Annals of Medical Research

DOI: 10.5455/annalsmedres.2020.02.100 2020;27(3):784-9

Original Article

Analysis of toxic plant and mushroom poisoning in children

Evrim Gul[1], Mehmet Yusuf Sari[2]

[1]Firat University, Faculty of Medicine, Department of Emergency, Elazig, Turkey
[2]Firat University, Faculty of Medicine, Department of Pediatric Intensive Care, Elazig, Turkey

Abstract

Aim: The aim is to evaluate geographical, sociodemographic, laboratory, clinical features and follow-up and treatment outcomes of children with toxic plant and mushroom poisoning.

Material and Methods: From 2015 to 2017, cases aged between 1 month and 18 years and diagnosed with toxic plant and mushroom poisoning were retrospectively evaluated.

Results: The mean age of the patients was 6.0±3.2 and the male/female ratio was 2.8. Mushrooms were the most common factors for poisoning (36.8%). The average time for application to the health facility was 2.4±1.9 hours. Poisoning was most commonly seen in summer (42.1%) and the most common complaint was vomiting. Most of the family members were primary school graduates. Treatment methods were activated charcoal (53%), activated charcoal and gastric lavage (26%), gastric lavage, activated charcoal and acetyl cysteine (11%) and acetyl cysteine (5%). One patient (5%) was applied followed up. Extracorporeal treatment was applied to two patients who developed liver and renal failure during treatment and follow-up. During the laboratory comparisons before and after hospitalization, white blood cell, creatinine kinase, aspartate aminotransferase and alanine aminotransferase levels were found to be significant ($p < 0,05$).

Conclusion: In childhood age group, more informative, symptomatic and supportive treatments can lead to positive results in toxic plant and mushroom poisonings. Sometimes more aggressive treatment methods such as extracorporeal treatment may be needed. Close monitoring of laboratory parameters in mushroom and plant intoxication cases due to late manifestations has an important role in patient follow-up and treatment.

Keywords: Toxic plants; mushroom; poisoning; childhood

INTRODUCTION

Childhood poisoning may occur due to drugs or other non-drug factors. Plants have an important place among the causes of non-drug poisoning. In some centers, the number of poisonings due to toxic plants has been reported to be more than 60,000 per year (1). Plants and plant-derived products may contain toxic substances. These toxic agents may lead to results starting from mild intoxication in humans to death. The severity of poisoning may vary according to the type of herbs and the characteristics of the poisoned person. Plant-derived products that can adversely affect human health are associated with the vegetation of region as well as the region's cultural and socioeconomic properties (2).

Plant poisoning occurs with the skin, gastrointestinal tract and respiratory system contacts. Although most mushroom and plant poisoning ameliorate with symptomatic and supportive treatment, some poisonings may need more serious treatments such as drugs, dialysis, hyperbaric oxygen treatment or organ transplantation. Mushroom and plant poisonings are preventable cause of mortality and morbidity.

In Turkey, mostly reported in the form of case reports, the numbers of clinical studies are few though there are numerous cases of plant-originated poisoning. Plant-derived food poisonings constitute about 1-3% of all poisoning cases. The most commonly poisoned age group is 0-5, and most of these poisoning occur in contact with houseplants (3,4). In our country, age range is reported as 2-11 years (5). In toxic plant poisoning cases, hospitalization rates are very low and mortality rates are less than 1 / 10.000 (3,4).

We aimed to evaluate the geographical, sociodemographic, laboratory, clinical features, follow-up and treatment

Received: 04.02.2020 **Accepted:** 10.03.2020 **Available online:** 10.03.2020
Corresponding Author: Evrim Gul, Firat University, Faculty of Medicine, Department of Emergency, Elazig, Turkey
E-mail: evrimgl@yahoo.com.tr

outcomes of the patients treated, and followed up in our clinic due to toxic plant and mushroom poisoning.

MATERIAL and METHODS

Ethics

Ethics committee approval was obtained from Local Ethics Committee for this study (30/11/2017:25). The patients' information remained confidential and was used only for research purposes.

Study design and population

Archival records and laboratory data of pediatric patients diagnosed with toxic plant and mushroom poisoning and treated in our clinic between January 2015 and October 2017 were retrospectively investigated. The demographic data of the patients, the cause of the poisoning, the time of arrival to the hospital, the symptoms during the admission, Glasgow Coma Scale, duration of hospitalization, electrocardiogram (ECG) findings, laboratory data and treatment methods were examined.

Statistical Analysis

In statistical analysis, continuous variables were expressed as mean ± standard deviation, and categorical variables were expressed as number-ratio. The results were analyzed using Statistical Package for the Social Sciences 21 (SPSS, Armonk, New York, IL, USA) software. Distribution of the data Kolmogorov-Smirnov and Shapiro-Wilk distribution was determined. Mann Whitney U test was used in the analysis of independent continuous variables, which do not comply with normal distribution. Paired Sample t-Test was used in the analysis of dependent continuous variables, which conformed to normal distribution Wilcoxon sign test was used in the analysis of continuous dependent variables, which do not comply with normal distribution. P<0.05 was considered significant.

RESULTS

Between January 2015 and October 2017, the total number of patients admitted to our clinic due to poisoning was 143. 19 (1%) of these patients were suffered from toxic plants or mushroom poisoning.

The mean age of the cases was 6 ± 3.2 (1-18) years. 14 (74%) were male, while 5 (26%) were female. Male / female ratio was 2.8. The cause of poisoning was mushrooms in 7 cases (36.8%), Indian oilseed (ricinus communis) in 6 (31.6%), Ferula rigidula in 1 (5.3%), atropa belladonna in 2 (10.5%), aristolochia clematitis in 1 (5.3%), and apricot kernels in 2 cases (10.5%) (Table 1).

The average time for application to the health facility was 2.4 ± 1.9 (1-8) hours. Four of the patients (21%) were asymptomatic, while 15 patients (79%) had complaints such as vomiting, altered mental state and respiratory distress. There was no statistically significant difference between hospital applications due to poisoning (p>0.05).

42.1% of the poisonings were seen in summer, 31.6% were in spring and 26.3% were in autumn. Mushroom poisonings were common in spring, ricinus communis poisonings were in autumn, atropa belladonna and apricot kernel poisonings were frequent in summer (Table 1).

When parental education levels were considered, 12 (63.2%) were found to have primary education, 6 (31.5%) were university graduates and 1 (5.3%) was not illiterate. Eleven of the patients (57.9%) were living in rural areas and 8 (42.1%) were living in urban centers (Table 1).

In the majority of rural patients, poisoning was most commonly caused by mushroom (63.6%) while Indian oilseed (ricinus communis) was found as the most common poisoning reason in patients living in the urban centers (75%).

Table 1. Geographic and sociodemographic characteristics of the patients

Parameters	Values
Age (Mean ±SD) /year	6± 3.2
Male n (%)	14 (74)
Female n (%)	5 (26)
Male / female ration	2.8
Application time for health institution (Mean±SD) /hour	2.4 ±1.9
The duration of admission in the PİCU (Mean ±SD) /day	3.4±2.3
The cause of poisoning n (%)	
Mushroom	7 (36.8)
Ricinus Communis	6 (31.6)
Atropa Belladonna	2 (10.5)
Apricot Kernel	2 (10.5)
Ferula Rigidula	1 (5.3)

Aristolochia Clematitis	1 (5.3)
Side effects n (%)	
Nausea and Vomiting	8 (42.1)
Asymptomatic	4 (21)
Consciousness change	3 (15.7)
Respiratory distress	1 (5.2)
Abdominal pain	1 (5.2)
Muscle weakness	1 (5.2)
Fainting	1 (5.2)
Poisoning by season n (%)	
Summer	8 (42.1)
Spring	6 (31.6)
Autumn	5 (26.3)
Family education status n (%)	
Primary school	12 (63.1)
University	6 (31.6)
Illiterate	1 (5.3)
Area of residence n (%)	
Rural	11 (57.9)
Downtown	8 (42.1)

Table 2. Laboratory data of cases

Laboratory data	Admission Results	Discharge Results	p value
Hemoglobin (g/dL) Median (Min- Max)	12.6 (9.5-16.2)	12.4 (9.5-15.6)	≥0.05*
Hematocrit (%) Median (Min- Max)	37.8 (28.7-50.2)	37.3(27.4-48.6)	≥0.05*
Leukocyte count (/mm^3) Median (Min- Max)	10200 (5430-21390)	7510 (5180-12720)	**<0.05***
Platelet count (/mm^3) Mean±SD	330.579±74.642	295.368±79.773	≥0.05**
Sodium (mmol/L) Mean±SD	138.42±2.01	137.74±2.18	≥0.05**
Potassium (mmol/L) Median (Min- Max)	4.3 (3.8-5.1)	4.4 (3.8-5.6)	≥0.05*
Calcium (mg/dL) Mean±SD	9.71±0.422	9.82 ±0.33	≥0.05**
Urea (mg/dL) Mean±SD	26.26±7.52	22.42±7.70	≥0.05**

Creatinine (mg/dL) Median (Min- Max)	0.36 (0.23-0.9)	0.32 (0.12-0.9)	≥0.05*
Aspartate aminotransferase (U/L) Median (Min- Max)	34(22-917)	161.90 (27-515)	**<0.05***
Alanine aminotransferase (U/L) Median (Min- Max)	24 (13-324)	87.54 (15-312)	**<0.05***
Creatinine kinase (U/L) Median (Min- Max)	295(16-2841)	106 (52-343)	**<0.05***
Prothrombin time Median (Min- Max)	14 (11.3-28)	13.1(12-17)	≥0.05*
Activated prothrombin time Median (Min- Max)	26 (12-37.8)	27.1 (21-31.9)	≥0.05*
International normalized ratio Median (Min- Max)	1.13 (0.39-2.24)	1.04 (0.39-1.23)	≥0.05*

*** Wilcoxon sign test**
****Paired Sample t-Test**

During the treatment, activated charcoal was performed in 10 patients (53%), activated charcoal and gastric lavage were applied in 5 (26%), a combination of gastric lavage, activated charcoal and acetyl cysteine was performed in 2 (11%), acetyl cysteine was applied in one (5%), and only one patient (5%) underwent follow-up. Extracorporeal treatment was applied to two patients who developed liver and renal failure during treatment and follow-up.

The mean duration of hospitalization was 3.4±2.3 (2-10) days. Mortality was not seen. During the laboratory comparisons before and after hospitalization, white blood cells, creatinine kinase, aspartate aminotransferase and alanine aminotransferase levels were found to be statistically significant (p <0,05) (Table 2).

DISCUSSION

Poisoning cases are frequently encountered in the emergency departments and require serious follow-up and treatment. Poisonings may have serious consequences, depending on the length of time the patient is admitted. Intensive care may be needed for some of these patients. Up to 5-30% of intensive care unit beds are used for poisoning cases (6).

In intensive care units, life support is provided, poisoning effect is determined and necessary treatment is applied (7). When poisoning cases in our country are examined, toxic plant and mushroom poisoning constitute 1-2% of total poisoning cases and 10-20% of cases in intensive care units (8, 9). In the study, poisoning cases constituted 13% of all cases, and toxic plant and mushroom poisoning comprised 1% of all cases and 13% of poisoning cases. In the study, toxic plant and mushroom poisoning cases were seen under the age of 5 (68%) and mostly in boys (73,6%), which is consistent with the literature (4, 10). Those children in this age group are naturally mobile and curious and some plants have vivid colors and aroma increases the frequency of poisoning.

In a retrospective study on 23 children with acute poisoning in the pediatric emergency department, it was reported that the most common poisoning was sprouted potato and apricot kernel (11). The most common poisoning in our study was mushroom and Indian oil seed (ricinus communis). There may be differences in plant flora due to geographical features such as location, climate type, population, transportation structure, vegetation cover and soil structure. For this reason, the factors of poisoning may vary. Toxic plant and mushroom poisoning symptoms are complaints such as fatigue, nausea, abdominal pain, cramps, diarrhea and vomiting in the patients (10). In a retrospective study conducted by Almis et al. (11) the most common complaints according to toxic substance were fatigue and vomiting. Jaspersen et al. (12) found that anticholinergic symptom findings were common, and Manríquez et al. (13) found that vomiting was the most frequent. In our study, we found that there were complaints such as vomiting, altered mental status and respiratory distress according to the order of frequency. Different medical sings may arise depending on the effect of poisoning.

In studies conducted in our country, it was seen that poisonings due to plants were more frequent in spring and summer (11, 14, 15). In our study, toxic plant and mushroom poisoning was more common in spring and

summer, which is consistent with the literature. As a result of the changes in nature with seasonal effects, the changes in the plants also occur. Especially in our region where terrestrial climate prevails, plants such as mushrooms are seen more in spring and autumn and seeds of plants are formed in summer and autumn. For this reason, due to the characteristics of the plants, which cause poisoning, an increase in toxic plant and mushroom poisonings can be seen in spring and summer.

In a study, when the educational levels of family members were examined, 69% of families were identified as primary school graduates (16). Similarly, in our study, 63.2% of the family members were primary school graduates. 57.9% of the patients were living in rural areas. Studies aiming at the prevention of poisonings should identify and train less educated families with high risk of poisoning and living in rural areas.

In our study, the average time of arrival of the patients to the hospital was 2.4 ± 1.9 (1-8) hours. This period is consistent with the literature (17,18). No difference was found between the western and eastern regions of our country in terms of the application periods, which shows there is no difference in terms of accessing to health services

The main treatment applied in cases of poisoning is to evaluate vital signs and consciousness status and to give basic and advanced life support if necessary. Although the basic treatment principles vary with each patient, the basic treatment methods are similar. Treatment principles are decontamination applications, elimination increase, antidote therapy, symptomatic and supportive therapy (19).

While there is no study on the actual use of extracorporeal treatment in cases of mushroom poisoning, the US Poison Control Center reported that extracorporeal treatment was applied to 0.15-0.22% of all poisoning cases (20). Leray et al. (21) reported that four patients with mushroom poisoning underwent hemodialysis due to acute renal failure and all patients recovered. In our study, decontamination applications such as stomach lavage and activated charcoal were applied to the cases. In addition, two patients underwent extracorporeal treatment methods such as hemodialysis and hemodiafiltration. As organ damages occur due to nephrotoxic and hepatotoxic toxins in mushroom poisonings, hemodialysis treatment was applied not to clear the toxin but to treat it in cases of acute renal failure and liver failure

Yilmaz et al. (22) reported that the mean duration of hospitalization was 3.4 ± 2.5 days, and the mean duration of hospitalization in our study was 3.4 ± 2.3 (2-10) days.

Agin et al. (8) found that the most common laboratory findings were leukocytosis and hyperglycemia, while Yılmaz et al. (22) reported it was hyperglycemia. In our study, white blood cell count, creatinine kinase, aspartate aminotransferase and alanine aminotransferase levels were the most common laboratory findings. The increase in levels of aminotransferases may be due to the toxic effects on liver cells, and the higher number of white cells may be due to the inflammatory response caused by toxic agents.

The limitation of our study was that it was a single-center study with retrospective design. Because of the number of patients was not high, multi-center, large-scale studies are needed in terms of the epidemiology toxic plant and mushroom poisoning of childhood in our country.

CONCLUSION

Although positive results can be obtained with social informing, symptomatic and supportive treatment in toxic plant and mushroom poisonings that may develop in childhood age group, more aggressive treatment methods such as drug treatment, extracorporeal treatment may be needed. Close monitoring of laboratory parameters in mushroom and plant intoxication cases due to late manifestations has an important role in patient follow-up and treatment.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: Ethics committee approval was obtained from Local Ethics Committee for this study.

Evrim Gul ORCID: 0000-0001-9049-5446
Mehmet Yusuf Sari ORCID: 0000-0001-7855-292X

REFERENCES

1. Shih RD. Plants, mushrooms, and herbal medications. In: Marx JA, ed. Rosen's Emergency Medicine: Concepts and Clinical Practice. Vol. 2. 8th ed. Philadelphia: Elsevier Saunders 2014:2066-75.
2. Dokmeci I. Bitkisel Kaynaklı Zehirler. Dökmeci İ, Dökmeci AH, editör. Toksikoloji Zehirlenmelerde Tanı ve Tedavi. 4. Baskı. İstanbul: Nobel Tıp Kitapları; 2005:528-31.
3. Krenzelok EP, Mrvos R. Friends and foes in the plant world: a profile of plant ingestions and fatalities. Clin Toxicol (Phila) 2011;49:142-9.
4. Bronstein AC, Spyker DA, Cantilena LR Jr, et al. 2009 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 27th Annual Report. Clin Toxicol (Phila) 2010;48:979-1178.
5. Mat A. Les Plantes Vénéneuses En Turquie. Adli Tıp Dergisi 1992;8:121-4.
6. Henderson A, Wright M, Pond SM. Experience with acute overdose patients admitted to an intensive unit over six years. Med J Aust 1993;158:28-30.
7. Schapira K, Linsley KR, Linsley A, et al. Relationship of suicide rates to social factors and availability of lethal methods: comparison of suicide in Newcastle upon 1961-1965 and 1985-1994. Br J Psychiatry 2001; 178:458-64.

8. Ağın H, Çalkavur Ş, Olukman Ö, et al. Childhood Poisoning: Evaluatıon Of Cases In The Last Two Years. Turkiye Klinikleri J Pediatr 2002;11:186-93.
9. Özayar E, Değerli S, Güleç H, et al. Retrospective Analysis of Intoxication Cases in the ICU Turk J Intense Care 2011;3:59-62.
10. Edward P Krenzelok & Rita Mrvos. Friends and foes in the plant world: A profile of plant ingestions and fatalities. Clinical Toxicology 2011;49.
11. Almış H, Karabiber H, Yakıncı C. Plant Related Poisonings in Children: An Evaluation of 23 Cases. J Turgut Ozal Med Cent 2014:21:126-9
12. Jaspersen-Schib R, Theus L, Guirguis-Oeschger M, et al. Serious plant poisonings in Switzerland 1966-1994. Case analysis from the Swiss Toxicology Information Center. Schweiz Med Wochenschr. 1996; 126:1085-98.
13. Manríquez O, Varas J, Ríos JC, et al. Analysis of 156 cases of plant intoxication received in the Toxicologic Information Center at Catholic University of Chile. Vet Hum Toxicol 2002;44:31-2.
14. Ergür AT, Sütçü İ, Tanzer F. Pediatri servisimizdeki zehirlenme olgularının değerlendirilmesi: 1990-1998. Türkiye Klinikleri Pediatri 1999;8:9-14.
15. Orbak Z, Selimoğlu MA, Alp H. Erzurum bölgesinde çocuklarda zehirlenme vakalarının değerlendirilmesi. Çocuk Sağlığı ve Hastalıkları Dergisi 1996;39:497-504.
16. Özenir M, Duru N, Elevli M, et al.İlaç Zehirlenmesi Olan Çocuklarda Demografik Özellikler ve Ailesel Etkenlerin Değerlendirilmesi The Medical Bulletin of Haseki 2013;51:157-61
17. Akbay-Öntürk Y, Uçar B. Eskişehir bölgesinde çocukluk çağı zehirlenmelerinin retrospektif değerlendirilmesi. Çocuk Sağlığı ve Hastalıkları Dergisi 2003;46:103-13.
18. Öner N, İnan M, Vatansever Ü, ve ark. Trakya bölgesinde çocuklarda görülen zehirlenmeler. Türk Pediatri Arşivi 2004;39:25-30.
19. Fazen LE, Lovejoy FH, Crone RK. Acute poisoning in a children's hospital: a 2-year experience. Pediatrics 1986;77:144-51.
20. Litovita TL, Felberg L, Soloway RA, et al. 1994 annual report of the American association of Poison Control Centers National Data collection System. American Journal of Emergency Medicine 1995;13:551.
21. Leray H, Canaud B, Andry C, et al.Amanita proxima poisoning: a new cause of acute renal insufficiency. Nephrologie 1994;15:197-9.
22. Yılmaz HL, Evliyaoğlu N, Pıtırtı M, et al. Yoğun bakım gerektiren zehirlenme olgularının geriye dönük değerlendirilmesi. Doktor 1996;4:327-33.