Alteration in Liver Enzymes in Aluminum Phosphide Poisoning, A Retrospective Study

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ABSTRACT

Background: Aluminum phosphide (ALP) or rice tablet is a common agent used as pesticides. It is cheap, widely available and highly toxic and responsible for many cases of poisoning in the agricultural communities. There is limited evidence about change of liver enzymes in patients with ALP poisoning in this region. Therefore, we decided to evaluate alteration of liver enzymes in ALP poisoning in Rasht.

Methods: In this retrospective cross-sectional study, all documents of patients with ALP poisoning admitted to Razi hospital of Rasht in 2008-2009 were assessed. Inclusion criteria were diagnostic clinical manifestation such as hypotension or metabolic acidosis, history of exposure to ALP during the past 24 hours and progressive signs and symptoms despite treatment (administration of sodium bicarbonate and vasopressor). Patients with past history of hepatic disease were excluded. Collected data were analyzed with SPSS software.

Results: Of 104 patients with ALP poisoning, 66 patients (63.5%) were men. The mean age was 33.8±14.69 years, and the mean time of hospitalization was 14.94±18.28 hours. Ninety-five patients (91.3%) needed ventilation and 93 patients (89.4%) died. Statistical analysis demonstrated that elevated liver enzymes were not significantly related with gender, age, time of admission, time of hospitalization, the need for ventilation and mortality.

Conclusion: It seems that liver enzymes changes is not seen widely in ALP poisoning and had lower importance than other complications. Because of limited studies in liver enzyme alterations in these patients, it is suggested that more studies with largee sample size is performed to investigate the ALP liver side effects.

Keywords: Aluminum Phosphide**,** Poisoning**,** Transaminases.

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INTRODUCTION

Aluminum phosphide (ALP) or rice tablet is a common agent used as pesticide in agriculture [1]. It is cheap, widely available and highly toxic in the agricultural community and responsible for many cases of poisoning [2,3]. The incidence of aluminum phosphide poisoning is on the rise [4]. Upon Exposure of ALP to water, moisture or gastric acid, it liberates phosphine gas, which is absorbed rapidly by inhalation, dermally, or gastrointestinally [2]. It is available as tablets (3 g) or as pellets (0.6 g quickphos, alphos, and cellphos). The specified fatal dose is 0.15-0.5 g [3]. The average time interval between intake of poison and death is three hours with a range of 1-48 hours. Ninety five percent of patients die within 24 hours and the commonest cause of death in this group is arrhythmia. Death after 24 hours is usually due to shock, acidosis, ARDS and arrhythmia. [5].

The exact mechanism of action of aluminum phosphide poisoning is still unknown, however an initial survey on different animals showed non-competitive cytochrome oxidase binding of phosphine, changes valences of haeme component of haemoglobin [6].

ALP poisoning affects most organs resulting in a variety of signs and symptoms. Early symptoms include nausea, vomiting, retrosternal and epigastric pain, dyspnea,

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anxious, agitation and smell of garlic on the breath. [6,7]. Cardiac toxicity, involvement of the respiratory system, gastrointestinal involvement, nervous system, electrolyte and metabolic abnormalities, hematologic abnormalities and unusual complications might occur [6].

Transient elevations of alanine aminotransferase and aspartate aminotransferase activities are not infrequent after ingestion of metal phosphides but jaundice secondary to liver damage is much less common [6,8]. Laboratory evaluation is often performed to assess the prognosis. Leucopenia indicates severe toxicity, and increased aspartate aminotransferase or alanine aminotransferase and metabolic acidosis indicate moderate to severe ingestional poisoning [5]. Development of refractory shock, acute respiratory distress syndrom, aspiration, pneumonitis, anaemia, metabolic acidosis, electrolyte imbalance, coma, severe hypoxia, gastrointestinal bleeding, and pericarditis are associated with poor prognosis [5]. For management of ALP poisoning, decontamination, supportive care, magnesium supplementation, N-acetylcysteine, pralidoxime are all suggested [6].

There has been no evidence for changes in liver enzymes in patients with ALP poisoning in our region. Therefore, the aim of this study was to determine the changes of liver enzyme in ALP poisoning in Rasht, Iran.

MATERIALS AND METHODS

In this retrospective cross-sectional study, all documents of patients with ALP poisoning admitted in Razi hospital of Rasht from 2008 to 2009 were assessed. This study was initiated after approval by the ethical committee of Guilan University of Medical Sciences. Variables such as age, gender, cause of exposure, mechanism of exposure, duration between exposure and admission, time of hospitalization, management, complications and liver function test were extracted and surveyed. Inclusion criteria were diagnostic clinical manifestations such as hypotension or metabolic acidosis, history of exposure to ALP during the past 24 hours and progressive signs and symptoms despite treatment (administration of sodium bicarbonate and vasopressor). Patients with past history of hepatic disease were excluded.

Collected data were analyzed with SPSS software (version 18) and variables were presented as frequency and mean ± standard deviation (SD).

RESULTS

Of 104 patients with ALP poisoning, 66 patients (63.5%) were men. The mean age was 33.8±14.69 years with the greatest frequency (29.8%) for the age group of 21-30 years (Figure 1). All patients were poisoned with ALP alone. Suicide was the cause of poisoning in all patients. The mean time between exposure to ALP and admission was 129.02±128.71 minutes with a range of 15 to 720 minutes. 70.3% of patients were admitted earlier than 60 minutes. The mean time of hospitalization was 14.94±18.28 hours. Most patients (69.2%) were hospitalized for less than 12 hours. Ninety-five patients (91.3%) needed ventilation and 93 patients (89.4%) died.

Alterations of liver enzymes were seen in 30 patients (31.7%), and their frequencies are shown in figure 2. Mean and SD of liver enzyme change are demonstrated in table 1. Statistical analysis revealed that changes in liver enzymes were not significantly related with gender (P=0.88), age (P=0.65), time of admission (P=0.98), time of hospitalization (P=0.19), need to ventilation (P=0.46) and mortality (P=0.32).

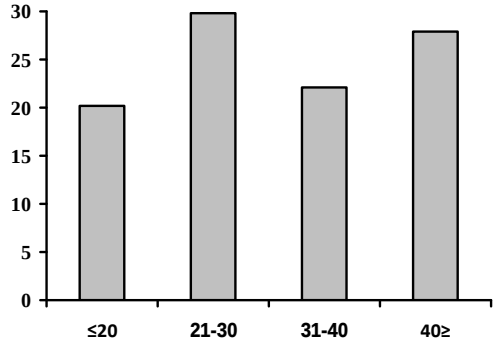

Figure 1. Frequency distribution of patients poisoned with ALP admitted to Razi hospital of Rasht from 2008 to 2009.

Table 1. Liver enzyme change in patients poisoned with ALP.

mean±SD	Liver enzyme
22.51±15.98	AST
23.19±26.78	ALT
0.92±0.37	Bilirubin
16.06±15.13	PT
36.19±16.52	PTT

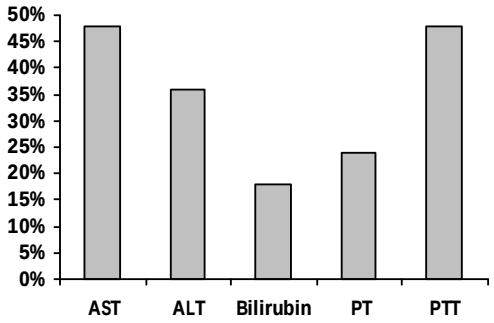

Figure 2. Frequencies of each liver enzyme in patients poisoned with ALP.

DISCUSSION

ALP is a powerful insecticide and widely use in the agricultural community especially in the north of Iran [3]. A few studies about ALP poisoning have been performed in this region but changes of liver enzymes in these patients were not evaluated. In this study, 104 patients with ALP poisoning were evaluated to determine liver enzyme changes. In a study in 2006 in Rasht, 116 patients between 2000 and 2003 were reviewed [9]. In another study in this region, 125 patients were surveyed in 2005-2006 [3].

In our study, ALP poisoning were almost two times more common men. Similar to our results, Tripathi and colleagues in India evaluated 239 patients with ALP poisoning and 69.53% of them were men [10]. In another study, 54.3% of patients were men [9]. These findings can be related to the higher incidence of more successful suicides in men and elevated mortality rates of ALP poisoning.

Previous studies reported that ALP poisoning were common in adolescent and young adults. In a study by Mehrpour et al, 69.26% of patients were younger than 30 years [11], and Rahbar et al reported that 64.7% of patients were 15-30 years old [9]. However, our study showed that more than half of patients were older than 30 years.

Most of our patients arrived to the hospital in $\leq$ 2 hours. In a report by Ashou and colleagues, the mean time between poisoning and admission was 2.1±1.55 hours, which was similar to our study [12]. Louriz et al evaluated the gap between exposure and admission as 5.3 hours [13].

The time of hospitalization in our study was 14.94 hours that was lower than similar studies. Louriz reported that duration of hospitalization in ALP poisoning was 60±70 hours [13]. Requirement of ventilation was considered as a prognostic factor in previous studies [13].In our study, most of patients require ventilation at the time of hospitalization; therefore, it could not used as a prognostic factor.

The mortality rate is highly variable, ranging from 37-100% and can reach more than 60% even in experienced and well equipped canters.(5) In a study in this region in 2006, 58.61% of patients with ALP poisoning died [9], and in a study by Mehrpour, 71.77% of patients perished [11]. Misra et al reported eight patients with phosphine poisoning following ingestion of aluminum phosphide tablets for suicidal attempts and six of them died [14]. The mortality rate in our study was 89.4%; consequently, it was higher than previous studies. It can be related to the higher age of our patients and the elevated success rate of suicide in older patients.

In our study, one third of patients had elevated liver enzymes. Other studies demonstrated wider spectrum of liver enzyme changes. In a report by Ashu, changes in liver enzymes were two times more than our results [12]. In another study in India, elevated enzymes were more than three times than our findings [13].Our lower rate of liver enzyme changes can be related to high mortality rate and low hospitalization time in our study.

Changes in liver enzyme were not significantly related with gender, age, time of

admission, time of hospitalization, need to ventilation and mortality. Ashu et al reported that AST, ALT and bilirubin related with mortality rate but PT and PTT were not evaluated [12]. Nonetheless, these relationships were not surveyed in the previous studies.

CONCLUSION

It seems that liver enzymes changes is not seen widely in ALP poisoning and is less important than other factors. Because of limited studies concerning liver enzyme changes, it is suggested that more studies with larger sample size be performed to investigate the ALP liver effects.

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REFERENCES

1. Rahbar Taromsari M, Teymourpour P, Jahanbakhsh R. Survey the Histopathological Findings in Autopsy of Poisoned Patients with Rice Tablet (Aluminium Phosphide). Journal of guilan university of medical sciences.2011; 19(76):56-63.
2. Bogle R, Theron P, Brooks P, Dargan P, Redhead J. Aluminium phosphide poisoning. Emergency Medicine Journal. 2006;23(1):e03-e.
3. Taromsari MR, Shad B, Aghajani Nargesi D, Akhoundzadeh N, Fallah Karkan M. The Study of Various Cardiac Arrhythmias in Patients Poisoned With Aluminum Phosphide (Rice Tablet). Iranian Journal of Toxicology. 2011;5(12):448-53.
4. Jaiswal S, Verma R, Tewari N. Aluminum phosphide poisoning: Effect of correction of severe metabolic acidosis on patient outcome. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2009;13(1):21-4.
5. Wahab A, Zaheer M, Wahab S, Khan R. Acute aluminium phosphide poisoning: an update. Hong Kong J Emerg Med. 2008;15(3):152-5.
6. Mostafazadeh B. Aluminium Phosphide Poisoning, Toxicity and Drug Testing, Prof.2012. http://www.intechopen.com/books/toxicity-and-drugtesting/aluminium-phosphide-poisoning.
7. Popp W, Mentfewitz J, Götz R, Voshaar T. Phosphine poisoning in a German office. The Lancet. 2002;359(9317):1574.
8. Memiş D, Tokatlıoglu D, Koyuncu O, Hekimoglu S. Fatal aluminium phosphide poisoning. European journal of anaesthesiology. 2007;24(03):292-3.
9. Rahbar taramsari M, Ourangpour R, Zarkami T, Palizkar M, Mousavian roushan zamir SA. Survey patients poisoned with aluminum phosphide (rice tablet). JGUMS. 2006;14(56):42-7.
10. Tripathi S, Pandey S. The effect of aluminium phosphide on the human brain: a histological study. Medicine, science and the law. 2007;47(2):141-6.
11. Mehrpour O, Shadnia S, Soltaninejad K, Yaghmaii A. Survey the change of electrolyte level and blood glucose in patients with acute aluminium Phosphine poisoning (rice tablet). Journal of Forensic medicine. 2009;53:49-53.[Persian]
12. Mathai A, Bhanu MS. Acute aluminium phosphide poisoning: Can we predict mortality? Indian journal of anaesthesia. 2010;54(4):302-7.
13. Louriz M, Dendane T, Abidi K, Madani N, Abouqal R, Zeggwagh A. Prognostic factors of acute aluminum phosphide poisoning. Indian journal of medical sciences. 2009;63(6):227-34.
14. Misra U, Tripathi A, Pandey R, Bhargwa B. Acute phosphine poisoning following ingestion of aluminium phosphide. Human toxicology. 1988;7(4):343-5.