ORIGINAL ARTICLE

Clinical Patterns of Aluminum Phosphide Poisoning and Its Association with Different Age Group & Gender

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ABSTRACT

Objective: To determine common clinical patterns of Aluminum Phosphide poisoning in patients received at tertiary level and its association with different age groups and gender.

Study Design: Descriptive cross sectional study design.

Place and Duration of Study: This study was conducted in Forensic Medicine Department and Medicine Department, Khyber Medical College, Peshawar from April 2017 to March 2018.

Materials and Methods: A total of 264 patients presenting and admitted with Aluminum Phosphide poisoning were recruited in this study through consecutive non-probability sampling and clinical features were recorded. A pre-designed performa was used to extract the data. SPSS 25.0 was used to measure mean±S.D for numerical variables and frequency with percentages for categorical variables. Association was made via Chi-Square; p-value of ≤0.05 was taken as significant.

Results: Sample of 264 patients had a mean age of 32.07±11.03 years, in which 64.4% were males & 35.6% were females. In the study, 45.1% had arrhythmias, 60.2% presented with ECG changes, 30.3% had shortness of breath and 80.3% with vomiting. The study recorded P-value of ≤ 0.05 for gender and age groups with all clinical features except shortness of breath, showing a significant association.

Conclusion: It was concluded that vomiting is the most common clinical feature in Aluminum Phosphide poisoning, in which males of younger age are more prone to this poisoning. A significant association was recorded for age groups and gender with all clinical features except shortness of breath.

Key Words: *Aluminum(MeSH),Arrhythmias (MeSH), Clinical Patterns (MeSH), Poisoning (MeSH),Shortness of Breath (MeSH), Vomiting (MeSH).*

Introduction

Aluminum phosphide is one of the most emerging poisons worldwide with no antidote available for the poison.[1]In recent past, this poison is nowbeing used as product of preservation in agriculture industry, with beneficial sidesthe same poisonhas also contributed a lot in suicidal and homicidal deaths.[2] Since 1940's this poison is being in the industry for its uses because of cheap, long lasting and effective fumigant characteristics and the gaseous form has easy with quick penetration producing early results.[2] A tablet of brownish dark color 3gm each having 20mm diameter and thickness measured as 5mm is being packed in pen structured plastic/tin with air tight feature keeping it fresh till not opened.[3]

The tablet after exposure to moisture releases phosphine gas which has some toxic effects. This toxin release has its effects on cardiovascular, respiratory, gastrointestinal and uro-genital systems.[4] The poisoning presents with nausea with vomiting, pain in the abdomen, shock which is unresponsive to the traditional treatment, ECG changes including arrhythmias and respiratory effects like edema and dyspnea.[5] Rare clinical manifestations like sensorium, tubular necrosis (acute form) and complications like pericarditis, cardiac failures can also be appreciated.[5] The active form of the compound is mostly fresh and has high mortality due to metabolic acidosis.In contrast the inactive and granular form leads to less severe effects than active form and has low death rates.[6] Dosage, severity, duration, failure to response are few criteria which determine the mortality of this poison, and in addition, hypomagnesaemia also contribute to be a major mortality factor.[7]Severity of

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hypotension, metabolic acidosis and severe vomiting are few other factors that determines the increase indeath ratio of this poison.[8] In clinical suspicion, history holds main pillars for detection and diagnosis of this poison, while in labs exhalation of phosphine detected by positive silver nitrate paper test is taken gold standard. This biochemical examination is the second mean used for confirmation.[2] Early detection holds an important landmark in saving life of such patients which are further treated with early gastric lavage followed by vasopressors and supportive care. Magnesium sulphate intravenously may act as treatment of choice however no antidote is available.[9] In a research, Gupta, et al.[10] studied 30 positive cases of this poison to find out the clinical profile, most of the poison was orally taken and was leading towards cardio-pulmonary shock in extreme poisoning cases. In literature acute renal failure and myocarditis were being reported as end organ damage after 12 hours.[9,10] Due to high mortality of this poison it is being regarded as "Killer with high mortality rate" in human beings.[9] Metabolic acidosis post vomiting is being reported to be as commonest cause leading to death in cases with this poison.

This study will enlighten the clinical patterns after Aluminum Phosphide poisoning, which would help all practitioners in general and medical clinicianswith forensic specialist in specific to identify the poisoning and to start further workup neededto decrease morbidity or mortality related to this poison. The objective of the study was to determine common clinical pattern of Aluminum Phosphide poisoning in patients received at Khyber Medical College, Peshawarand its association with different age groups and gender.

Materials and Methods

This cross-sectional study was conducted in the in the Department of Forensic Medicine and Medicine, Khyber Medical College, Peshawar from April 2017 to March 2018. A total of 264 patients based on consecutive non-probability sampling and presenting with AluminumPhosphide poisoning were recruited in the study. Ethical & Review board approval was taken from Institutional Ethical & Review board. All the patients of both gender and age ranging from 14 to 60 years presenting to the Emergency department of Khyber Teaching Hospital and being diagnosed as Aluminum Phosphide poisoning (vide Toxicology Laboratory of Forensic Medicine Department KMC) and then admitted in Medicine Department were included in this study. Patients with co-morbidities like history of asthma, COPD, known cardiac diseases, and history of thyrotoxicosis were excluded from the study. After taking informed written consent a self-administered pre-designed performa was used to extract the data including clinical features. To analyze the parametric data SPSS v25.0 was used and descriptive statistics were applied on numerical and categorical variables. Association was made vide Chi-Square; p-value less than ≤0.05 was taken significant

Results

The study was conducted on 264 patients presenting with Aluminum Phosphate poisoning. The mean age of the sample was 32.07±11.03 years. On grouping the sample in different age groups, it was observed that 101 (38.3%) of patients were in the age group of 14-25 years, 69 (26.1%) were in the age group of >25 to 35 years, 52 (19.7%) patients were in the age group of >35 to 45 years and 42 (15.9%) were in the age group of >45 to 60 years.

While distributing the patients with regards to gender, it was observed that in our study 170(64.4%) of the sample were male and 94(35.6%) were female gender. Out of 264 patients presenting with Aluminum Phosphate poisoning, 119(45.1%) had arrhythmias, 159(60.2%) had ECG changes, 80 (30.3%) had shortness of breath and 212 (80.3%)had vomiting.

Table I: Association of Clinical Features with Different Age Groups

Age Group	Clinical Patterns							
	Arrhythmia	Sign*	ECG Changes	Sign*	Shortness of Breath	Sign*	Vomiting	Sign*
14 to 25 years	25	< 0.001	38	< 0.001	38	0.098	77	< 0.001
> 25 to 35 years	14		41		14		69	
>35 to 45 years	38		38		14		38	
> 45 to 60 years	42		42		14		28	

*Chi-Square test was used for significance.

Table II: Association of Clinical Patterns with Gender

Gender	Clinical Patterns							
	Arrhythmia	Sign*	ECG Changes	Sign*	Shortness of Breath	Sign*	Vomiting	Sign*
Male	92	< 0.001	132	< 0.001	53	0.678	145	0.006
Female	27		27		27		67	

*Chi-Square test was used for significance.

The clinical features with regards to different age groups and gender were stratified and association was measured using chi square test taking p value of ≤ 0.05 as significant. All clinical features like arrhythmias, ECG changes and vomiting showed a significant relationship with age group having a P-value of < 0.001 for all while shortness of breath had insignificant relationship with a P-value of 0.098. In the same way, when gender was compared with clinical features, all features except showed a significant result with a P-value of < 0.001 while again shortness of breath had an insignificant association with P-value of 0.678.

Discussion

This cross-sectional study showed male predominance in Aluminumphosphide poisoning cases with a frequency of 64.4%. The study also revealed that mostly young adults with a mean of 32.07 ± 11.03 years are reported with this poisoning. A significant relationship was recorded between age group and gender with all clinical features (p-value = <0.001) except shortness of breath.

This poison is extremely dangerous in its early stage, the ingestion of which is mostly suicidal and very much uncommon being accidental and almost rarely it is used as homicidal. The absence of specific treatment particularly the antidote has made this poison a killer and has a high mortality. With time this poison has gained a lot of importance for its preservative properties in agricultural sector and is now easily available.[11]

Khodabandeh, et al.[12] suggests figures with a male–female ratio of 55:45 and mean age of 26 ± 8 years which is slightly different from what we extracted however in both studies young age group and males as gender was more prone to poisoning.

The effects of this poison on cardiovascular system, particularly heart in the form of arrhythmias and ECG changes can be compared with many studies, a study conducted at India in 1991 showed cardiac arrhythmias and disturbance in about 38.2 % of patients which is quite near to the results extracted in this study.[13] In another study conducted at Iran about 80% of patients ingesting Aluminum Phosphide showed different cardiac signs on ECG which is quite different from results of this study.[14]Cardiac toxicity of this poison comprises of circulatory failure like hypotension, heart congestion, edematous myocardial fibres due to edema, vacoulation of cardiac myocytes, necrosis having infiltrates of neutrophil and eosinophil are mostly found, detected and appreciated in autopsy. Significant increase of ventricular dimension mostly left leading to hypokinesia, akinesia and reduction of ejection fraction which in turn causes severe form of hypotension, and disrupts systemic venous pressure while pulmonary artery wedge pressure remain normal, ECG shows particular abnormalities which can be differentiated easily.[15,20]

Corrosive lesions of gastrointestinal tract particularly stomach and esophagus leads to hematemasis after vomiting, epigastric pain, erosion at both duodenum and esophagus, strictures (which in turn lead to dysphagia) and fistulas formation.[21-22]This apparent and visual form of dysphagia may appear with in 3 to 4 days after ingestion but it also may take upto 2 weeks.[23]Farzaneh E, et al.[14] in a study conducted at Iran also showed Nausea/Vomiting as a major clinical presentation of Almuninium Phosphide poisoning along with other gastrointestinal features which is in similarity with the this study.

Shortness of breath demonstrated in this study can also be correlated with a study by Chugh SN, et al.[24] which shows 40% patients showing respiratory clinical feature like tachypnea, dyspnea, crepitations and rhoonchi. All such patterns tends to appear with in or after four to forty eight hour of ingesting this poison causing arterial pressure to be reduced, O_2 saturation decreased without a possible increase in pulmonary artery wedge pressure and clearly suggesting the non- cardiogenic effect. These findings obviously states that this feature is produced by this poison.[25] The non-cardiogenic feature may also lead to adult respiratory distress with non-specified edema that would be protein rich and hemorrhagic.[8]

It is assumed that the region of study has a lot of Aluminum phosphide poisoning cases but due to lack of support for ordinary people and insufficient awareness, maximum aren't reported to concerned authorities. This compelled the authors to have a smaller sample size. To validate the study further and incorporate more convincing results in literature, it is suggested that a study plan involving different regions and a big sample will prove much fruitful.

Conclusion

It is concluded that vomiting is the most common clinical feature in Aluminum Phosphide poisoning, in which males of younger age are more prone to this poisoning. A significant association was recorded for age groups and gender with all clinical features except shortness of breath.

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