) and married (56%). The case fatality rate was 84% among which 20% cases were brought dead while 64% died in the hospital. All poisoning cases were suicidal in intent.

Conclusions: Herein we report a case series on 25 Aluminum phosphide poisoning cases with high case fatality rate and all cases being suicidal in intent.

Keywords: Aluminum phosphide; Nepal; pesticides; suicide.

INTRODUCTION

Acute poisoning is a major cause of hospital admission and mortality of patients brought in an emergency.¹ As per the WHO report, more than three million poisoning cases occur globally with a quarter-million deaths annually.² Among total poisoning cases, every year 0.3 million people die due to acute pesticide poisoning worldwide.³

The easy availability of pesticides in an agricultural-based country like Nepal makes pesticides a common suicide agent.⁴ Pesticide agents like organophosphorus compounds and phosphides, most commonly Aluminum phosphide, causes the majority of deaths.⁵ Among seven tertiary hospitals across Nepal, the most commonly used pesticide was found to be Aluminum phosphide.⁶ Aluminum phosphide is an inexpensive and highly toxic inorganic compound with a mortality rate ranging from 37-100%.^{5,7}

Our case series highlights the intent and outcome of the Aluminum phosphide poisoning patients presented to the emergency of Scheer Memorial Adventist Hospital (SMAH) in the year 2017 to 2020.

METHODS

This hospital record-based retrospective study presented as a case series includes all the Aluminum Phosphide poisoning patients presented to the emergency department of Scheer Memorial Adventist Hospital, Banepa from 2017 to 2020. Cases of poisoning other than from Aluminum Phosphide were excluded.

The study was approved by the Institutional Review Committee (IRC) of SMAH (Ref no: 5/2021).

Data were collected by reviewing medical charts from hospital records. The collected data were demographic variables like age, sex, marital status, religion and

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occupation, prior history of suicide, substance abuse, psychiatric illness, intention, and reason for poisoning, consciousness at presentation, emesis induced, gastric lavage, vitals, complications, and outcomes.

The collected data were extracted in Microsoft Excel-13 and analyzed by using Statistical Package for the Social Sciences (SPSS) version-22.

RESULTS

Out of 25 total Aluminum phosphide poisoning patients, all were suicidal in intent. Most cases were female and married. Most of them had complications and the most common outcome was death. Table 1 shows the basic details of the individuals.

Table 1. Basic details of individuals (n=25).

SN	Age	Sex	Marital status	Occupation	Quantity (tablets)*	Reason for intake	GCS	Emesis at home	Gastric lavage#	Complication	Outcome
1	56	M	Married	Undisclosed	5	Family dispute	Semiconscious	No	Not done	Cardiogenic shock	Deceased
2	62	F	Widow	House manager	2	Family dispute	Unconscious	No	Not done	Unknown	Brought dead
3	35	M	Married	Farmer	6	Not disclosed	Semiconscious	Yes	Done	Dysarrhythmias	Deceased
4	41	M	Polygamous	Undisclosed	4	Not disclosed	Conscious	No	Done	Dysarrhythmias	Deceased
5	31	M	Polygamous	Undisclosed	3	Family dispute	Unconscious	No	Not done	Unknown	Brought dead
6	21	F	Married	House manager	4	Husband left	Unconscious	No	Done	Dysarrhythmias	Deceased
7	48	M	Married	Farmer	10	Not disclosed	Semiconscious	No	Done	Cardiogenic shock	Deceased
8	38	M	Married	Business	3	Not disclosed	Unconscious	Yes	Done	Cardiogenic shock	Deceased
9	48	F	Married	Undisclosed	3	Family dispute	Semiconscious	No	Done	Cardiogenic shock	Deceased
10	23	F	Married	Farmer	Not specified	Not disclosed	Unconscious	No	Not done	Cardiopulmonary arrest	Brought dead
11	17	F	Single	Undisclosed	2	Family dispute	Semiconscious	Yes	Not done	Cardiogenic shock	Deceased
12	18	F	Single	Undisclosed	5	Family dispute	Semiconscious	No	Not done	Cardiogenic shock	Deceased
13	55	F	Married	Undisclosed	Not specified	Not disclosed	Unconscious	No	Not done	Cardiogenic shock	Deceased
14	60	F	Widow	House manager	loose powder	Not disclosed	Semiconscious	Yes (soap water)	Done	None	Improved and sent home
15	43	M	Married	Undisclosed	4	Not disclosed	Conscious	No	Done	None	Referred
16	28	F	Widow	Undisclosed	6	Depression	Semiconscious	Yes (soap water)	Done	Dysarrhythmias	Deceased
17	33	M	Widow	Undisclosed	2	Depression	Conscious	Yes	Not done	Unknown	Deceased
18	32	F	Widow	House manager	6	Grief of husband demise	Unconscious	Yes	Not done	Unknown	Deceased
19	46	M	Married	Undisclosed	4	Not disclosed	Unconscious	No	Not done	Unknown	Brought dead
20	29	F	Single	Finance worker	1	Dispute with boyfriend	Semiconscious	Yes	Done	None	Referred
21	71	M	Widower	Undisclosed	10	Not disclosed	Unconscious	No	Not done	Unknown	Deceased
22	32	F	Married	House manager	6	Not disclosed	Unconscious	Yes	Not done	Cardiopulmonary arrest	Brought dead
23	40	F	Married	Undisclosed	4	Influence of alcohol	Conscious	Yes	Not done	None	LAMA
24	28	F	Married	Undisclosed	Not specified	Dispute with husband	Semiconscious	No	Done	Cardiogenic shock	Deceased
25	38	F	Married	Undisclosed	2	Husband left	Semiconscious	No	Not done	Cardiogenic shock	Deceased

Note: * 1 tablet=3 gm; #done with coconut oil

Two-thirds of the total cases were female. Around one-fourth of the total poisoning cases were either widow/widower. Most of them (64%) followed Hinduism. 12 percent of the total cases had a history of prior attempts of suicide and a history of psychiatric illness. Likewise, more than one-third of the total cases had a history of smoking (40%) and alcohol intake (36%). (Table 2)

Table 2. History of Aluminum phosphide poisoning cases (n=25).

Variables		Frequency (n)	Percent (%)
Sex	Female	15	60.0
	Male	10	40.0
Marital status	Married	14	56.0
	Widow	6	24.0
	Single	3	12.0
	Polygamous	2	8.0
Religion	Hindu	16	64.0
	Undisclosed	9	36.0
Prior attempts of suicide	No	22	88.0
	Yes	3	12.0
History of psychiatric illness	No	22	88.0
	Depression	3	12.0
Smoking	No	15	60.0
	Yes	10	40.0
Alcohol	No	16	64.0
	Yes	9	36.0

On examination, more than three-fourths of the total cases were either semiconscious (44%) or unconscious (40%) at the time of presentation. Nearly half of the cases (44%) had gastric lavage done with coconut oil and emesis induced at home (40%). Most of them (40%) had a pulse within the normal range whereas around one-third (32%) had bradycardia. More than three-fourths of patients (76%) had temperature within a normal range and most patients (44%) had normal respiratory rate. (Table 3)

Table 3. Examination and emergency care (n=25).

Variables		Frequency (n)	Percent (%)
Consciousness at presentation	Semiconscious	11	44.0
	Unconscious	10	40.0
	Conscious	4	16.0
Emesis induced at home	No	15	60.0
	Yes	10	40.0
Gastric lavage	Not done	14	56.0
	Done(coconut oil)	11	44.0
Pulse	60-100	10	40.0
	<60	8	32.0
	>100	5	20.0
	Missing	2	8.0
Temp	97-100.4	19	76.0
	<97	4	16.0
	Missing	2	8.0
RR	15-20	11	44.0
	>20	7	28.0
	<15	5	20.0
	Missing	2	8.0

Around two-thirds of the total cases (68%) were brought to the emergency room and more than half (60%) had complications following Aluminum phosphide poisoning. The most common clinical outcome was death, with 64% dying during the hospital stay while 20% brought dead to the hospital. (Table 4)

Table 4. Clinical outcome following Aluminum phosphide poisoning.

Variables		Frequency (n)	Percent (%)
Complication	Yes	15	60.0
	Unknown	6	24.0
	No	4	16.0
Admission	ER	17	68.0
	ICU	4	16.0
	Missing	2	8.0
	No admission	1	4.0
	Referred	1	4.0
Outcome	Deceased	16	64.0
	Brought dead	5	20.0
	Referred	2	8.0
	Improved and sent home	1	4.0
	Leave against medical advice (LAMA)	1	4.0

DISCUSSION

Pesticide poisoning is a major public health problem in developing countries with high case fatality.⁸ Of all global suicides, more than one-third (39%) occur in the South-East Asian Region (SEAR) with the highest suicidal rate of 17.7 per 100,000.⁹ Organophosphorus compounds are commonly used chemical substances for attempted suicide.^{4,8} However not rarely, we encounter several other varieties of poison ingestion like aluminum phosphide. In 2019, the Centre for Pesticide Suicide Prevention identified Dichlorvos and 3gm tablets of aluminum phosphide as the most common causes of pesticide suicide in Nepal, and thereafter the Plant Quarantine and Pesticide Management Center put a prohibition on both the pesticides, to be enforced after a period of two years for the chemicals already on the market.⁶

This hospital record-based study explores factors contributing to the exposure of poison and most importantly the outcome. In this study, most of the reported cases of Aluminum phosphide poisoning were female (60%) which was consistent with the studies of Saha et al. and Alnasser et al.^{10,11} In contrast to it, various other studies showed the majority of reported

cases being male.¹²⁻¹⁴ Studies reflect that females in developing countries are more vulnerable to suicide attempts due to various social and cultural factors like early marriages, domestic violence, problematic love, and marital relationships, and unwanted pregnancies.¹⁵⁻¹⁷

In our study, all the patients reporting to the hospital intentionally consumed the poison for the suicidal attempt. Similar findings were found in studies done by Navabi et al and Nosrati et al.^{14,18} Various other studies also reported self-poisoning with suicidal intent.^{3,19} In contrast, a study done in Saudi Arabia over nine years reported no cases of intentional poisoning.¹¹

Family dispute and grief of losing their spouse were the reason found in most cases for attempting suicide while 3 out of 25 cases (12%) had a history of psychiatric illness (depression). Similarly, in other studies as well, familial disputes were found to be the main precipitating factor.^{10,20} However, various studies done in India and Sri Lanka showed that psychiatric illnesses like depression are associated with suicidal attempts.²¹⁻²³

Aluminum phosphide poisoning has a high mortality (30-100%) and the survival rate is very poor if more than 1.5 g is ingested.²⁴ In our study as well, there was 84% case fatality among which 20% cases were brought dead

while the rest 64% died in the hospital. A study done by Chugh et al over a period of 7 years also showed 77.2% mortality.²⁵ Various studies revealed that major complications leading to death were shock and cardiac arrhythmias.²⁶⁻²⁸ In our study also cardiogenic shock and dysrhythmias were the main causes leading to death.

CONCLUSIONS

Our case series showed the high case fatality rate of Aluminum phosphide poisoning. All cases had suicidal intent for the consumption of poison. As Aluminum phosphide is now prohibited in Nepal, we won't probably be seeing cases of Aluminum phosphide poisoning in near future.

CONFLICT OF INTEREST

None

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