Wheat Pill Poisoning: Clinical Manifestation and its Outcome

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Abstract

Background: To determine the clinical features and outcome in patients presenting with wheat pill poisoning.

Methods: In this descriptive study 77 patients with wheat pill ingestion were included. The diagnosis was based on basis of history of consumption of wheat pills. All patients were given initial resuscitation e.g. gastric lavage with vegetable oil and shifted to intensive care unit. Serial ECG and arterial blood gases were done. If pH was less than 7.2, alkali therapy in the form of NaHCO₃ (Usually 7.5% Solution) was initiated. Amiodarone was given for arrhythmias and infusion inotrops (i.e. dopamine & dobutamine) to correct hypotension. End point was death or shifting back to respective medical unit.

Result: Out of 77 patients, majority (53%) were females. Maximum patients belonged to age group (20 – 30 yrs) i.e. 45 patients. Severe Metabolic acidosis was the commonest cause of death. Overall mortality was 33%. Common symptoms were vomiting, hypotension, arrhythmias, irritability, confusion and metabolic acidosis. Patients who consumed more than one tablet did not survive. Patient who presented late, i.e., after 12 hrs, succumbed to death.

Conclusion: Wheat pill is very common mode of suicide in a country like Pakistan as it is freely available and cheap. Arrhythmia and metabolic acidosis is the major cause of death after wheat pills ingestion.

Key Words: Poisoning, Arrhythmias, Metabolic acidosis

Introduction

Pakistan is a wheat growing country. Wheat pills are used to preserve wheat grains. Wheat pills contain aluminium phosphate which is a well known, highly effective insecticide and rodenticide. Moisture in the air mixes with phosphide grains and sets off phosgene, the active form. Aluminium phosphate is reported to be highly toxic when consumed from a freshly opened container and the fatal dose for an average sized individual is believed to be 150-500 grams. Wheat pill poisoning is a very serious but under reported problem. Medical critics still say if a patient with suspected aluminium phosphate poisoning is saved in a hospital then either it was not aluminium phosphate or the poison was exposed one. The reported in hospital mortality of aluminium phosphate poisoning varies from 55% – 90%. However the actual numbers of cases affected are much larger, as less than 5% of those with aluminium phosphate poisoning eventually reach a tertiary care center. Ready availability of such a deadly poison in Asian countries makes it an important public health concern. Likewise deliberate self harm appears to be a major health problem in these countries. In an autopsy study of unnatural deaths in Northwest India, aluminium phosphate was found to be the most common suicidal poison. Considering its disastrous effects, Iran has banned its marketing. In the European countries its supply is restricted under 1998 pesticide act. There has been little progress in our understanding of the characteristics of the poison and limited data is available on the predictors of mortality in these patients. Regarding its mechanism of action, studies show that phosphine mainly binds cytochrome oxidase and changes the valences of the haem component of hemoglobin. Death is reported to result from profound shock, myocarditis and multiorgan failure. Updating knowledge of health care professionals may help reduce the risk of deleterious consequences of poisoning. The purpose of this study was to retrospectively study the profile of patients presenting to ICU with wheat pill poisoning and their course of disease.

Patients and Methods

In this descriptive study patients who presented to ICU at Benazir Bhutto Hospital, Rawalpindi during
years May, 2010 to Dec, 2013, were enrolled 77 patients by consecutive sampling irrespective of age and gender. The diagnosis was based on basis of history of consumption of wheat pills. All patients with diagnosis of wheat pills were given initial resuscitation by medical unit on call in ER & e.g. gastric lavage with vegetable oil and then shifted to intensive care unit. In all patients ECG and arterial blood gases(ABG) estimation were done. If pH was less than 7.2 alkali therapy, in the form of NaHCO₃ (Usually 7.5% Solution).The amount of NaHCO₃ given was decided from base excess and calculated bicarb space by equation:NaHCO₃ = Base deficit x 30% x body weight in Liters.

Serial ABGs were done to correct academia (Table 1). Symptoms, treatment given on individual basis for the metabolic acidosis, vomiting, arrhythmia, hypotension. Soda bicarb was used for metabolic acidosis metaclopromadie for vomiting, amiodarone for arrhythmias, & infusion inotrops (i.e. dopamine & dobutamine) to correct hypotension. End point was death or shifted back to respective medical unit.

Results
This descriptive study was done form May 2010 to December 2013. Females constituted 53%. Overall mortality was 33%(Table 2)Most common symptoms was vomiting, other common symptoms were hypotension & arrhythmias, followed by irritability, confusion & metabolic acidosis (Table 2) patient who consumed more than one tablet and who presented late (i.e > 12 hrs0 did not survive . All the patients, who did not survive revealed significantly reduced HCO3 levels (Table 4)

**Table 1: Criteria for severe metabolic acidosis**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>pH</td>
<td>&lt; 7.2</td>
</tr>
<tr>
<td>HCO₃</td>
<td>&lt; 12 mEq/L</td>
</tr>
<tr>
<td>Anion gap</td>
<td>&gt; 20 mEq/L</td>
</tr>
</tbody>
</table>

**Table 2: Wheat Pill poisoning – Demographic Profile**

<table>
<thead>
<tr>
<th>Total Patients (77)</th>
<th>Age Group</th>
<th>Mean Age</th>
<th>Male to Female Ratio</th>
<th>Overall Mortality</th>
<th>Case Fatality</th>
<th>No. of Tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 (47%)</td>
<td>16 - 60</td>
<td>25 yrs ± 2.34</td>
<td>1: 1.2</td>
<td>26/77</td>
<td>33%</td>
<td>&gt;1</td>
</tr>
<tr>
<td>41 (53%)</td>
<td></td>
<td></td>
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**Discussion**
Aluminium phosphide is an extremely toxic compound. In literature the reported mortality of this compound varies from 55-90%. In our study the overall mortality came out to be 33%.The toxicity of aluminium phosphide is attributed to the liberation phosphine gas. This is a cytotoxic gas and causes free radical mediated injury. Phosphine is a nucleophile and acts as a strong reducing agent and inhibits cellular enzymes. It was thought that phosphine has strong inhibitory effects on mitochondrial cytochrome. Subsequent studies demonstrated that inhibition of cytochrome oxidase generates super oxides and peroxides. The major lethal consequence of aluminium phosphide ingestion i.e circulatory collapse is due to the super oxides and per oxides. These toxins lead to direct depressant effects on cardiac myocytes, fluid loss and adrenal gland damage. In our study 62% patients developed hypotension. 52% patients developed arrhythmias which included SVT, VF and VT.

Aluminium phosphide is a very common method of suicidal poisoning among the younger productive age group. Mean age of patients in our study was 25 ±2.34. Patients mainly presented with nausea and vomiting early in the course. 90 % of the patients had vomiting. The patients needed inotropic support in most of the cases. As peroxides can damage any tissue so is the case with pulmonary membrane. 45% patients developed tachypnea. In a retrospective study, Ashu M. et al. found six factors that can be assessed at admission to the hospital to predict mortality from wheat pill poisoning. These include an elevated serum creatinine concentration, a low pH value, a low serum bicarbonate value, a low APACHII score, an early need for mechanical ventilation and an early need for ionotropes. Likewise we found metabolic acidosis to
be the cause leading to death. The female to male ratio was 1:1.2.

**Conclusion**

1. Aluminium phosphide is a very fatal poison and efforts are needed to understand its pathophysiology and management.
2. It is required to understand pathophysiology and to design active management algorithms for wheat pill poisoning management.

**References**