

Examining Clinical Outcomes and Management Strategies in Wheat Pill Poisoning

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Abstract

Objective: To retrospectively analyze the clinical presentation and management strategies of patients who died from wheat pill poisoning.

Methodology: A retrospective study was conducted in the Department of Medicine in Divisional Headquarters Teaching Hospital, Azad Kashmir, in which 12 deaths caused by wheat pill poisoning were analyzed. All patients who died from wheat pill poisoning from October 2019 to October 2022 were included in study. The presenting symptoms, clinical findings, initial resuscitation, management and mode of death was recorded for all cases.

Results: A total of 12 cases were included, with a mean age of 27 ± 12.2 years. There were 2 males (16.6%) and 10 females (83.3%). The main presenting symptoms were vomiting (11 cases, 92%) and irritability (7 cases, 58%). Pre-existing psychiatric illness was present in 4 of the 12 cases (33%). The majority of the patients (92%) died within 48 hours of pill ingestion. In most cases, the mode of death was cardiac arrhythmias, with other modes including recalcitrant shock, metabolic acidosis, and myocardial infarction. Management strategies included initial assessment of airway, breathing, and circulation, system management to stabilize symptoms and maintain cardiovascular function, and advanced treatments such as magnesium sulfate administration and considering hemodialysis in severe cases.

Conclusion: The study found that among the 12 cases of wheat pill poisoning, the majority were young females, with high mortality rates primarily due to cardiac arrhythmias. Prompt hospital arrival and medical management are crucial, as most deaths occurred within 48 hours of ingestion.

Keywords: Wheat pill poisoning, Aluminium phosphide, Ionotropic support, Management strategies, Epidemiology

Introduction

Aluminum phosphide is a readily accessible rodenticide used in agricultural regions like Pakistan to safeguard crops, notably wheat and occasionally rice.¹ Wheat pill[®] or less commonly known as rice pill mainly consists of Aluminium phosphide (ALP) and is used in agricultural countries like Pakistan to preserve wheat grains and rice.² Wheat pill is a fumigant rodenticide and pesticide and is extremely toxic. Due to its low price and ease of availability, it is a commonly used agent with suicidal intent.^{3,4} Deliberate self-harm is a major health problem worldwide

but is especially prevalent in developing countries.⁹ Wheat pill intoxication is a growing public health concern in Pakistan and has escalated over the past few years predominantly among young adults.⁵ Although very less literature is available on aluminum phosphide poisoning in Pakistan, according to a national health survey done in 2022 in South Punjab areas, it was concluded that among unintentional injuries aluminum phosphide poisoning is the second commonest cause.⁶ ALP is available in tablet form or powdered sachets and the lethal dose for an average-built adult is 150-500 mg.⁷ When the ALP in a wheat pill comes in contact with moisture or in the case of ingestion – with acid in the stomach, a gas called phosphine is released. This is lethal to rodents as well as to humans as phosphine binds to cytochrome oxidase and causes cellular hypoxia leading to unrestricted organ damage and acute cardiac toxicity leading to focal myocardial necrosis.^{8,9} Despite early diagnosis and efficient resuscitative measures, a poor prognosis and high mortality rate has always been observed among wheat pill poisoning cases.

The study's primary objective was to conduct a retrospective analysis, providing a comprehensive depiction of the clinical characteristics exhibited by patients admitted to intensive care units due to wheat pill poisoning. Additionally, it aimed to clarify the management strategies employed in these cases and document the progression of the disease until the unfortunate occurrence of the patients' demise. This study's findings hold significance not only for medical practitioners but also for policymakers and public health officials involved in agricultural safety and pesticide regulation in regions where Aluminium phosphide usage is prevalent. The purpose of this study was to retrospectively analyse the deaths caused by wheat pill poisoning and describe the clinical characteristics and management of cases presenting to the intensive medical care unit and the course of disease till death.

Patients and Methods

A retrospective study was conducted in the department of Medicine in Divisional Headquarters Teaching Mir-Pur Azad Kashmir, Pakistan, on patients who died of wheat pill poisoning from October 2019 to October 2022. The ethi-

cal permission was taken from IRB with reference number ERC 5284/1523. All 12.0 patients who died with a diagnosis of AIP poisoning based on history were included. Patients were included based on a confirmed diagnosis of Aluminium phosphate poisoning derived from their medical history. The analysis encompassed all demographic information, including age, gender and marital status, ensuring a comprehensive representation of affected individuals. Pre- existing psychiatric illness status did not exclude patients from the study. Over a period of 3 years there were 12 deaths caused by wheat pill poisoning and the patients were included irrespective of their age, gender and marital status.

From the records, all patients with AIP poisoning were initially resuscitated by gastric lavage if not done at a primary health care facility. Inotropic supports (dopamine, dobutamine) and fluid therapy was initiated in those patients who had a blood pressure of less than 90/60 mmHg. Thorough examination of all systems was carried out and documented. All baseline blood investigations were sent, and ECG and arterial blood gases (ABGs) were checked. All patients were given IV MgSO4 and calcium gluconate, Symptomatic treatment for individual symptoms was done such as IV amiodarone in cases of arrhythmias, sodium bicarbonate for metabolic acidosis and anti-emetics in cases of vomiting. Data was entered and analyzed in SPSS V25.0. Age was presented as mean and standard deviation. Gender, Marital status, time for pill ingestion to hospital, pre-existing psychiatric illness etc. were presented as frequency and percentage. Chi square test was applied to compare the general parameters with age group gender. P value less than 0.05 was considered as significant.

Results

Total 12 cases were included. The mean age was 27+ 12.2 year. There was 2(16.6%) male and 10(83.3%) female. Fig: 1 There were 5(41.6%) respondents in 11 to 20 years of age group, 6(50%) in 21 to 30 years of age group and only 1(8.30%) in greater than 30 years of age group. Table: 1 Out of 10(83%) of female, 50% of them were unmarried. There were 1(50%) male and 4(40%) female in 11 to 20 years of age group, 6 (60%) females in 21 to 30n years of age group and only 1(50%) male in greater than 30 years of age group. there was a significant difference of age and gender. (P<0.05). Distribution of general parameters among marital status and time from pill ingestion to hospital arrival, pre-existing psychiatric illness etc. were shown in Table: 2 Pre-existing psychiatric illness was found to be present in 4 of the 12 cases (33%). 11(92%) of the patients of wheat pill poisoning died within 48 hours (about 2 days) of pill ingestion. In most of the cases, the mode of death was cardiac arrhythmias. Other modes included recalcitrant shock, metabolic acidosis, myocardial infarction (table 2). Most of the patients took one to two pills only and all of them ingested the pills with the intention of deliberate self- harm or suicide. There were 67% of the patients from the records, who were brought into the hospital within 4 hours of pill ingestion. Most cases (83%) presented in the summer from March to August. The main presenting symptoms were vomiting 11(92%) and irritability 7(53.8%). There was 6 (50%) of the cases which presented with hypotension, but along the course of illness, eventually all the patients developed hypotension and thence required fluid (figure 3).Particularly, these symptoms of the disease, we can confirm it after diagnostic criteria and inotropic support.

Particularly these are symptoms of this disease, we can confirm it after diagnostic test. Arterial Blood Gases (ABGs) revealed metabolic acidosis in 4(33%) of the cases, however in the remaining cases ,no record of ABGs was available.

Wheat pill poisoning, specifically referring to aluminum phosphide, is a serious condition that requires immediate and comprehensive medical management. Below are the tables showing management of wheat pill poisoning in all 12 cases.

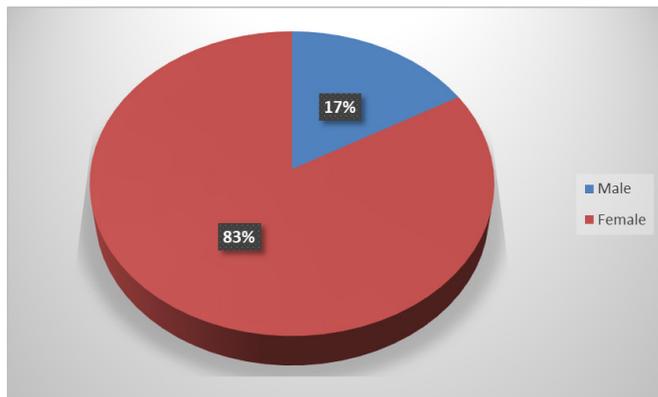


Fig 1: Gender Distribution Among Wheat Pill Poisoning Cases

Table: 1: Age Distribution Among Wheat Pill Poisoning Cases

Age	Percentage
11---20	41.6
21-30	50.0
>30	8.30

Table: 2: Demographic and Clinical Characteristics of Wheat Pill Poisoning Cases

Martial Status	Unmarried	50%
	Married	50%
Time from pill ingestion to hospital arrival	<4 hours	67%
	>4 hours	33%
Pre-existing psychiatric illness	Yes	33%
	No	67%
Time from pill ingestion to death	<48 hours	92%
	>48 hours	8%

Table: 3: Clinical Presentation and Frequency Distribution

Clinical Presentation	Frequency	Percentage
Vomiting	11	92%
Irritability	7	53.8
Hypotension	6	50%
Metabolic acidosis	4	33.3%
Hypoxia	2	16.6%
Nausea	4	33.3%

Table 4: Management Protocol for Poisoning: Steps, Descriptions, and Outcomes

Management Step	Description	Outcome
Initial Assessment	Evaluation of airway, breathing, circulation	Patient is stabilized with ensured breathing and a stable heart rate
	Obtaining patient history	Better-informed treatment plan based on a thorough understanding of poisoning extent
System Management	Monitoring, and management of symptoms such as vomiting, hypotension and metabolic acidosis	Symptoms are stabilized, and severe complications like shock or organ failure are prevented
	Cardiovascular function monitoring, and electrolyte imbalances especially hypokalemia and metabolic acidosis	Blood pressure is maintained, and electrolyte levels and acid-base balance are normalized
Laboratory Treatment	Obtaining blood tests including Glucose, renal and liver functions	Organ function and metabolic status are assessed, guiding further treatment
	Monitoring ECG	Cardiac abnormalities are detected early and managed appropriately
Advance Treatment	Administering magnesium sulfate to minimize toxic effects on the heart	Cardiac toxicity is potentially reduced, improving patient prognosis
	Considering hemodialysis if severe poisoning	Toxins are removed more effectively from the bloodstream, reducing systemic effects

Discussion

The study retrospectively analyzed 12 cases of wheat pill poisoning at a single hospital from October 2019 to October 2022. The majority of patients were young females presenting with symptoms such as vomiting and irritability. Most patients died within 48 hours of ingestion, with cardiac arrhythmias being the primary cause of death. Management strategies included initial stabilization, symptom management, and advanced treatments like magnesium sulfate administration and hemodialysis in severe cases. The findings emphasize the importance of immediate medical intervention to improve patient outcomes. Attempting suicide with poisonous agents is a worldwide public health concern. According to the WHO about 2 million people are globally affected by deliberate self-intoxication.¹⁰ Wheat pill poisoning is a growing medicolegal concern in Pakistan and many other agricultural countries.¹¹ In European countries the availability of ALP is restricted to qualified users hence its misuse is rare.¹² This retrospective analysis of wheat pill poisoning cases delved into the multifaceted aspects surrounding this critical health issues. Firstly the study highlights the global significance of deliberate self-intoxication, with wheat pill poisoning emerging as a significant public health concern, particularly in agricultural countries like Pakistan. The study's findings reveal a disturbing trend of escalating cases, predominantly among young adults, highlight-

ing the complex interplay of socio-economic pressures, mental health challenges and agricultural factors driving suicidal behaviors.

In this study, there were more females 10(83.3%) affected by wheat pill poisoning compared to males 2(16.6%). This finding was consistent with many previous studies and owes to the fact that it is in this age group that the transition from teenagers to young adults occurs and the responsibilities and difficulties along with it come up. Individuals in this age group are affected the most by the economic de-stability and inflation occurring worldwide as pursuing a means of income becomes more profound and difficult at the same time. In one study, 30 patients were admitted. Females outnumbered males in all age groups with a sex ratio of 2.75:1. The mean age of patients was 22.77 ± 12.79 years and 96.6% of patients came from rural areas. There were 93.3% of the cases exposed to poisoning at home, where suicidal poisoning accounted for (86.7%) of cases. Elghany et al. (2018) reported that 43.3% of patients died from wheat pill poisoning.¹³ Peer pressure, the upkeep of positive social bonds, and coping with challenges stemming from fractured family dynamics and job dissatisfaction are issues that affect individuals across all age brackets.¹⁴ These elements collectively contribute to declining mental well-being, potentially resulting in conditions such as depression and even suicidal behavior. In areas where access is unrestricted, the ingestion of wheat pills becomes a viable option for addressing such issues. Pre-existing psychiatric illness was found to be present in 4 of the 12 cases (33%). 92% of the patients of wheat pill poisoning died within 48 hours (about 2 days) of pill ingestion. In one study, it was reported that ALP poisoning is most often lethal. However, there is an emerging evidence of successful use of various drugs such as magnesium sulfate, trimetazidine, and other interventions such as intra-aortic balloon pump and extra corporeal membrane oxygenation in case of ALP poisoning.^{15,16}

Numerous management factors are linked to the outcomes of wheat pill poisoning cases, yet death remains an unavoidable outcome, prompting ongoing exploration and experimentation of new modalities. Initially, bioinformatics facilitated the progression from virtual assistance to animal trials and ultimately to human trials. While the effectiveness of these methods remains a subject of debate, continued research is imperative to advance the body of knowledge regarding the early detection, treatment, and prognosis of wheat pill poisoning.¹⁷ Wheat pill poisoning represents a complex and challenging public health issue with far reaching implications. Effective prevention and management demand a multifaceted approach encompassing awareness campaigns, policy interventions and enhanced clinical practices.¹⁸ By addressing the underlying social, economic and psychological determinants contributing to suicidal behaviors, stakeholders can work towards reducing the burden of wheat pill poisoning and improving patient outcomes.

Limitations

The study's limitations include a small sample size of 12 cases, limiting generalizability. Reliance on medical records may introduce inconsistencies or missing data. Lack of a control group hampers the ability to establish causality. The focus on fatal outcomes neglects potential long-term effects or variations in presentation. Being a single-center study may limit applicability to

diverse settings.

Authors' Contributions

QAA conceived and designed the study, participated in data collection, and contributed to drafting the article. SMS and critically revised and analysed the work, and gave intellectual input..

Conclusion

The study concludes that wheat pill poisoning, primarily affecting young females, exhibits high mortality rates, often due to cardiac arrhythmias. Urgent hospitalization and timely medical intervention within 48 hours post-ingestion are crucial, emphasizing the importance of restricting access, raising awareness, enhancing healthcare professional training, and furthering research for improved prevention and treatment strategies.

Conflict of Interest: The authors have no conflict of interest.

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