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A Study on Pattern and Outcome of Aluminium Phosphide (Celphos) Poisoning in Rural Tertiary Care Hospital in Uttar Pradesh

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Abstract
Background: *Poisoning is a significant global public health problem. According to the WHO, 99 per cent of the fatal poisoning cases occur in developing countries. Aluminium phosphide (ALP), a fumigant used to protect grain stores, Poisoning is frequent in North India. In India, the correlates of suicide were Family problems, Illness, Unemployment, Addiction and poverty. Knowledge of pattern of poisoning is important to devise Treatment and prevention strategies.*
Methods: *This Hospital based Observational Study was conducted in the Department of Medicine, UPUMS, Saifai. The study was conducted from Jan 2017 to July 2018. A total of 69 cases of Aluminium Phosphide Poisoning were included in the study. Data regarding socio demographic profile, clinical profile, lab parameters, electrocardiography (ECG) and arterial blood gasses (ABG) were collected. Patients were followed up till discharge or expiry. Outcome of the patient was assessed at the time of discharge/expiry.*
Results: *The mean age of the study population was 24±5.9 years. 50.7% were female. 60.9% were married. Route of ingestion was oral (100%).31.9% patients had hypotension at presentation. During follow up 62 Patients (89.9%) developed hypotension. All 62 patients developed severe metabolic acidosis. ECG findings were sinus tachycardia in 46.4 %, followed by ventricular tachycardia in 24.6%. Mortality was seen in 62 cases (89.9%).*
Conclusion: *Aluminium Phosphide is a lethal poison and there is no antidote for this poison. Aluminium Phosphide poisoning is associated with very high mortality. Multiple approaches are required to reduce mortality associated with intentional poisoning.*
Keyword: *Aluminium Phosphide, Celphos, Poisoning.*

Introduction

Poisoning is a significant global public health problem. According to World Health Organisation (WHO) data, in 2012 an estimated 193,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low and middle-income countries. Nearly a million people die each year as a result of suicide, and chemicals account for a significant number of these deaths.[1]

According to the WHO, 99 per cent of the fatal poisoning cases occur in developing countries.[2] A poison is a substance which when administered, inhaled or ingested, is capable of acting deleteriously on the human body.[3] In low and medium income countries, pesticides, kerosene, household chemicals and drugs are common causes of poisoning. In high-income countries, substances involved mainly include drugs, carbon monoxide, and personal care and cleaning products in the home.[4]

Pattern of poisoning in an area depends upon a variety of factors, ranging from access to and availability of poison, socio-economic status of the individual, cultural and religious influences, etc. Poisoning forms a major problem in developing countries, though the type of poison and the associated morbidity and mortality varies from one place to another and it may change over a period of time.[5]

According to official data of national crime records bureau for 2014, 26% of India's officially recorded suicides were poisoning, which was 29.1% and 27.9% in 2012 and 2013 respectively.[6]A particular feature of self-poisoning in northern India is the frequent ingestion of Aluminium phosphide (ALP), a fumigant used to protect grain stores, with an associated case fatality in excess of 70%.[7]

The commonest agents in India appear to be pesticides, sedative drugs, chemicals, alcohol, plant toxins and house hold poisons (mostly cleaning agents). Aluminium phosphide has begun to emerge as a major player in the toxicology field, particularly in the some northern Indian states.[8]In India, the top causes or correlates of suicide were family problems, Illness, Psychiatric problems, Unemployment, Addiction, failure in examination, bankruptcy, poverty, and dowry disputes.[9]

Knowledge of pattern of poisoning is important to devise prevention strategies which have shown to be effective, such as restriction of access to means of poisoning. The present study is conducted in the context of identifying the pattern of Aluminium Phosphide poisoning cases in a rural tertiary care hospital, Uttar Pradesh

Material and Methods

This hospital based Observational study was conducted in the Department of Medicine, U.P.UMS (Uttar Pradesh University of Medical Sciences), Saifai, Etawah, between Jan 2017 to July 2018.All Aluminium Phosphide poisoning cases were included. Age<13 were excluded. Total study population was 69 cases of Aluminium Phosphide poisoning.

Methodology

All the aluminium Phosphide poisoning cases admitted in the emergency ward, ICU and medical ward of UPUMS during the study period of Jan 2017 to Jul 2018 were included. Information was gathered using predesigned and pretested questionnaire. Patients who meet the inclusion criteria for selection of study subjects were identified. The purpose of the study was explained to the patients, if the patient was not in the sane state to give consent, then consent was obtained from the relatives. Those who consented to participate had a chance of being included. Informed written consent from parents or guardian was taken.

Data regarding socio demographic profile, clinical profile, lab parameters, electrocardiography (ECG), arterial blood gasses (ABG), radiological investigations was collected. Patients were followed up till discharge or expiry. Outcome of the patient was assessed at the time of discharge/expiry.

The data thus collected were analysed using SPSS version 24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp). Continuous were presented as mean (±standard deviation). Categorical variables were summarized using absolute and relative frequencies and compared using the Chi-square test. A p value <0.05 in final analyses was considered as significant

participants was 24±5.9 years (Table 1). Majority belong to 15 to 30 years (85.5%). Females were 50.7% and male were 49.3%. 60.9% were married. 97.1% were Hindu. Majority of them belong to upper lower class (37.7%) followed by lower middle class (33.3%). 43.5% were educated upto high school level and most of them were Unemployed (50.7%).

Results

Study population was 69 cases of Aluminium Phosphide Poisoning. The mean age of the study

Table 1 Demographic profile of Aluminium Phosphide Poisoning (N=69)

Socio Demographic Features	Sub Features	Frequency	Percentage
Age	• 15 – 30 • 31 – 45 • 46 – 60 • >60	59 8 1 1	85.5 11.59 1.44 1.44
Gender	• Male • Female	34 35	49.3 50.7
Marital Status	• Married • Unmarried	42 27	60.9 39.1
Religion	• Hindu • Muslim	67 2	97.1 2.9
Socioeconomic Status	• Upper Class • Upper Middle • Lower Middle • Upper Lower • Lower Class	1 10 23 26 9	1.4 14.5 33.3 37.7 13
Education	• Professor • Graduate • Intermediate • High School • Middle School • Primary School • Illiterate	2 1 22 30 7 3 4	2.9 1.4 31.9 43.5 10.1 4.3 5.8
Occupation	• Farmer • House Wife • Professional • Skilled • Semi Skilled • Semi Professional • Un Employed	12 5 2 3 5 7 35	17.4 7.2 2.9 4.3 7.2 10.1 50.7

Table 2 Clinical and Biochemical features of Aluminium Phosphide poisoning (N=69)

Clinical And Biochemical Features	Frequency	Percentage
Route Of Ingestion		
• Oral	69	100
• Inhalation	0	0
Pulse Rate		
• Normal	48	69.6
• Tachycardia	21	30.4
• Bradycardia	0	0
Blood Pressure		
• Normal	47	68.1
• Hypotension	22	31.9
Arterial Blood Gas		
• Nomal	7	10.1
• Metabolic Acidosis	62	89.9
Outcome		
• Death	62	89.9
• Discharge	7	10.1

In patients with aluminium phosphide poisoning (Table. 2), route of ingestion was oral in 100%. 30.4% had tachycardia at presentation. 31.9% patients had hypotension at presentation. During follow up 89.9% developed hypotension. Liver function was deranged in 84.1% and renal function was deranged in 87%. Mortality was seen in 62 cases (89.9%). Case fatality was 89.9%. All 62 patients developed metabolic acidosis and refractory hypotension during hospital stay.

Table 3 ECG findings in Aluminium Phosphide Poisoning (N=69)

ECG Findings	Frequency	Percentage
Sinus Tachycardia	32	46.4
Normal	7	10.1
Av Block	1	1.4
Complete Heart Block	1	1.4
Ectopics	1	1.4
Idioventricular Rhythm	3	4.3
LBBB	2	2.9
RBBB	2	2.9
Sinus Bradycardia	3	4.3
Ventricular Tachycardia	17	24.6

ECG findings were sinus tachycardia in 32 (46.4 %), followed by ventricular tachycardia in 17 (24.6%). Other ECG findings (Table. 3) were AV block, complete heart block, Ectopics, idioventricular rhythm, LBBB, RBBB and Sinus bradycardia.

Discussion

In our study the mean age of the study population was 24±5.9 years. Aluminium Phosphide poisoning is common in young individuals.[10] In our study 85.5% belong to 15 to 30 years and females were 50.7% slightly outnumbering male.

Many studies in India showed male preponderance.[11] 31.9% developed hypotension at presentation and eventually 89.9% patients developed hypotension during hospital stay. Aziz et al.[12] found 75% of the patients had hypotension. 89.9% patients in our study developed metabolic acidosis and refractory hypotension during hospital stay. Non survivors have more severe hypotension and metabolic acidosis.[13]

Liver function was deranged in 84.1% and renal function was deranged in 87%. The major complications following ALP poisoning are cardiac arrhythmia, hypotension, acute respiratory

distress syndrome, acute renal failure, hepatic congestion, disseminated intravascular coagulopathy, and sometimes multi-organ failure.[14,15]

Mortality was seen in 62 cases (89.9%). Poisoning with ALP is associated with a very high mortality. This is due to the high toxicity of the substance and there is no effective antidote. The most common cause of death following ALP poisoning is cardiogenic shock secondary to toxic myocarditis. Patients who have taken lower doses, expired tablets, or tablets exposed to air have a greater chance of survival. Vomiting and early supportive care can also increase the survival rate.[16]Mortality rate due to Celphos poisoning varies in available literature. It was 78% in a study conducted by Reyna-Medina et al.[17]

Mortality rate in ALP Poisoning varies from 35% to 100% and principally depends upon the amount consumed, the relative freshness of the compound, promptness or delay in treatment, duration of shock, and efficacy of treatment. Severe poisoning causes death in about 3 hrs, ranging between 1 - 48 hrs. Clinical presentation depends upon the time elapsed from the time of ingestion.[18]

ECG Findings in Aluminium Phosphide Poisoning

In our study, sinus tachycardia was seen in 46.4 %, followed by ventricular tachycardia in 24.6%.Aziz et al.[12] studied 100 aluminium phosphide cases in Pakistan found that the rate of cardiac arrhythmias was higher (80%), which included 31% of patients having atrial fibrillation, 20% having ventricular fibrillation, 7% having 3rd degree AV block and 5% having 2nd degree AV block.

Correspondingly, Soltaninejad et al.[19] reported atrial fibrillation in 35%, prolonged QTc interval in 35% and bundle branch block in 20% of ALP poisoned patients. Abnormalities of automaticity, which could arise from, a single cell, and abnormalities of conduction, which stem from abnormal interaction between Myocytes, account for cardiac arrhythmias leading to circulatory collapse.[20]

Conclusion

Aluminium Phosphide is a lethal and dangerous poison and there is no antidote for this poison. Aluminium Phosphide poisoning is associated with very high mortality. Multiple approaches are required to reduce mortality and morbidity associated with intentional poisoning. Banning or enforcing regulations on the sale of Aluminium Phosphide would be one approach. Celphos poisoning is a disease of young. Depression and substance abuse are well-recognized risk factors contributing for suicide in adolescents. Awareness educational programs and counselling sessions should be conducted to prepare people to face stress and challenges in today's materialistic world. Promotion of training and education of qualified mental health professionals is justified considering the size of the public-health problems that can lead to suicide.

Declarations

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