

# The Evaluation of Poisoning Cases who Applied to the Adiyaman University Training and Research Hospital Pediatrics Emergency Department

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## Abstract

**Objective:** To investigate the epidemiological and clinical characteristics of intoxications in our region, to illuminate measures, and to contribute to the national survey.

**Material and Methods:** Medical records of 366 cases who were diagnosed as intoxications during 2013 in the pediatric emergency department were reviewed retrospectively.

**Results:** A total of 80,833 patients were admitted to pediatric emergency department in 2013. The ratio of poisoning cases to all pediatric emergency admissions was 0.4%; 184 (50.2%) cases were female, 182 (49.8%) cases were male, and the mean age was  $5.7 \pm 1.4$  years. Also, 56.8% of patients were under 5 years old. Most (95.7%) cases were accidental, while 4.3% of them were suicides. The common causes of intoxication were medications and scorpion envenomation. The most common pharmacological agents that caused intoxication were analgesics and antidepressants. The most common clinical findings were vomiting (24.3%), nausea (20.2%), abdominal pain (13.6%) and headache (11.4%). Supportive treatments were applied to 90.1% of patients, and antidotes were used in 4.9% of patients. A patient with a scorpion sting died due to cardio-pulmonary insufficiency.

**Conclusion:** In our region, the most common poisoning agents were drugs and scorpion stings. Education of parents may decrease acute intoxication cases causing morbidity and mortality. (*JAEM 2014; 13: 166-71*)

**Key words:** Adiyaman, childhood, emergency department, poisoning

## Introduction

The emergence of signs and symptoms in an organism caused by a toxic substance entering the body is recognized as poisoning. Although poisonings may occur in any age group, these instances are more common in children, and the effects may be more serious for this population, as well (1). Poisoning is an important cause of childhood death. In different studies conducted in Turkey, mortality rates caused by poisonings in children have been reported to range from 0% to 5.5% (2, 3). Several substances, such as drugs, other substances not used as drugs, nutrients, and secretions of some animals, may lead to poisoning. The causes of intoxication vary according to geographical regions, seasons, traditions and customs of a society, age group, and sociocultural levels (1, 4, 5).

Determining the clinical and epidemiologic features of intoxications will provide useful information about how to determine both preventive measures and appropriate treatment. For this purpose,

each region around the world should determine and update its epidemiological data regarding toxins and intoxication. In this study, we aimed to contribute to the research by determining the etiologic, demographic, clinical, and epidemiological aspects of children admitted to emergency departments because of poisonings.

## Material and Methods

In this study, the medical records of 366 patients admitted to the pediatric emergency department of Adiyaman University Teaching and Research Hospital due to poisoning between January 1, 2013 and December 31, 2013 were retrospectively evaluated. The following data were collected: gender, age, cause of poisoning, time between poisoning and arrival to the hospital, clinical and laboratory findings, follow-up methods, duration of follow-up, treatment methods, and response to treatment.

Places of residence of patients were divided into three groups: province center, towns or villages, and other provinces. Elapsed time



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between poisoning and admission to the emergency department was divided into three groups: 0-4 hours, 5-12 hours, and more than 12 hours. Poisoning types were classified under two headings: suicidal and accidental. Poisonings were classified into seven sub-headings according to the responsible agent: nutrients, carbon monoxide, pharmacological agents, non-pharmacological chemicals, animal-origin poisons, multiple drug intake, and unclassified. Clinical and laboratory findings of patients and treatment modalities are provided in the tables.

### Statistical Analysis

Descriptive and frequency statistical analyses were performed by using the Statistical Package for the Social Sciences (SPSS) for Windows, version 15.0 software (SPSS, Chicago, IL, USA). The study was approved by ethics committee of Adiyaman University.

### Results

Of the 80,833 patients admitted to the pediatric emergency department of Adiyaman University Teaching and Research Hospital between January 1, 2013 and December 31, 2013, 366 patients (0.4%) had been diagnosed with acute poisoning. The gender distribution was 184 female patients (50.2%) and 182 male patients (49.8%). The mean age of the patients was  $5.7 \pm 1.4$  years (6 months to 17 years). In the distribution of patients according to age group, 208 patients (56.8%) were younger than 5 years, 90 (24.6%) were between the ages of 5-12 years, and 68 (18.6%) were older than 12 years. Regarding location, 214 (58.4%) patients presented from a province center, 149 (40.7%) patients presented from towns or villages, and 3 patients (0.8%) presented from neighboring provinces. Seasonally, the patients were admitted at different points throughout the year: 142 (38.8%) patients in the summer, 97 (26.5%) patients in the spring, 77 (21.1%) patients in the autumn, and 50 (13.5%) patients in the winter. Accidental poisoning was responsible for 95.7% of all poisonings, and suicidal poisoning was responsible for 4.3% of all poisonings. All of the suicidal poisoning patients were older than 12 years (5 male and 11 female). The majority of patients (84.9%) was admitted to the emergency department within the first 4 hours of poisoning. However, for 13 (3.5%) patients living in villages, the elapsed time for admittance was longer than 12 hours. Yet, 224 patients were admitted directly to our emergency department, 109 patients were first admitted to the emergency department of the county, and 3 patients were first admitted to the emergency department of the neighboring province. In accordance with the recommendations of the National Poisoning Research Center (UZEM), 209 (57.1%) patients were hospitalized in the pediatric intensive care unit (PICU), 37 (10.2%) patients were hospitalized in the pediatric ward, and 117 (31.9%) patients had been discharged after observation in the emergency department. Follow-up of 16 patients who were poisoned with corrosive agents was performed by pediatric surgery. Three patients who were recommended to be hospitalized in the PICU were transferred to other hospitals due to a lack of beds. The demographic and clinical features of the patients are given in Table 1.

In addition, 110 (30.1%) patients were poisoned with pharmacological agents, 87 (23.7%) came into contact with venomous animals, 68 (18.5%) ingested non-pharmacological chemicals, 59 (16.1%) experienced carbon monoxide poisoning, 32 (8.7%) ate deficient food sources, and 27 (7.3%) ingested toxins that could not be classified. The

**Table 1.** Demographic and clinical characteristics of the patients

Features	n	%
<b>Gender</b>		
Female	184	50.2
Male	182	49.8
<b>Age groups</b>		
<5 years	208	56.8
5-12 years	90	24.6
> 12 years	68	18.6
<b>Elapsed time for admittance</b>		
0-4 hours	311	84.9
5-12 hours	42	11.4
>12 hours	13	3.5
<b>Places of residence</b>		
Province center	214	58.4
Towns or villages	149	40.7
Other provinces	3	0.8
<b>Season</b>		
Spring	97	26.5
Summer	142	38.8
Autumn	50	13.6
Winter	77	21.1
<b>Poisoning type</b>		
Suicidal	16	4.3
<5 years	0	0.0
5-12 years	0	0.0
>12 years	16	4.3
Accidental	350	95.7
<b>Follow-up methods</b>		
Follow-up in emergency department	117	31.9
Hospitalized in the pediatric services	37	10.2
Hospitalized in the PICU	209	57.1
<b>Duration of follow-up</b>		
0-12 hours	120	32.7
13-24 hours	182	49.7
25-48 hours	38	10.3
>48 hours	26	7.1
<b>Outcomes</b>		
Death	1	0.27
Survivors	362	98.9
Referred	3	0.8

most frequent responsible agents in poisoning cases involving pharmacological drugs were analgesic-antipyretic-anti-inflammatory drugs (7.3%), central nervous system drugs (7.1%), and cardiovascular system

drugs (3.1%). The most common causes of poisoning with non-pharmacological agents were corrosive substances (4.3%), organophosphates (4.1%), and rat poisons (3.5%). Scorpion envenomations were the most common poisoning caused by contact with venomous animals. Eight patients had a history of multiple-drug ingestion. A detailed distribution of responsible agents is given in Table 2.

Almost all patients who were admitted for contact with venomous animals had local symptoms. The most common local signs were pain (89.6%), hyperemia (56.3%), and swelling (34.4%). Cold extremities (48.2%) were the most important evidence of systemic toxicity in these patients. Considering all of the poisoning cases, most of the patients were asymptomatic. In symptomatic patients, vomiting (24.3%), nausea (20.2%), abdominal pain (13.6%), headache (11.4%), and mental status changes (8.4%) were the most common symptoms of systemic poisoning.

In most of the patients, routine laboratory investigations were normal. In biochemical investigations, increased creatine kinase (CK) (3.2%) (5-130 IU/L), increased lactate dehydrogenase (LDH) (2.7%) (150-500 IU/L), and hyperglycemia (1.1%) (>110 mg/dL) were the most common pathological findings. Leukocytosis (4.9%) (>13,500/mm<sup>3</sup>) and leukopenia (1.1%) (<5/mm<sup>3</sup>) were the most common hematologic findings. Carboxyhemoglobin levels were greater than 5% in 34 (57.6%) patients poisoned by carbon monoxide. Electrocardiogram (ECG) recordings for 236 (64.4%) patients were available. Sinus tachycardia (n=31; 8.4%), QT prolongation (n=13; 3.5%), and ST changes were the most common ECG changes in patients. The clinical signs and laboratory findings of the patients are shown in Table 3.

All of the patients who were poisoned with scorpion or snake venom received an administration of one dose of an antivenom ampoule, a steroid, and an antihistamine in the emergency department. All patients in this category were hospitalized in the PICU, and further treatments were applied to patients in need, according to the treatment regimens of the PICU. Since skin integrity was disrupted, these patients were given tetanus prophylaxis, and 10 patients had to be vaccinated. Two scorpion sting cases presented with pulmonary edema at admission. Both patients were treated with dobutamine plus doxazosin and required mechanical ventilation. Improvement in pulmonary edema was observed in 1 patient after 36 hours of the treatment; unfortunately, the other patient suffering from massive pulmonary edema died after 48 hours of treatment (Table 4).

When dealing with poisoning cases involving pharmacological or non-pharmacological agents, unless there were different suggestions by UZEM, gastric lavage was conducted, and activated charcoal (1 g/kg) was administered to all patients. Additional doses of activated charcoal were given to 6 patients with poor general health. Almost all of the patients were treated with supportive, intravenous maintenance (264 [72.1%] patients). N-acetyl cysteine (300 mg/kg in 20 hours) was given to 15 (60%) patients poisoned with paracetamol. Fomepizole (15 mg/kg) was given to a patient with methyl alcohol poisoning. Neostigmine (0.025 mg/kg) was administered to a 4-year-old patient showing typical anticholinergic symptoms. Atropine (0.05 mg/kg) was administered to a patient with organophosphate poisoning as an antidote. Vitamin K (1-5 mg intramuscularly), as an antidote, was given to 2 of 13 patients poisoned with rat poisons. Children with chemical pneumonitis after hydrocarbon ingestion were hospitalized in the PICU, and antibiotics were given to some. Because of ongoing respiratory distress and diminishing conditions in their chests in radiographic findings, combined steroid treatments (neb-

**Table 2.** Distribution of responsible agents

Responsible agents	n	%
Food poisoning	32	8.7
Carbon monoxide poisoning	59	16.1
<b>Pharmacological agents</b>		
Analgesic-antipyretic-anti-inflammatory drugs	27	7.3
Central nervous system drugs	26	7.1
Cardiovascular system drugs	11	3.1
Respiratory system drugs	9	2.4
Vitamins or hematopoietic drugs	8	2.1
Drugs, including hormones	8	2.1
Antibiotics	8	2.1
Gastrointestinal drugs	6	1.6
Antihistamines	5	1.3
Nasal decongestants	2	0.5
<b>Non-pharmacological chemicals</b>		
Corrosive substances	16	4.3
Organophosphates	15	4.1
Rat poisons	13	3.5
Hydrocarbon-containing	9	2.4
Alcohol-containing substances	6	1.6
<b>Contact with venomous animals</b>		
Scorpion sting	80	21.8
Snakebites	6	1.6
Others	1	0.2
Multiple-drug ingestion	8	2.1
Unclassified	27	7.3

ulized budesonide [200 µg, twice daily] and parenteral methylprednisolone [0.5 mg/kg/dose, IV]) were given to 6 patients with chemical pneumonitis. All patients with carbon monoxide poisoning received oxygen inhalation treatment, except for a patient who showed no evidence of hypoxemia and a carboxyhemoglobin level of less than 5% (Table 4).

Almost all food poisoning patients were discharged from the emergency department within the first 24 hours. A case of mushroom poisoning caused 1 patient to be hospitalized in the PICU, and another patient suffering from over-vomiting was hospitalized in the pediatric ward.

Only 3 patients were referred to other centers due to a lack of beds in the PICU. Hospitalization occurred in 209 (57.1%) patients in the PICU and 37 (10.2%) patients in the children's services ward. Furthermore, 117 (31.9%) patients were discharged after observation in the emergency department. The mean hospitalization time was 22.8±10.7 days (4 hours to 12 days). Although 92.9% of patients were discharged within the first 48 hours, 26 (7.1%) patients had prolonged lengths of stay. The most important causes of prolonged hospitalization were snakebites, chemical pneumonia, scorpion stings, and poisoning with lipophilic central nervous system drugs. Only 1 patient suffering from a

**Table 3.** Clinical and laboratory findings of patients

Clinical and laboratory findings	n	%
<b>Local signs*</b>		
Pain	78	89.6
Hyperemia	49	56.3
Swelling	30	34.4
<b>Symptoms of systemic poisoning</b>		
Vomiting	89	24.3
Nausea	74	20.2
Abdominal pain	50	13.6
Headache	42	11.4
Cold extremities *	42	48.2
Mental status changes	31	8.4
Diarrhea	15	4.1
Weakness	10	2.7
Dyspnea	9	2.4
Fever	9	2.4
Hypersalivation	6	1.6
Sweating	5	1.3
<b>Pathological laboratory findings</b>		
Increased carboxyhemoglobin**	34	57.6
Leukocytosis	18	4.9
Increased creatine kinase	12	3.2
Increased lactate dehydrogenase	10	2.7
Hyperglycemia	4	1.1
Leukopenia	4	1.1
Hypernatremia	4	1.1
Coagulopathy	3	0.8
Elevated AST-ALT	3	0.8
Hyponatremia	3	0.8
Hyperkalemia	3	0.8
Hypokalemia	3	0.8
<b>Pathological ECG findings</b>		
Sinus tachycardia	31	8.4
QT prolongation	13	3.5
ST changes	7	1.9
Sinus bradycardia	5	1.3

\* These data belong to the 87 patients with contact with venomous animals.  
\*\* These data belong to the 59 patients with carbon monoxide poisoning.

scorpion sting died due to complications with severe heart failure and pulmonary edema. Our mortality rate was 0.27%.

## Discussion

Emergency services are helpful for poisoning cases, because unintended outcomes can be significantly reduced with early and ef-

**Table 4.** Treatment modalities of patients

Treatment modalities	n	%
Supportive care	330	90.1
Intravenous mai	264	72.1
Activated charcoal	134	36.6
Gastric lavage	126	34.4
Antibiotics	96	26.2
Steroids	96	26.2
Scorpion or snake venom *	86	98.8
Antihistamine	86	23.4
Oxygen inhalation treatment **	58	98.3
Antidote applications	18	4.9
Tetanus prophylaxis	10	2.7
Vitamin K	2	0.5
Mechanical ventilation	2	0.5

\* These data belong to the 87 patients with contact with venomous animals.  
\*\* These data belong to the 59 patients with carbon monoxide poisoning.

fective treatment. Thus, poisoning accounts for many emergency department admissions. Studies from various countries have reported the rate of poisoning cases admitted to emergency departments as ranging between 0.2% and 4.7% (6-8). In the studies conducted in various regions of Turkey, this rate has varied from 0.4% to 6.2% (2, 9, 10). Throughout Turkey, this rate is reported to be 0.9% (11). In our study, this rate was 0.4% and represented the lowest rate reported rate in Turkey. Despite this low rate, we believe that poisonings are common in our region, and the number of inappropriate admissions into emergency departments has decreased the rate.

In most of the previous studies, poisonings were reported mostly for children younger than 5 years, and accidental and suicidal poisonings were more common in girls older than 12 years (3, 11, 12). Sumer et al. (13) reported that 97% of the poisonings in their study occurred accidentally, and all of the suicidal poisonings were girls older than 12 years. In this study, 73.8% of patients were younger than 5 years. Bükülmez et al. (14) stated that 60% of their patients were younger than 5 years, and the number of males was high in all age groups. In another study, most of the patients were female, 16.5% of the poisonings were suicide attempts, and most of those poisonings were girls older than 12 years (15). In our study, 56.8% of patients were younger than 5 years, 4.3% of the poisonings were suicidal, and most of those poisonings involved females, which were similar to the previous studies. However, the male-to-female ratio was higher in this study than in the previous studies.

Several studies have suggested that poisoning agents and the method of poisoning may relate to seasonal differences in children. Several studies expressed that poisonings were more common during the summer and spring in Turkey (11, 16-18). Similarly, in this study, most of the poisonings occurred in the spring and summer seasons. We believe that this relationship is associated with higher chemical use, such as in whitewashing or painting, more contact with venomous animals, and increased difficulty in storing food appropriately during the summer and spring seasons than in other months.

Most poisoning cases were admitted to the emergency department within the first 4 hours. Guzel et al. (10) reported that the mean elapsed time between the poisoning incident and admission to the emergency department was 1.5 hours (10 minutes to 4 days). In a study from the Thrace region of Turkey, the admission time was reported to be  $2.9 \pm 1.7$  hours (1-8 hours) (17). Kendirci et al. (15) stated that all patients were admitted within the first 48 hours, and 50.6% of those admitted were within the first hour. In this study, we found that, consistent with previous studies, 84.9% of patients were admitted to the emergency department within the first 4 hours, and the mean admission time was  $2.1 \pm 1.3$  hours (15 minutes to 30 hours).

When childhood poisoning was analyzed according to the responsible agents, pharmacological agents were the most prominent causes (11, 19-21). In Turkey, there are several studies suggesting that the most common agents are medical drugs. Binay et al. (22) reported that drugs were responsible for 41.3% of poisonings (the most common were analgesic-antipyretic and anti-depressant drugs), and food poisoning and toxic gases encompassed the other most common causes of poisoning, respectively. Eliacik et al. (23) reported that medical drugs (50.6%), corrosive agents (20.1%), and carbon monoxide (16.6%) were most frequently responsible for poisonings, and antipyretics (45.7%) and central nervous system drugs (35.8%) were the most common causes of poisonings. In contrast to these studies, many studies have shown that medical drugs are not the most commonly responsible agents. Kondolat et al. (2) reported that 66.9% of patients were poisoned with non-pharmacological agents (most commonly with corrosive substances), and central nervous system drugs and analgesics were the most common drugs responsible for poisonings. In another study, carbon monoxide (49%) and medical drugs (32.5%) were the most common causes of poisoning, and paracetamol was the most frequently responsible drug (15). In the present study, we found that the most common cause of poisoning was medical drugs (30.1%), and analgesics and central nervous system drugs were the most common responsible drugs. Likewise, we found that scorpion envenomations were the second most common cause of poisonings, which differs from other studies. This cause may be related to the geographical and climatic characteristics of our region.

Although most poisoning cases are asymptomatic, different clinical signs can be seen according to differences in toxin type, route of exposure, and targeted organs. In general, nausea or vomiting, mental status changes, tachycardia, headaches, and abdominal pain have been reported as the most common clinical findings (2, 19). However, erythema and edema in the oral mucosa caused by corrosive substances, dehydration caused by food poisoning, and local skin irritations caused by exposure to venomous animals may be more pronounced. In the present study, nausea and vomiting were the most common clinical findings, and local symptoms were more pronounced in animal-origin poisoning, which is similar to findings in previous studies.

The basic principles of treatment for poisoning can be summarized as preventing or reducing the absorption of the toxic substances, administering antidotes to alter the metabolism of the toxic substances, and accelerating the excretion, and providing supportive care (2). To reduce gastrointestinal absorption, early gastric lavage and administration of activated charcoal provide effective results in appropriate cases. In many studies, the most common treatment methods are gastric lavage, administration of activated charcoal, oxygen, and intravenous hydration (2, 17, 22). There are antidotes for few of the substances that cause poisoning. Because the use of these antidotes is life-saving, practitioners should be sensitive to possessing,

prescribing, and using the antidotes. In the present study, the most common treatment methods were intravenous hydration, gastric lavage, and administration of activated charcoal, which was consistent with previous studies. In our study, antidotes were administered to 12 patients in accordance with the recommendations of UZEM.

Different results have been reported in different publications about follow-up methods for poisoned patients. One study reported that 73.5% of patients were discharged from the emergency department, but 48 (9.3%) patients were referred to other centers (22). In another study, 82% of patients were discharged from the emergency department, 13% was hospitalized in the pediatrics services, and 3% was referred to another center due to lack of a PICU in their hospital (24). In the present study, most of the patients were hospitalized in the PICU or pediatric services, and 3 patients were referred to other centers due to a lack of beds in the PICU. The high number of hospitalized patients in this study may be related to differences in poisoning agents or clinical status and the higher prevalence of scorpion stings or snakebites than in previous studies.

Studies reporting mortality rates vary, with rates reaching approximately 1% in developed countries and between 1.8% and 11.6% in developing countries (25-27). In different studies conducted in Turkey, mortality rates in childhood poisonings have been reported to range from 0.4% to 5.5% (13, 17). However, there are some studies reporting no deaths from poisoning (2, 14, 15). In the present study, only 1 case with a scorpion sting who had severe heart failure and pulmonary edema died. Our mortality rate is consistent with previous data, where the mortality rate was extremely low (0.27%). We believe there are several factors that contributed to this low rate, including early admission to the emergency department, timely and effective first-line treatment, the presence of a PICU, and low referral rates to other facilities.

## Study Limitations

The major limitations of our study were the retrospective design and the use of single-center data.

## Conclusion

In our region, the most prominent causes of childhood poisoning were drugs and scorpion stings. Early admission to the emergency department and consultation with poison control centers will reduce morbidity and mortality in poisoning cases. Because most of the poisonings in children occur accidentally and with children younger than 5 years, educating parents, child caregivers, physicians, and pharmaceutical manufacturers about these issues and eliciting greater sensitivity to these issues may help reduce the frequency of poisonings. Suicidal poisonings seem to be a major problem for adolescent boys and girls in our region. For this age group, the establishment of special psychological support and training for families regarding adolescent behaviors will be useful. We believe that comprehensive, multi-center studies are required to achieve reliable epidemiological data about poisonings.

**Ethics Committee Approval:** The study was approved by the ethics committee of Adiyaman University.

**Informed Consent:** Due to the retrospective nature of this study, informed consent was waived.

**Peer-review:** Externally peer-reviewed.

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