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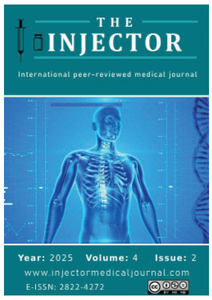

Original Article

Clinical and demographic characteristics of pediatric poisoning cases in an emergency department

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Abstract

Objective: This study aimed to evaluate the epidemiological and demographic characteristics of childhood poisoning cases.

Methods: Patients admitted to the Pediatric Emergency Department due to drug and non-drug toxin poisoning within a 2-year period were evaluated retrospectively. Substance abusers, chronic medication poisonings, drug reactions, and insect bites were excluded from the study. Patient age, gender, date/time of admission, time of poisoning, causative agents, reason for ingestion, frequency of calls to the poison control center, complaints and findings at admission, interventions and treatments, clinical outcomes, and follow-up duration were recorded and evaluated using hospital records.

Results: The total number of pediatric emergency department visits during the study period was 360,945. Of the cases presented to the pediatric emergency clinic over the 2-year period, 880 (0.24%) were diagnosed with intoxication. The majority of cases were in the 1–5-year age group (57.4%). Of all patients, 55% were girls and 45% were boys. Drugs were the most common cause of poisoning (64.7%, n = 569/880). Among drug-related poisonings, analgesics and antipyretics were the leading agents (9.3% of all cases). Medication poisonings were more common in girls (59.4%), while other poisonings were more common in boys (53.5%). The proportion of suicidal poisoning was significantly higher in girls (33.7%) and occurred predominantly in adolescents ($p < 0.001$). One-third of female adolescents presented with suicidal poisonings, representing a significant clinical concern. Poisoning from environmental or exposure agents were significantly higher in boys (60.4%) ($p < 0.001$).

Conclusion: Childhood poisonings represent a preventable cause of morbidity and mortality worldwide. Prevention is achievable only through raising public awareness and implementing appropriate protective measures.

Keywords: Child, drug, pediatric emergency, poisonings.

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INTRODUCTION

Poisoning is the presentation of particular symptoms and signs in an organism due to ingestion, inhalation, cutaneous absorption, or parenteral delivery of a toxin to the body. Poisonings constitute a potential source of morbidity and mortality in pediatric emergency care. Childhood poisonings represent an increasing health issue in both developed and developing nations (1,2). According to the Annual Report of America's Poison Centers National Poison Data System, the highest frequency of poisonings in 2022 occurred in children aged 2 years and younger, with a rate of 5,330 per 100,000 children in this group (3). According to 2020 data, 46.9% of the total applications to the National Poison Information Center (NPIC) involved childhood poisoning cases (4). Pediatric poisonings are seen in both developed and developing countries and are more common in young children due to factors such as curiosity, exploratory behaviors, and limited awareness of risks (5). The epidemiology of childhood poisoning differs by location and is affected by sociocultural, economic, and environmental factors. In younger children, the majority of poisonings are accidental, typically involving drugs, home chemicals, or plants; in contrast, in teens, planned poisonings, frequently associated with self-harm, are more common (6,7). Regional and hospital-based studies are crucial for identifying local patterns, high-risk age demographics, and causative agents, thereby informing preventive strategies and enhancing emergency management protocols. Emergency management protocols typically include rapid triage, initial stabilization (airway, breathing, circulation), administration of activated charcoal when indicated, symptomatic treatment, and early consultation with poison control centers (8). Identifying the clinical and epidemiological characteristics of poisoning helps determine appropriate clinical approaches and preventive measures.

This study aimed to evaluate the epidemiological and demographic characteristics of cases aged 0-18 years presenting to the Pediatric Emergency Department due to poisoning.

MATERIALS AND METHODS

This study was conducted in accordance with the principles of the Declaration of Helsinki. The study was approved by the Ministry of Health, Prof. Dr. Cemil Taşcıoğlu City Hospital Clinical Research Ethics Committee (decision no. 244, dated November 18, 2014). Patients admitted to the Pediatric Emergency Department due to drug and non-drug toxin poisoning within a 2-year period were evaluated retrospectively. All poisoning cases admitted during the study period were included in the analysis. Cases with incomplete demographic or clinical information were excluded from the analysis. Substance abusers, chronic medication poisonings, drug reactions, and insect bites were excluded from the study. Patient age, gender, date and time of admission, time of poisoning, causative agents, reason for ingestion, frequency of calls to the poison control center, complaints and findings at admission, interventions and treatments, clinical outcomes, and follow-up duration were recorded and evaluated using hospital data.

Statistical Analysis

Cases were evaluated for age, gender, causative agents, reason for ingestion, seasonal distribution of poisoning, and signs and symptoms of poisoning. SPSS version 15.0 (Windows) was used for statistical analysis. Descriptive statistics were presented as numbers and percentages for categorical variables and as means and standard deviations for numerical variables. Comparisons of numerical variables between two independent groups were performed using the Mann–Whitney U test when they did not meet the standard distribution assumption. The ratios of categorical variables between groups were evaluated using chi-square analysis. Statistical significance was set at $p < 0.05$.

RESULTS

Poisoning cases were included among patients admitted to the Pediatric Emergency Department over the 2 years. A total of 360,945 patients presented to the pediatric emergency department during this time, and 880 (0.24%) of them were diagnosed with intoxication. This rate was 0.29% in 2012 and 0.2% in 2013. The mean age of the poisoning cases was 6.5 ± 5.1 years. The gender ratio was 55% female (n = 484) and 45% male (n = 396). The distribution of cases among girls and boys by age groups is shown in Table 1.

Table 1. Distribution of cases among girls and boys by age groups

		Gender						
		Total		**Female**		**Male**		
		n	**%**	**n**	**%**	**n**	**%**	**p**
Age group	**0-1**	20	2.3	13	2.7	7	1.8	**<0.001***
	1-5	505	57.4	224	46.3	281	71.0	
	6-10	104	11.8	48	9.9	56	14.1	
	11-15	241	27.4	191	39.5	50	12.6	
	>15	10	1.1	8	1.7	2	0.5	
	Total	880	100	484	100	396	100	

Chi-square test
$p < 0.05$ was considered significant

Drug-related poisoning was the predominant cause, accounting for 64.7% of all pediatric poisoning cases. Distribution of poisoning agents is shown in Figure 1.

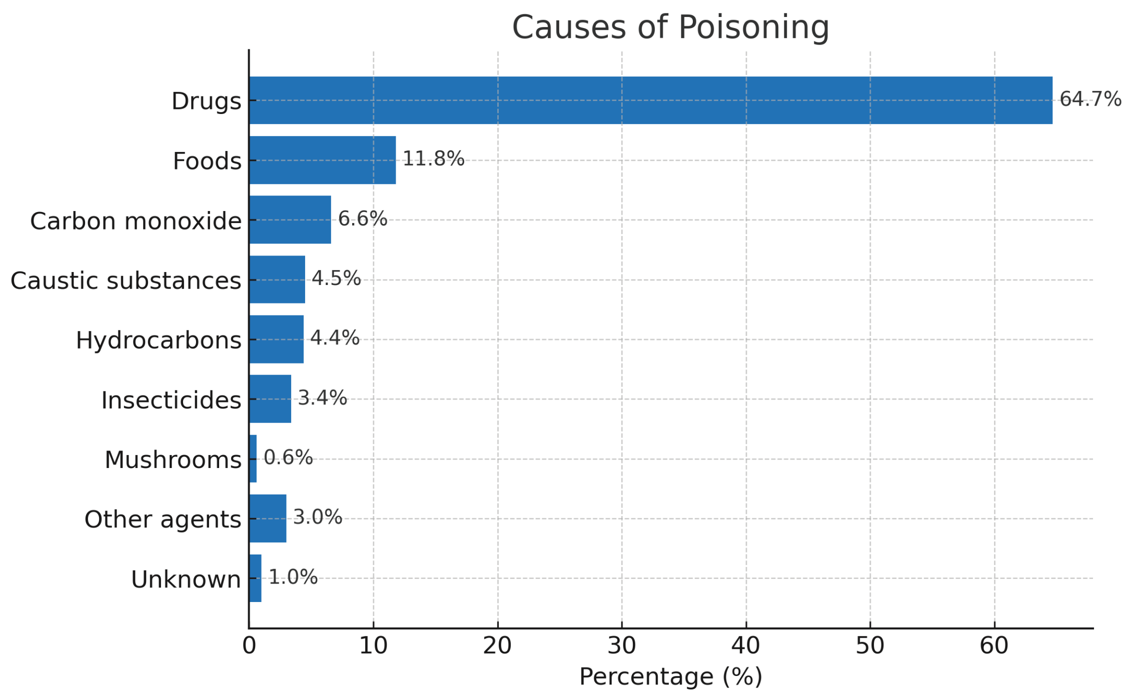

Figure 1. Distribution of poisoning agents

Among medication poisonings, 11.9% (n = 105) were due to multiple drug intake. When the factors of poisoning were examined, the most common reason for admission in girls and boys was related to drugs, 69.6% (n=337) and 58.6% (n=232), respectively. Reasons for taking the substance were 49.1% (n=432) due to items left in the open, 20.3% (n=179) for suicide, 12.7% (n=112) for food, 9.3% (n=82) for home accidents, 3.2% (n=28) for drinking it thinking it was water, and 5.3% (n=47) for other reasons. In females, the reasons for taking the substance were 39.9% (n=193) due to exposure to accessible items, 33.7% (n=163) for suicidal purposes, 11.6% (n=56) due to food, 8.1% (n=39) due to home accidents, 2.5% (n=12) for drinking it thinking it was water, and 4.3% (n=21) for other reasons. In males, the reasons were 60.4% (n=239) due to exposure to accessible items, 14.1% (n=56) due to food, 10.9% (n=43) for home accidents, 4% (n=16) for suicidal purposes, 4% (n=16) for drinking it thinking it was water, and 6.6% (n=26) for other reasons. There was a statistically significant difference in the reasons for taking the substance between gender groups ($p<0.001$). The rate of taking the substance for suicidal purposes was higher in females.

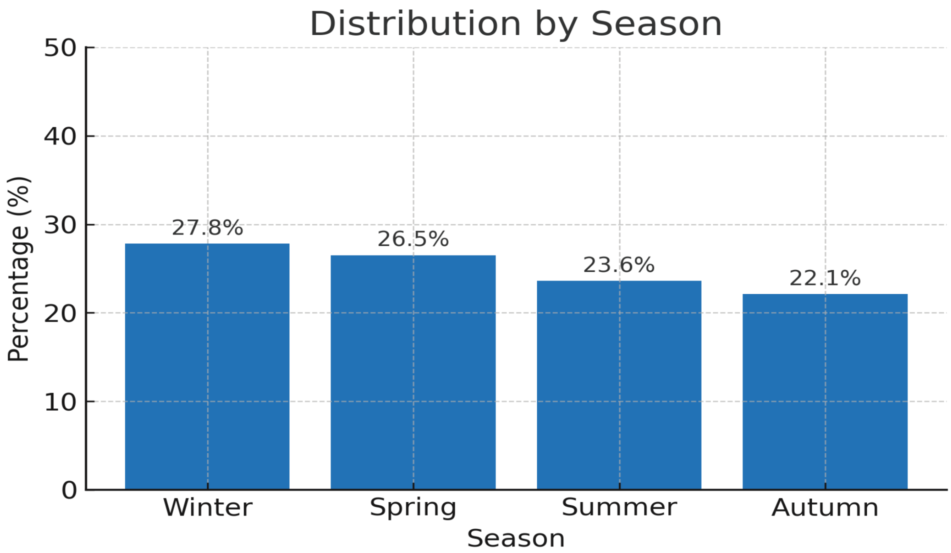

Figure 2. Distribution of poisoning cases by seasons

Of the poisoning cases, 27.8% (n=245) occurred in winter, 26.5% (n=233) in spring, 23.6% (n=208) in summer, and 22% (n=194) in autumn. The distribution of poisoning cases by age groups and seasons is shown in Table 2.

Table 2. Distribution of poisoning cases by age groups and seasons

Age group (years)	Spring n (%)	Summer n (%)	Autumn n (%)	Winter n (%)	p
0–1	1 (5.0)	9 (45.0)	3 (15.0)	7 (35.0)	<0.001*
1–5	115 (22.8)	122 (24.2)	124 (24.5)	144 (28.5)	
6–10	48 (46.2)	18 (17.3)	9 (8.6)	29 (27.9)	
11–15	69 (28.6)	54 (22.4)	55 (22.8)	63 (26.2)	
>15	0 (0.0)	5 (50.0)	3 (30.0)	2 (20.0)	

Chi-square test

**$p < 0.05$ was considered statistically significant*

In poisoning cases, 77.4% (n=681) were asymptomatic, and 22.6% were symptomatic. When the poisonings were grouped as drug and non-drug causes, 7% of drug-related poisonings and 48.8% of non-medication poisonings were symptomatic. The distribution of signs and symptoms, in order of frequency, was as follows: 18% (n=158) nausea–vomiting–abdominal pain, 1.5% (n=13) confusion, 0.9% (n=8) headache, 0.8% (n=7) dizziness, 0.6% (n=5) loss of consciousness, 0.6% (n=5) convulsions, 0.5% (n=4) increased salivation, 0.2% (n=2) diarrhea, and 0.1% (n=1) cough. Other signs and symptoms were present in 1.9% (n=17) of the cases.

DISCUSSION

The observed poisoning rate of 0.24% in pediatric emergency department visits corresponds with the lower range of international reports (9). A multicenter study spanning 20 nations revealed a rate of 0.47%, although a systematic review indicated a wider global range of 0.14% to 7.6%. In a study conducted between 2015 and 2019, the rate of admissions to the pediatric emergency department due to poisoning was reported as 1.01% (10). These findings indicate that poisoning represents a minor yet clinically relevant portion of pediatric emergency department admissions worldwide, with considerable variance across different contexts and timeframes (8,11). Our finding of a mean age of 6.5 ± 5.1 years is consistent with similar studies. Özkan et al. (12) reported a mean age of 7.5 ± 6.39 years among pediatric poisoning cases. These data collectively emphasize that early childhood, particularly the preschool years, remains the most vulnerable period for poisoning incidents. The female-to-male ratio was 55% to 45%, consistent with multiple studies indicating a small female predominance, especially in instances of intentional poisoning among adolescents (1,6). Accidental poisonings in younger demographics often exhibit a male predominance, possibly attributable to more energetic exploratory behaviors; however, the higher representation of females in the entire sample may be explained by the presence of self-harm ingestions, which occur more frequently among adolescent girls (13). Cultural norms regarding medication storage and supervision of children in extended family households may increase the risk of accidental ingestions among younger children. Our finding that medications account for the majority of pediatric poisonings (64.7%) aligns with reports from the United States (61–68%) and several European countries (55–70%) (14,15). Analgesic and antipyretic medications constituted the predominant agents, at 9.4%, followed by pharmaceuticals for the respiratory system, at 6.6%. In agreement with our findings, additional studies have identified analgesic–antipyretic medicines as the primary cause of pharmaceutical-related poisonings in children, followed by medications that affect the central nervous system (10,16,17). The predominance of analgesic–antipyretic poisonings may be explained by the widespread availability of these medications in households and their child-friendly formulations, which often include colorful, sweet-tasting preparations. In our study, food poisoning was the leading category among non-medication poisonings. Similar to our results, a study examining pediatric patients in Southwest China found that the most common non-drug cause of poisoning was spoiled food (18). According to our data, accidental ingestion represented 49.1% of poisoning, whereas suicidal ingestion was more prevalent among adolescent girls. Literature in pediatric poisoning also shows that accidental poisoning represent approximately 90.1% of cases in young children, with suicidal ingestions becoming increasingly common in adolescents (19). The predominance of multiple-drug ingestion among female adolescents in our study aligns with previous research indicating that intentional self-poisoning in this group frequently involves polypharmacy, often with higher associated morbidity than single-agent ingestions (20,21). While our data did not reveal a statistically significant seasonal variation in poisoning cases, the highest incidence occurred during the winter months, and the lowest was recorded in autumn. The literature consistently shows that pediatric poisoning cases are most frequent in the summer or rainy seasons, with lower incidence in autumn and winter, which parallels our findings (22). When our study examined seasonal poisoning factors, drugs were the leading cause of poisoning in every season. Similar to studies in the literature, no statistically significant differences were found in drug-related poisonings by season (22–24). In our study, food poisoning was the second most common cause of poisoning in spring, summer, and autumn, while carbon monoxide (CO) poisoning was the second most common cause in winter. Multiple studies indicate that CO poisoning in children peaks during the winter months, primarily due to the increased use of indoor heating systems and inadequate ventilation (25,26). Specifically, traditional heating practices and limited use of carbon monoxide detectors in households may contribute to these seasonal peaks. In our study, 77.4% of poisoning cases were found to be asymptomatic. The most common symptoms were nausea and vomiting. Similarly, studies conducted in Turkey and India found that the most common symptoms in symptomatic cases were nausea and vomiting (27,28). Our findings highlight that public health initiatives should prioritize parental education and awareness campaigns emphasizing the safe storage of medications and household chemicals in locked cabinets, out of children's reach. Seasonal interventions are also warranted, such as campaigns to improve household ventilation and encourage the installation of carbon monoxide detectors during the winter months. Strengthening the visibility and accessibility of poison control hotlines could provide families with rapid guidance in case of exposure, thereby reducing morbidity and mortality.

Limitations:

This research includes some limitations. The retrospective approach relied on medical records, which may have included insufficient or inconsistent documentation of exposure data, clinical observations, and treatment outcomes. Secondly, since the study was performed in a single tertiary pediatric emergency department, the findings may lack generalizability in other regions or healthcare environments with varying demographic and environmental characteristics. Additionally, mild cases that did not present to the emergency department may not have been captured in our data, potentially leading to an underestimation of the true incidence of pediatric poisonings.

CONCLUSION

Our research indicates that early childhood, especially the preschool years, represents the most sensitive phase for pediatric poisonings, underscoring the necessity for focused prevention efforts within this age group. The prevalence of medication-related poisonings, particularly those involving analgesic–antipyretic drugs, highlights the essential need for proper storage methods and parental monitoring to avoid accidental ingestions. Effective preventive strategies should include safe storage campaigns, child-resistant packaging, and easy access to poison control hotlines. To reduce the incidence of poisonings in children, public awareness must be increased, and environmental factors must be monitored. Studies employing data from children who present to pediatric emergency departments due to poisoning will be informative in this context.

Conflict of interest: Authors declare there is no conflicts of interest.

Financial support and sponsorship: There is no financial support or sponsorship.

Ethical considerations: This study was conducted as a thesis and was approved by the Ministry of Health Prof. Dr. Cemil Tascıoğlu City Hospital Clinical Research Ethics Committee (Decision No. 244, dated November 18, 2014).

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