

Pattern of Aluminium Phosphide Poisoning and Autopsy Findings at KEMU Lahore

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ABSTRACT

Background: Aim of the study was to analyze the epidemiological features and autopsy findings in different organs of human body due to Aluminum phosphate (ALP) poisoning also known as wheat pills in Lahore.

Materials & Methods: Out of 74 suspected poisoning cases, 17 cases (22.97%) were diagnosed as a case of ALP poisoning on the basis of chemical reports during a 3 year study period from January 2006 to December 2008 in the department of Forensic Medicine & Toxicology at K.E.M.U. Lahore.

Results: Suspected poisoning cases which were subjected to medico legal autopsies in the department of Forensic Medicine K.E.M.U. Lahore, constituted 2.48% of total autopsies conducted during this study period. ALP poisoning cases accounted for 22.97% of all suspected poisoning cases. It was most common in females (70.58%) than males with M.F ratio 0.41:1 in 3rd decade of life (41.66). Its incidence was highest during the 3rd quarter of the year (41.17%). Suicidal number was highest (100%) in females as compared to males (80%). Accidental cases 20% were seen in males and no homicidal case was reported in either sex. It was more common in rural inhabitants 59% which constituted the 18% population of Lahore. Autopsy findings showed classical signs & symptoms of garlicky pungent odor (47.06%), blood tinged froth (64.7%), cyanosis of face (41.17%) & congestion of brain, liver, spleen, kidneys, lungs & heart in varying degree.

Summary: Easy availability & cheapness of ALP tablets is a major factor in the causation of its widespread use among the young females as a tool in the attempted suicide.

Recommendations: Public awareness through media regarding its toxicity and lethality is a need of the time. Treatment measures should be made available readily in the hospitals. There should be legal ban on its storage & sale which should be limited to only authorized persons for its usage, storage & sale.

Keywords: Aluminium Phosphide, Wheat pills, Autopsy findings, Suicide

INTRODUCTION

Anything which when used internally or externally in a dose or in repeated doses, if acts chemically or physiologically, causing disturbance of body functions and leads to disease or death is a poison. ⁽¹⁾ Legally poison is a substance which when used is injurious to health or life ⁽²⁾. Poisoning whether intentional or accidental causes mortality throughout the world. ⁽³⁾ According to WHO, 3 million acute pesticides poisoning cases with 2,20,000 deaths occur annually ⁽³⁾⁽⁴⁾⁽⁵⁾. Out of these 90% fatal poisoning occur in developing countries especially among the agricultural workers ⁽³⁾. Developing countries such as India, Iran, Sri Lanka, Bangladesh & Pakistan have reported alarming rates of toxicity & deaths due to poisoning. ^(5, 6, 7) In USA deaths of the people who die from poisoning number more than 775 per

year. ⁽³⁾⁽⁸⁾. Most of the people who died from poisoning were adults & deaths often resulted from intentional rather than accidental exposure ⁽³⁾⁽⁸⁾.

Insecticides & pesticides are responsible for majority of the poisoning cases resulting from occupational, accidental & intentional exposure, thus producing a major health problem. ⁽⁶⁾ A hospital based poisoning survey indicated that out of all poisoning cases, poisoning by insecticide and pesticide accounted for 13 % in Africa, 11 % in Middle East, 27 % in Latin America and 55 % in Asia. It was 59% in India and 9% in China of all poisoning cases. ^(6, 9, 10) Stocks of pesticides are readily available & knowledge of toxicity is frequently poor. Where toxicity is well recognized, paradoxical increase in the rate of poisoning have also occurred. ⁽⁶⁾.

The fatality rate all over the world for pesticide poisoning has been estimated about 0.5% for developing countries & 0.25% for developed countries.^{(11, 12).}

At our centre, over the last 5 year period (1984-88) total no of autopsies conducted annually was 4149 of which 60 cases (1.44%) were due to intake of poison. 13 (21.66%) cases were due to insecticides including organo phosphorus and chlorinated hydrocarbons. 5 cases were suicidal and 8 accidental^{(11).}

ALP is highly toxic, low cost fumigant available in tablet form used for stored cereal grains. When exposed to moisture it produces phosphine gas which is rapidly absorbed by inhalation, dermally or gastro intestinally depending upon the route of administration ⁽¹⁶⁾. It has a fatal dose of between 0.15 and 0.5 gram.⁽¹⁷⁾ ALP has been used as pesticide since 1940. In India this poisoning was not known before 1980⁽¹³⁾. The incidence of poisoning has been increasing steadily & now it is a common form of poisoning in the sub continent.⁽¹³⁾ In a study conducted by Siwach Z & Gupta⁽¹⁴⁾, ALP was found to be the most common cause of acute poisoning among all poisoning cases in India^(6,15). It was also found to be the most common cause of suicidal death in North India.⁽¹⁶⁾ Poison shows a distinct male preponderance in the low socio-economic strata and in rural areas probably due to the heavy social stress burden in this group.^(17,18)

Objective

The present study was designed to analyze the epidemiological features and autopsy findings in different organs of human body due to wheat pills poisoning leading to death in Lahore.

MATERIAL AND METHODS

Out of 2979 autopsies conducted at Forensic Medicine department of KEMU, 74 cases of suspected poisoning were reported during the period starting from January 2006 to December 2008. 17 cases were included in this study where the chemical reports were positive for Aluminum Phosphide. These cases were brought by the police from different police stations of Lahore. The data was retrieved from autopsy reports, treatment

notes of the Hospitals, inquest reports of the police and reports of the chemical examiner. The variables including age, sex, manner of death, monthly variation, habitat and autopsy findings were tabulated to analyze the picture. Ananmouty was maintained in all respects.

RESULTS

Out of 74 deaths by poisoning, 17 (22.97%) cases were established due to ALP poisoning. The table depicts the incidence of chemically proven ALP poisoning deaths. The presence of classical sign & symptoms of ALP poisoning, were taken as supportive evidence. All the study cases were confirmed to be of ALP poisoning on chemical analysis of the viscera in the laboratory of chemical examiner Punjab Lahore (Table 1). Female cases 70.58% were more than males (29.41%) with M.F ratio 0.41:1. (Table -2) Age distribution showed highest number for males during second decade (60%) followed by 41.66 for females in 3rd decade (Table-3). Maximum occurrence was observed in 3rd quarter (41.17%) and minimum in 2nd quarter (5.88%). (Table-4). No homicidal case was noted in males and females. 4 males 80% and 12 females 100% showed suicidal incidence. Only one male 20% was recorded as accidental case as per history given by the relatives. (Table-5) External Examination:

- Face: Congestion, cyanosis: 7 (41.17 %)
- Garlicky pungent odor: 8 (47.05%)
- Froth over mouth & nostrils: 13 (76.47%)
- Blood tinged froth: 07 (64.7%)

Internal findings: There was garlicky smell from froth on mouth & nostrils, stomach contents & lung sections. Naked eye examination in ALP poisoning exhibited congestion of brain, lungs, kidneys, liver, spleen & stomach to varying degrees. Lungs were edematous & congested. Hemorrhages were present in alveoli. Trachea showed blood stained froth. In the stomach grayish white fluid or paste was seen in non hospitalized cases where no stomach wash was done along with congestion, erythematous patches. Heart, liver, spleen and kidneys show congestion & edema. (Table-6). 59% cases belonged to rural areas and 18% to urban areas. (Table-7)

Table 1: Total autopsies versus all poisoning and ALP poisoning autopsies.

Total autopsies	Total no of autopsies of poisoning cases		Total no of autopsies of ALP poisoning death	
	No	%	No	%
2979	74	2.48	17	22.97

Fig:01 Total autopsies versus all poisoning and ALP poisoning autopsies

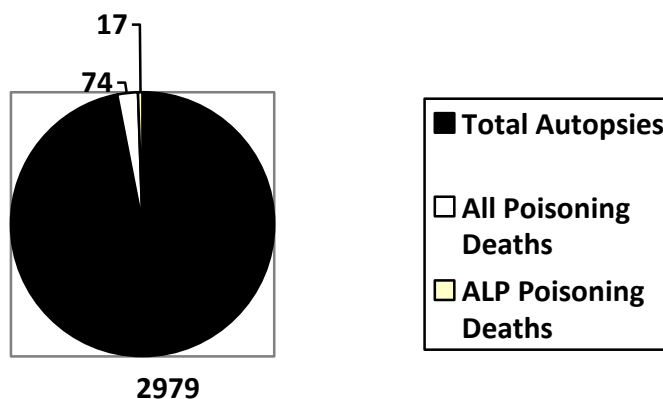


Table 2: Sex Distribution in ALP Poisoning Deaths

Total Male		Total Female		Ratio
No	%	No	%	-
5	29.41%	12	70.58%	0.41:1

Table 3: Age Group Distribution in ALP Poisoning Deaths.

Age group year	Total no	%age	Males	%age	Females	%age
0-10			-	-		
11-20	7	41.17	3	60	4	33.33
21-30	6	35.29	1	20	5	41.66
31-40	3	17.64	1	20	2	16.66
41-50	1	5.88	-	-	1	8.33
51-60	-	-	-	-	-	-
61 onwards	-	-	-	-	-	-
Total	17		5		12	

Table 4: Month- wise Breakup of ALP Poisoning Deaths

Months	No	%age	Males		Female	
			No	%age	No	%age
January-March (winter)	4	23.52	2	40	2	16.66
April-June (summer)	1	5.88	-	-	1	8.33
July-September (rainy)	7	41.17	1	20	6	50
October-December (autumn)	5	29.41	2	40	3	25
Total	17		5		12	

fig:02 Age Group Distribution in ALP Poisoning Deaths

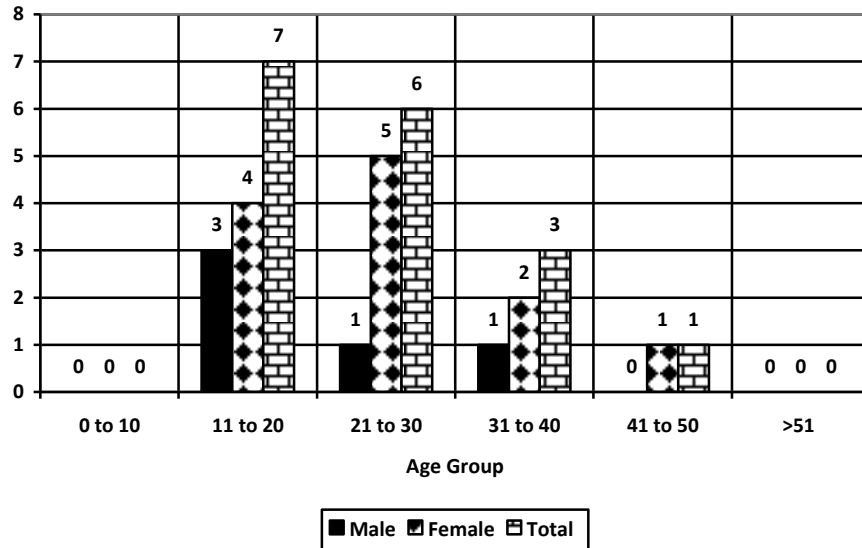


Table 5: Manner of Death in ALP Poisoning Deaths

Manner	Males		Females		Total	%age
	No	%age	No	%age		
Homicidal	-	-	-	-	-	-
Suicidal	4	80	12	100	16	94.1
Accidental	1	20	-	-	1	5.88
Total	5	100	12	100	17	100

fig: 03 Manner of Death in ALP Poisoning Deaths

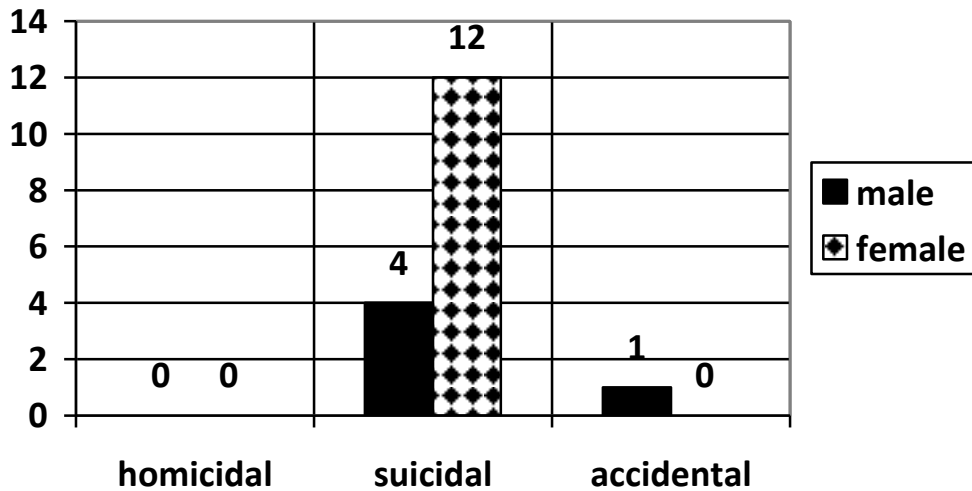


Table 6: Autopsy Findings in ALP Poisoning Deaths Internal Findings

Organs	Stomach		Liver		Kidney		Spleen		Heart		Lungs		Trachea	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Presence of material	5	29.41	-		-		-		-		-		-	
Congestion	10	58.82	12	70.58	10	58.82	10	58.82	5	29.41	12	70.59	15	88.23
Edema	12	70.59	12	70.58	7	41.17	10	58.82	-		11	64.7	Froth/ Typical odor	
Sub mucosal hemorrhages	10	58.82	-		-		-		-		6	35.3	-	
Typical odor	9	52.94	-		-		-		-		-		-	
Mucosal changes	7	41.17	-		-		-		-		-		-	
Sub-mucosal Hemorrhages	6	35.3	-		-		-		-		-		-	
Sloughing	4	23.52	-		-		-		-		-		-	

Table 7: Urban/Rural Areas Distribution in ALP Poisoning Deaths.

Area	Males=n=7		Female=n=12		Total	%age
	No	%	No	%		
Urban	1	20	2	17	03	18
Rural	3	60	7	58	10	59
Unknown	1	20	3	25	04	24
Total	5		12		17	

DISCUSSION

Total ALP Poisoning Autopsies

Out of 2979 autopsies conducted at KEMU Lahore during the 3 year study period, the number of deaths due to poisoning was 2.48% which is higher than 1.44% ⁽¹¹⁾ in five years study at the same centre but lower than 11.70% ⁽³⁾ during one

year study in 2003 and 13.6% ⁽¹³⁾ during 1993 – 2002 in India.

Out of these suspected poisoning deaths, our study revealed 22.97 deaths due to ALP intake while Rana P.A⁽¹¹⁾ quoted 21.66 % deaths due to pesticides without mentioning ALP specifically or individually. It is much lower than 40.49% ⁽³⁾ 32% ⁽⁷⁾ and 26.1% ⁽⁹⁾ in India, 24.1% ⁽⁷⁾ in Tehran. Only

one death occurred due to ALP in 1997-2003 reported to National Poison Information Service London⁽¹⁹⁾

Our study revealed a lower incidence of ALP poisoning than India and Tehran. It seems that one of the reasons of this trend is easy accessibility & cheapness of the ALP as well as social problems. In foreseeable future ALP might become the most frequent agent used in poisoning cases especially in suicide attempt. Previous study at our centre revealed that most frequent cause of death among poisoning intake cases was insecticides (21.66%) followed by tranquilizers (18.33%) then barbiturates and opium (15%) then cyanide (10%) between January 97 to June 2003⁽¹¹⁾.

The possible reason may be the previously incriminated drugs and poisons were included in one category and now ALP is an isolated substance that has occupied the first place among intoxication related deaths⁽⁷⁾. Another limitation is the absence of good quality mortality data of ALP poisoning which is likely to result in underestimation. Most of the deaths due to pesticides occur in rural areas, where the quality of data collection is poorer than urban areas and lack of reporting of such cases to the police⁽⁵⁾.

Sex Distribution

Female showed higher incidence (70.58%) than males 29.41% with M/F ratio 0.41:1. Jain A.K⁽¹³⁾ quoted equal incidence. Moghaddam H⁽⁷⁾ quoted 59% females. A preponderance of females over males may be explained on the basis of family conflicts and problem arising out of them. These findings are contrary to Siwach⁽¹⁴⁾ who quoted M/F ratio as 4:1 and other authors i.e 4.5:1⁽¹¹⁾, 2.8:1⁽¹⁰⁾ 2:1⁽⁹⁾ 2:1⁽³⁾.

Age Incidence

Our study revealed higher incidence 60% for males during second decade and higher incidence 41.66% for females during 3rd decade. These findings correspond with those of⁽³⁾,⁽⁷⁾,⁽⁹⁾,⁽¹³⁾,⁽²⁰⁾. Least number of cases was observed in extremes of ages. Possible explanation could be that younger persons are easily excited. On the other hand more the elderly individuals, more the mature steps are taken.

Month-wise Variation

Our study indicated maximum number during July to Sep 41.17 % and the minimum 5.88% during April to June. Kapoor⁽⁴⁾ quoted maximum ALP

poisoning deaths in rainy season, Murali⁽¹⁰⁾ quoted no difference in mortality for different months. Very little literature available regarding seasonal variation in poisoning. Reason may be rise in temperature and lack of temperament and tolerance in the body due to the high temperature and other changes. Another reason could be use of ALP in newly harvested crops stored during these months.

Manner of death:

No homicidal case was recorded during the study period. Only 1 male 20% was recorded as accidental case due to mishandling while 4 males 80% and 12 females 100% showed suicidal incidence. In Pakistan ALP poisoning with suicidal intent is common due to its easy availability in every house. Existing trend may be due to its higher toxicity towards human beings and our social problems. A recent study⁽²¹⁾ showed that 14% of all deaths amongst 10–50 years old women in Bangladesh were due to suicidal ingestion of pesticides. Dalbirsingh⁽²²⁾ quoted 87% suicidal while Ashok⁽¹³⁾ quoted 100% suicidal. It varies from 4% in European region over 50% in Western Pacific region⁽⁵⁾. In Africa the suicidal incidence due to pesticides is 33% of all the suicidal deaths, in America it is 0.07%⁽⁵⁾.

Autopsy Findings:

Gross examination during postmortem revealed that face was cyanosed and congested in 41.17% cases. Garlicky pungent smell was observed in 47.05% cases. Froth at and around mouth and nostrils was present in 76.47% cases while blood tinged froth was observed in 64.70% cases. The examination revealed that almost all the organs were congested to varying degrees including brain, lungs, liver, spleen, kidney and stomach. There was grayish brown fluid or paste like material seen in 29.41 cases with distinct garlicky pungent smell. This was usually observed in non-hospitalized persons where gastric lavage was not done due to short time. The mucosa of stomach was pale due to grey color of ALP. There was thinning of gastric mucosa in fundal region in 23.35% cases. This was perhaps due to vapours of phosphine gas which raised and got accumulated in fundal region. These findings were consistent with others.⁽³⁾⁽¹³⁾.

Habitat:

In the present study the preponderance of rural habitat over urban was observed. Due to

urbanization in Lahore the ratio of urban to rural habitat has become 82:18⁽²³⁾. This greater incidence in rural population is due to the fact that Pakistan is an agricultural country and more people live and earn their livelihood in rural areas in this part of the country.

Females of rural areas were more affected than males. This could be explained by the fact that women did not tolerate the stress and strain easily as compared to males. Further females are mostly involved in processing and storage of crops within the houses. Our findings are in agreement with ⁽⁷⁾. Considering the higher mortality of this poison and women's preference for wheat pills as a choice method for suicide, we expect to see more mortality in this group. ⁽⁷⁾. These findings are contrary to⁽³⁾ and⁽¹⁷⁾ who quoted male preponderance in their series of poisoning cases.

Summary:

In the present study 17 cases of ALP poisoning have been established due to autopsy findings and chemical reports in respect to poison. It has been observed that it is fairly common as a suicidal poison in females especially amongst younger age group of rural background. It is cheap, easily available and highly lethal.

Recommendations:

It requires a deep study to understand the predisposing factors and mechanism of action to assess and formulate an appropriate treatment in such cases based on such a study. Next method should be adopted for safe use of pesticides.

Their safety to human beings should be ensured before marketing.

Awareness should be created through media among the habitants of rural area and urban peripheries regarding its toxicity and high mortality.

A legal ban should be imposed on its over-the-counter sales. Its possession should be authorized to personal trained in proper storage and dispensary.

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