DOI: 10.59213/TP.2023.24008
Trends in Pediatrics 2023;4(1):47-54

Original Article

Poisonings in childhood: A 5-year experience of a tertiary city hospital in İstanbul

Mehmet Tolga Köle[1], Gökşen Erkin[1], Aydan Erdem[1], Serdar Mehmetoğlu[1], İbrahim Kandemir[2], Kemal Pişmişoğlu[1], Hakan Günhan[1], Feyza Hüsrevoğlu Esen[3], Yakup Çağ[1], Yasemin Akın[1]

[1]University of Health Science, Kartal Dr. Lütfi Kırdar City Hospital, Department of Pediatrics, İstanbul, Türkiye
[2]Güngören Hospital, Department of Pediatrics, İstanbul, Türkiye
[3]University of Health Science, Kartal Dr. Lütfi Kırdar City Hospital, Department of Pediatric Emergency, İstanbul, Türkiye

Cite this article as: Köle MT, Erkin G, Erden A, et al. Poisonings in childhood: A 5-year experience of a tertiary city hospital in İstanbul. Trends in Pediatrics 2023;4(1):47-54.

ABSTRACT

Objective: Poisoning is a substantial public health problem preventable with basic precautions. This study aims to contribute to the literature by analyzing the demographic variables, epidemiological characteristics, and prognosis of children brought to the pediatric emergency department of our center due to poisoning in the last five years.

Methods: We retrospectively evaluated the medical records of 1928 patients who were under-18 years old and admitted with acute intoxication diagnosis to our tertiary hospital's pediatric emergency department in Istanbul between 2016 and 2021. Patients were divided into two groups by poisoning factors: drug and non-drug substances.

Results: We included all 1928 patients (55.1% male, 44.9% female). The median age was 30 (20-49) months, and 85.5% (n=1650) of patients were under 72 months old. There was a male gender dominance (62.4%) among patients aged 3-6, all of whom had accidental poisoning (100%). Poisonings among patients older than 12years of age were more common in girls (59.8%) and were mainly suicidal attempts (65.2%). We detected drug exposure in 58.9% (n=1047) of patients; the most common drugs were analgesics (13.5%, n=269), psychotropics (6.2%, n=102), and hormone preparations (4.5%, n=86). We also detected non-drug exposure in 41.1% (n=792) of patients; the most common non-drug substances were corrosive-caustic substances (14.6%, n=284), and detergent poisonings (5.5%, n=106). None of the patients died.

Conclusion: Patients in the under 6 years old group admitted due to poisoning were predominantly male, and all cases were accidental. Whereas poisonings above the age of 12 were more common in girls and were usually due to suicide. Our study also showed that poisonings in children passed with milder symptoms, and we discharged most of the children after a short observation without the need for hospitalization. Well-balanced clinical management may prevent unnecessary hospitalization and unnecessary medical interventions.

Keywords: Children, poisoning, intoxication, emergency department, suicide

Correspondence: Mehmet Tolga Köle **E-mail:** mehmet_tolga@hotmail.com
Received: 07.11.2022 **Accepted:** 07.03.2023

INTRODUCTION

Although poisoning may result in mortality and morbidity, it is a substantial public health problem preventable with basic precautions.[1] It constitutes approximately 0.5-2% of the reasons for applying to emergency outpatient clinics in childhood.[2-4] For effective and rapid treatment, it will be helpful to have information about the common types of poisoning and their symptoms.[5]

Most poisonings are seen in children and adolescents. According to American Poison Control Center, 58% of the cases in the USA were under the age of 20.[6] Likewise, according to the National Poison Information Center report, approximately 60% of the admissions to emergency due to poisoningin Turkey are in children.[7] Studies have shown that poisoning is most common in children under the age of five.[5,8] According to the data of the Turkish Statistical Institute, injuries due to external factors and poisoning are responsible for 29.5% of the deaths in children under the age of 18 in Turkey.[9]

The causes and types of poisoning vary according to age, gender, season, socioeconomic status, and geographical region.[10] Even in the same province, the demographics and agents of poisoning can change over time.[5] Therefore, following these changes related to childhood poisonings will help physicians, and other healthcare professionals working in the emergency room to recognize poisoning cases without wasting time and manage treatment effectively. Early diagnosis and treatment play a crucial role in the clinical results of poisoning cases.[11]

Our study aims to contribute to the literature by retrospectively analyzing the causes, demographic variables, epidemiological characteristics, and prognoses of children brought to the pediatric emergency service of our center due to poisoning in the last five years.

MATERIAL AND METHODS

Permission for the study was obtained from the ethics committee of Istanbul Kartal Dr. Lütfi Kırdar City Hospital with the file number 2021/514/204/14. The study was carried out in accordance with the Declaration of Helsinki.

We retrospectively analyzed the medical records of 2368 patients who were under the age of 18 and admitted to the Pediatric Emergency Outpatient Clinic ofIstanbul Kartal Dr. Lütfi Kırdar City Hospital with poisoning between January 2016 and January 2021.

We excluded patients who were misdiagnosed or applied with the complaint of swallowing foreign objects like coins or toys. In addition, we could not reach some patients' data, so we included all eligible 1928 patients whose data was available in the study. Patient data werescanned from the hospital database and recorded in an Excel file.

We assessed patients by gender, age, the reason for exposure to poisoning (accidental or suicide), factor(s) causing poisoning, route of exposure to poisoning, place of poisoning, time of poisoning (hour, month, and day), hospital arrival time, treatment modality in pediatric emergency observation, duration of emergency department observation and pediatric emergency outcomes. The poisoning factors of the patients who applied for suicidal poisoning were also analyzed.

Patients who applied to the Pediatric Emergency Outpatient Clinic due to poisoning were divided into two groups according to the poisoning factors: drug and non-drug substances. After that, the patients were divided into subgroups according to the specific substances. In addition, we divided patients into different age groups and evaluated the causes of poisoning and its relationship with other variables according to age groups in our study.

Statistics

We presented the descriptive results with normal-distributed data as mean ± standard deviation and skewed data as median (interquartile range (IQR) 25/75). We used the One-way ANOVA test to compare more than two groups with normal distribution and homogenous variance and the Kruskal-Wallis test for non-normally distributed data. Tukey and Dwass-Steel-Critchlow-Fligner tests are used for pair-wise comparison, respectively. Type 1 error of <0.05 was considered statistically significant. We also built a binomial regression model with factors defined in the literature. We selected the predictors that may be statistically significant ($p<0.1$) by the "forward selection" method. Variance inflating factor test is used for collinearity assumption. We interpreted the R2 McFadden and the X2 value of likelihood ratio tests in the binomial regression model. Moreover, we presented binomial test results with an "estimated marginal means" table and a graph. We used the R-based statistical package program JAMOVI 2.2.5.

RESULTS

The number of patients admitted to the pediatric emergency department was approximately 660,000 in five years-period, and 0.35% (n=2368) of the admissions were due to poisoning.

We included 1928 patients (55.1% male, 44.9% female) in our study. The median age was 30 months (20-49 months). 85.5% (n=1650) of the patients were under 72 months. There was a male gender dominance (62.4%) among patients aged 3-6, all of whom had accidental poisoning (100%). As we divide patients into two groups by age (12 years), poisonings over the age of 12 were more common in girls (59.8%) and were mostly suicidal attempts (65.2%) (p<0.001, chi-square test). Drugs constituted 57.7% of poisonings in children younger than 12 years of age, while this rate was 75.8% for patients above 12 years of age (p<0.001, chi-square test).

As we evaluate the route of exposure to poisoning, 93.9% of the patients were poisoned orally, 1.9% by inhalation, 1.3% by skin, and 0.4% by the ocular route. The route of exposure was unavailable in the records of 2.5% of the patients. While 5% of the patients applied because of suicidal attempts, the rest (95%) were poisoned accidentally. While the most common place of

Table 1. Medication-related poisoning agents

	Accidental poisoning	Self-inflicted poisonings	Total n (%)	% of All Patients
Analgesics				
-Non-steroidal anti-inflammatory	152	1	153 (13.5)	8
-Paracetamol	92	5	97 (8.5)	5
-Other	18	1	19 (1.7)	0.5
Myorelaxants	25	2	27 (2.4)	1.4
Psychiatric drugs				
-Antidepressants	49	9	58 (5.1)	3
-Antipsychotic drugs	41	4	45 (4)	2.4
-Other	12	3	15 (1.3)	0.8
Neurological drugs				
-Anti epileptic drugs	24	2	26 (2.3)	1.4
-Other	10	0	10 (0.8)	0.5
Gastrointestinal drugs	56	4	60 (5.3)	3.1
Cardiovascular drugs				
-Antihypertensive drugs	65	2	67 (5.9)	3.5
-Other	8	0	8 (0.7)	0.4
Antihistamines	49	1	50 (4.4)	2.6
Antimicrobials	45	1	46 (4.1)	2.4
Cold medications	64	5	69 (6.1)	3.6
Antitussive and mucolytics	34	2	36 (3.2)	1.9
Hematological drugs	35	0	35 (3.1)	1.8
Hormone preparations	84	2	86 (7.5)	4.5
Vitamin derivatives	54	1	55 (4.8)	2.9
Antineoplastic drugs	5	0	5 (0.4)	0.3
Topical medications	50	0	50 (4.4)	2.7
Multiple drug intake	62	43	105 (9.3)	5.5
Unidentified drugs	13	1	14 (1.2)	0.7
Total	1047	89	1136 (100)	58.9

poisoning was at home (93.9%), 2.4% of poisonings occurred outside the home. We could not reach data for the remaining 3.7% of the patients.

Drugs were the common cause of poisoning (58.9%), however 41.1% (n=792) of the patient poisoned by non-drug substances. The factors causing poisoning are presented in Table 1. Analgesics and antipyretics constituted the largest group in drug poisonings. Non-steroidal anti-inflammatory drugs (NSAID) were the most common analgesic drugs (8%). The second most common poisoning agent was psychiatric drugs (6.2%) (antidepressants, antipsychotics, and sedative agents), followed by hormone preparations (4.5%). In addition, multi-drug use constituted 5.5% of the admissions (Table 1). In non-drug poisonings, corrosive-caustic substances accounted for 14.6% of all poisonings and 5.5% of detergent poisonings (Table 2).

Gastric lavage and activated carbonare major treatment approaches for poisoning in the pediatric age group. We administered activated carbon, gastric lavage, and specific antidotes to 21.8% (n=420),20% (n=386), and 1.6% (n=31) of the patients, respectively. 27 of these 31 patients had paracetamol intoxication, and N-acetylcysteine (NAC) was given as an antidote. Other patients were administered Flumanezil after benzodiazepine intoxication and atropine after organophosphate poisoning.

In Table 3, the patients were divided according to age groups and compared in terms of gender, type of poisoning agent, and hospital arrival time.

70.7% of the patients were discharged from the emergency room, 22.5% were hospitalized in the pediatric service, and 3.7% continued treatment in our pediatric intensive care unit. 1.8% of the patients did not accept the treatment and left the hospital, and 1.1% were referred to the pediatric surgery service. As we divided the age groups into two groups, more than 70% of the patients under 12 years of age were discharged from the emergency department, while this rate decreased to 49% over 12 years of age ($p<0.001$). In addition, while intensive care need was below 5% in children under 12 year-olds, this rate increased to 33.3% in children older than 12 ($p<0.001$). None of the patients died or had chronic sequelae in patients treated in our services. The mean hospital arrival time was 60 (30-105) minutes for all ages, and this time lap increased as the patient's age increased.

Table 2. Non-medication related poisoning agents

Substances	Frequency	Percent	% of All Patients
Caustic-corrosive substances	281	35.5	14.6
Mushrooms	5	0.6	0.3
Pesticides and insecticides	36	4.5	1.9
Hydrocarbons	26	3.3	1.4
Carbon monoxide and gas poisoning	24	3	1.2
Zoic	3	0.4	0.2
Herbal	24	3	1.2
Food poisoning	26	3.3	1.4
Mercury	5	0.6	0.3
Detergents	106	13.4	5.5
Alcohol	64	8.1	3.2
Antiseptic	20	2.5	1
Dye poisoning	13	1.6	0.7
Thinner	30	3.8	1.6
Narcotic	12	1.5	0.6
Cosmetic	39	5	2
Other non-drug substances	33	4.2	1.7
Unknown	45	5.7	2.3
Total	792	100	41.1

Table 3. Comparison of poisonings by age groups

		Age (month)					
		<12 n=95	**12-35 n=1028**	**36-71 n=527**	**72-143 n=146**	**>144 n=132**	**p**
Gender (%)	Female	49.5%	47.3%	37.6%	38.4%	59.8%	<0.001
	Male	50.5%	52.7%	62.4%	61.6%	40.2	
Drug/non-drug (%)	Drug	33.7%	54.7%	70.2%	49.3%	75.8 %	<0.001
	Non-drug	66.3%	45.3%	29.8%	50.7%	24.2%	
Poisoning time of day (%)	Night	22.1%	28.3%	32.4%	28.8%	38.9%	0.044
	Day-time	57.1%	52%	44.4%	55.9%	42.6%	
	Evening	20.8%	19.7%	23.1%	15.3%	18.5%	
Poisoning place (%)	Home	95.8%	96.7 %	82.6%	84.9%	86.4%	<0.001
	Outside	-	1.3%	1.5%	8.9%	9.1%	
	Unknown	4.2%	2%	5.9%	6.2%	4.5%	
Suicidal attempt (%)		%0	%0	%0	%7.5	%65.2	<0.001
Ending (%)	Discharged	72.6%	70.7%	74.6%	74.7%	49.2%	
	Ward	23.2%	22.5%	21.4%	16.4%	33.3%	
	NICU	1.1%	3.2%	2.5%	4.8%	13.6%	
	Referred	-	1.6%	0.4%	1.4%	1.5%	
	Unknown	3.2%	2%	1.1%	2.7%	2.3%	
Hospital arrival time (minute)		42.5 (20-60)	55 (30-90)	60 (30-120)	90 (45-240)	90 (50-180)	<0.001

*Chi-square test

Table 4. Estimated Marginal Means table for age (month) and gender

Gender	**Age (month)**	**Probability (%)**	**Lower CI (%)**	**UpperCI (%)**
Female	94.7 (-1 SD)	5.19	2.129	12.1
	134.3 (mean)	32.42	22.21	44.63
	173.8 (+1 SD)	80.79	70.931	87.88
Male	94.7 (-1 SD)	1.78	0.672	4.6
	134.3 (mean)	13.68	8.114	22.14
	173.8 (+1 SD)	58.15	43.932	71.13

*Estimated Marginal Means table of binomial regression model

Suicide attempts were usually performed with drugs (91.8%). It is noteworthy that "multiple drug intake" (48.3%) ranked first. Psychiatric drugs (18%) and analgesics and pain relievers (7.9%) ranked first and second in "single drug poisoning", respectively in single-drug poisonings took second order.

We did not observe any suicide attempts before 72 months, so we considered patients over 72 months as a separate group for interpreting the suicidal attempts and subjected the gender and age to multivariate analysis as these are possible risk factors for suicide attempts according to the literature (Table 4).[4] The predictors affecting the likelihood of admission due to a suicidal attempt were gender (female odds: 3.03; p=0.001) and age (odds ratio: 1.06 per month; p<0.001).

DISCUSSION

Poisoning is one of the most common but preventable causes of emergency admission in childhood.[12] Our study is a retrospective study in a tertiary hospital in Istanbul, including five years

of data, and very comprehensive in terms of the number of cases. In this study, we analyzed the patients who applied to the pediatric emergency outpatient clinic due to poisoning and aimed to update existing information, determine preventive measures accordingly, and plan treatment management quickly and effectively.

In our study, the number of patients who applied to our pediatric emergency outpatient clinic due to poisoning constituted 0.35% of the total admissions. This rate was reported between 0.5% and 0.7% in recent studies conducted in Turkey.[13-15] In a study conducted in our clinic between 2010 and 2011, this rate was 1.01% .[16] We can attribute this change to the increased patient admissions to the emergency department for reasons other than poisoning. At the same time, raising public awareness of poisonings reduces this rate. In addition, in recent years, research by pharmaceutical companies in Turkey regarding the safety caps have been aimed at this purpose.

In our study, 85.5% (n=1650) of the patients admitted with poisoning were under 72 months of age, which is consistent with the literature.[3,12,17] Similar to our study, studies have emphasized that the male gender was predominant, and the cause of poisoning was mostly accidental in poisonings under 12 years of age.In contrast, poisonings above 12 years of age were more common in females and were usually due to suicide.[3,4,14] The 2019 data of the American Poison Control Center, which includes the data of approximately 2.5 million patients published in 2020 by Gummin et al.[6], showed parallel results with our study on age and gender. The incidence of poisoning cases under the age of 6 was high because children in this age group are more curious due to their attitudes toward exploring the environment.[2,18]

In addition, we took the cases over the age of 6 as a separate group and subjected the gender and age, which are possible risk factors for suicide, to multivariate analysis.[4]This binomial model (suicide or accidental poisoning) calculated that each monthly increase in patient age increased the suicide odds by 1.006 times (or 0.6 %). Additionally, the female gender increased the suicide odds by 3.03 times. Lin et al.[4] reported 10.5 years of age as the cut-off value for suicide. In the study that included 10 years of data conducted by Kline et al.[19], it was shown that the likelihood of suicide increased as age increased and it was mostly seen in girls. In this study, it was emphasized that education and health policies should be developed for high school-age children in order to reduce the suicidal tendency in adolescents.[19] Clinicians should investigate the possibility of suicide in older girls who come to pediatric emergency outpatient clinics with suspicion of poisoning, plan emergency management by considering suicidal attempts, and refer these patients to child psychiatrists in addition to clinical treatment.

Consistent with studies, the majority of our patients were poisoned by ingestion.[2,6,20] In parallel with the literature, we observed that 93.9% of poisonings occurred at home.[2,6,14] This result is not surprising we knowing that 85.5% of our patients admitted with poisonings were under 72 months, most of the potential poisoning agents were reached at home, and the behavior of putting small foreign objects into the mouth was more common in this age group.

In our study, intoxications with drugs (58.9%) were higher than non-drug agents (41.1%), consistent with other studies.[16,17,21,22] The causes of poisoning vary according to socioeconomic status and geographical region.[10] Analgesics and antipyretics constituted the largest group in drug poisoning in our study. NSAIDs were the most common analgesic drugs. The second most common poisoning agent was psychiatric drugs (6.2%), followed by hormone preparations (4.5%). Multiple drug intake accounted for 5.5% of the admissions. In the study conducted in our hospital in 2011 by Dündar et al.[16], Central Nervous System drugs (psychiatric drugs, anti-epileptic) constituted the majority of drug poisoning, while analgesic and antipyretic drugs were the second most common. Thus, we can attribute this change over the years to the obligatory prescription of most CNS drugs, the easy accessibility of analgesic-antipyretic drugs, and the inappropriate use of drugs. In many studies, analgesics and antipyretics were the most common factors in medication-related poisoning.[2,17,23,24] In our study, the most common cause of non-pharmaceutical poisoning was corrosive-caustic substances, in line with the recent studies conducted in Turkey.[3,25] In the second place, poisoning with detergents came forth. Esophageal injury should be considered after poisoning with corrosive-caustic substances.[5]

Suicidal drug intake constituted 5% of total poisonings and 10.1% of drug-related poisonings. In a study conducted in our hospital in 2011, this rate was 12.4% in drug-related poisonings.[16] In suicidal attempts, multiple drug intake draws attention in the literature similar to our study.[5,10] In our patient group, psychiatric drugs were ranked first in single-drug poisonings.

The time elapsed between poisoning and the patient's admission to the emergency department is crucial for the management and prognosis of the treatment. In a 3-year study conducted in Qatar, Ahmed et al.[17] reported that admission to the emergency department was less than one hour in 255 of the poisoning cases. According to studies conducted in our country, admission to the emergency department was 60 minutes at the utmost.[10,14] In our patient group, the time until arriving at the emergency department after poisoning was 60 (30-105) minutes, and it was noteworthy that this time increased as the patient's age increased. We think that the increase in the suicide rate with

age in children causes a prolongation of the time to apply to the emergency department after the poisoning in older children. In addition, the fact that our hospital has many transportation opportunities and its central location has enabled patients to reach the hospital quickly.

In our study, 21.8% of the cases were treated with activated carbon, 20% with gastric lavage, and 1.6% with the specific antidote. NAC was administered as an antidote to 27 patients with paracetamol poisoning. A study from Turkey reported that they applied gastric lavage in 24.5%, activated carbon in 30.9%, and specific antidote in 2% of the cases (more than half were NAC).[14] In a study conducted in Singapore, 3.5% of the patients who applied to the emergency department after poisoning were treated with gastric lavage, 25% activated carbon, and 7.7% antidote (mostly NAC).[2] The use of activated carbon and gastric lavage in children depends on the poisoning agent and the time elapsed between poisoning and the patient's admission to the emergency department.[26]

We evaluated the need for hospitalization in the service and intensive care unit retrospectively to assess the clinical status of patients presenting with poisoning. In our study, 70.7% of the patients were discharged from the emergency room, 22.5% were hospitalized in the pediatric health and diseases service, and 3.7% were admitted to the pediatric intensive care unit for further treatment and follow-up. In the study published by Lee et al.[5] in 2019, it was reported that 17.2% of the patients who applied to the emergency outpatient clinics due to poisoning were followed-up in the pediatric health and diseases service, and 3.6% in the pediatric intensive care unit. In a study published in Iran in 2013, 5.8% of patients who applied to emergency outpatient clinics with poisoning needed pediatric intensive care services.[27] In a study similar to ours and containing 3-year data in Italy, most patients were hospitalized in the pediatric intensive care unit for follow-up of vital functions.[26] We did not observe any death due to poisoning in our patient group, which is compatible with studies in children.[2,3,26,28] Since most of the poisonings in children are accidental, the mortality rate is lower than that of the adult patient group.[26] In the study conducted by Akin et al.[20] in our clinic between 2005 and 2007, 2 patients died due to poisoning. We think raising awareness of poisoning in the community and minimizing the duration of admission to the emergency department are critical subjects to prevent death due to poisoning. Compared to other studies conducted in our clinic, this period was shorter in our study.[16,20] The increase in transportation opportunities to our hospital over time is also an important factor in this.

The main limitation of the study was that it was retrospective. We recorded the patient data by accessing the hospital information system and files. Nevertheless, in our retrospective single-center study conducted in a tertiary hospital, we could not reach all of the medical practices performed in previous health units. However, the number of patients and the scope of the data are the strengths of our study.In addition, studies on poisoning in children in previous years in our center demonstrated the change in the same region over the years, which provided the opportunity to compare the data.

CONCLUSION

As a result, admissions due to poisoning under the age of 6 were predominantly male, and all were accidental. Whereas poisonings above the age of 12 were seen mostly in girls and were generally due to suicide. Our study also showed that poisonings in children passed with milder symptoms, and most of the children were discharged after a short observation without theneed for hospitalization. A well-balanced clinical management may prevent unnecessary hospitalization and unnecessary medical interventions. Suicide and self-harm in adolescents have been increasingly significant health problems in recent years. A poison counseling center establishment for only pediatric patients may enable us to reveal the causes of poisoning in children of different age groups and take more effective measures.

Ethical approval

This study has been approved by the İstanbul Kartal Dr. Lütfi Kırdar City Hospital Clinical Research Ethics Committee (approval date 22/06/2021, number 2021/514/204/14).

Author contribution

Surgical and Medical Practices: MTK, GE, AE, SM, İK, FHE, YÇ, YA; Concept: MTK, GE, AE, SM, İK, KP, HG, YÇ, YA; Design: MTK, AE, SM, İK, KP, HG, FHE, YÇ, YA; Data Collection or Processing: MTK, GE, SM, İK, KP, HG, FHE, YÇ, YA; Analysis or Interpretation: MTK, GE, AE, SM, İK, KP, HG, FHE, YÇ, YA; Literature Search: MTK, AE, İK, YÇ, YA; Writing: MTK, GE, SM, İK, KP, HG, FHE, YÇ, YA. All authors reviewed the results and approved the final version of the article.

Source of funding

The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest.

REFERENCES

1. Zhang Y, Yu B, Wang N, Li T. Acute poisoning in Shenyang, China: a retrospective and descriptive study from 2012 to 2016. BMJ Open. 2018;8:e021881. [Crossref]
2. Koh SH, Tan KHB, Ganapathy S. Epidemiology of paediatric poisoning presenting to a children's emergency department in Singapore over a five-year period. Singapore Med J. 2018;59:247-50. [Crossref]
3. Sahin S, Carman KB, Dinleyici EC. Acute poisoning in children; data of a pediatric emergency unit. Iran J Pediatr. 2011;21:479-84.
4. Lin YR, Liu TH, Liu TA, Chang YJ, Chou CC, Wu HP. Pharmaceutical poisoning exposure and outcome analysis in children admitted to the pediatric emergency department. Pediatr Neonatol. 2011;52:11-7. [Crossref]
5. Lee J, Fan NC, Yao TC, et al. Clinical spectrum of acute poisoning in children admitted to the pediatric emergency department. Pediatr Neonatol. 2019;60:59-67. [Crossref]
6. Gummin DD, Mowry JB, Beuhler MC, et al. 2019 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 37th Annual Report. Clin Toxicol (Phila). 2020;58:1360-541. [Crossref]
7. Özcan N, İkincioğulları D. Ulusal zehir danışma merkezi 2008 yılı çalışma raporu özeti. Turk Hij Den Biyol Derg. 2009;66(Supp: ER-3):29-58.
8. Günay A, Uğurlu Z, Ceylan A, Ayten N. A retrospective investigation of poisoning cases presented to the pediatric emergency department of Başkent university Ankara hospital between 2012 and 2017. J Pediatr Emerg Intensive Care Med. 2019:6;13-7. [Crossref]
9. Turkish Statistical Institute. İstatistiklerle Çocuk, 2015. Available at: https://data.tuik.gov.tr/Bulten/Index?p=Istatistiklerle-Cocuk-2015-21521
10. Halhalli HC, Uslu T. Evaluation of Pediatric Patients Admitted to the Emergency Department Due to Drug Intoxication. Cureus. 2021;13:e13366. [Crossref]
11. Soori H. Developmental risk factors for unintentional childhood poisoning. Saudi Med J. 2001;22:227-30.
12. Gheshlaghi F, Piri-Ardakani MR, Yaraghi M, Shafiei F, Behjati M. Acute poisoning in children; a population study in Isfahan, Iran, 2008-2010. Iran J Pediatr. 2013;23:189-93.
13. Akgül F, Er A, Çelik FÇ, et al. Retrospective analysis of childhood poisoning. J Pediatr Emerg Intensive Care Med. 2016;3:91-6. [Crossref]
14. Gokalp G. Evaluation of poisoning cases admitted to pediatric emergency department. Int J Pediatr Adolesc Med. 2019;6:109-14. [Crossref]
15. Bozlu G, Kuyucu N. Çocuk Acil Servise Son 5 Yılda Gelen Zehirlenmeler: 1734 Olgunun Değerlendirilmesi. Adli Tıp Bülteni. 2018;23:106-9. [Crossref]
16. Dündar I, Akın Y, Yücel M, Yaykıran D. Çocuk Acil Servisine İlaç Entoksikasyonu Nedeni ile Başvurmuş Olan Çocuk ve Ergen Olguların Değerlendirilmesi. J Pediatr Emerg Intensive Care Med. 2021;8:140-5. [Crossref]
17. Ahmed A, AlJamal AN, Mohamed Ibrahim MI, et al. Poisoning emergency visits among children: a 3-year retrospective study in Qatar. BMC Pediatr. 2015;15:104. [Crossref]
18. Öztoprak Ü, Energin VM. Çocuk Acil Servisine Zehirlenme Nedeniyle Başvuran Olguların Değerlendirilmesi. J Contemp Med. 2019;10:585-90. [Crossref]
19. Kline JN, Badolato GM, Goyal MK. Trends in Pediatric Poisoning-Related Emergency Department Visits: 2001-2011. Pediatr Emerg Care. 2021;37:e7-12. [Crossref]
20. Akin Y, Ağzikuru T, Cömert S, Atilkan P, Erdağ GC, Telatar B. Hospitalizations for pediatric intoxication: a study from Istanbul. Turk J Pediatr. 2011;53:369-74.
21. Ramos CLJ, Barros HMT, Stein AT, Costa JSD da. Risk factors contributing to childhood poisoning. J Pediatr (Rio J). 2010;86:435-40. [Crossref]
22. Karacı M, Yıldız N, Metin Ö, Özçetin M. A Retrospective Study of Childhood Intoxication in the Zonguldak Region. Eurasian J Emerg Med. 2013;12:145-9. [Crossref]
23. Yehya A, Albals D, Issa R, Fawadleh A. Retrospective assessment of acute poisoning incidents by pharmaceutical agents in Jordan: Data from Pharmacy One™ Poison Call Center, 2014 to 2018-Part II. Pharmacol Res Perspect. 2020;8:e00583. [Crossref]
24. Demirgan EB, Erol M, Demirgan S, Yiğit Ö, Türkay M. Çocuk acil polikliniğine başvuran ilaç ile zehirlenme olgularının retrospektif değerlendirilmesi. Okmeydanı Tıp Dergisi. 2014;30:128-34. [Crossref]
25. Tıplamaz S, Kırkpınar E, İnanıcı MA. Acute poisoning in children; Evaluation of cases admitted to Marmara University Hospital in 2015. Marmara Medical Journal. 2018;31:120-5. [Crossref]
26. Marano M, Rossi F, Ravà L, et al. Acute toxic exposures in children: analysis of a three year registry managed by a Pediatric poison control Center in Italy. Ital J Pediatr. 2021;47:125. [Crossref]
27. Haghighat M, Moravej H, Moatamedi M. Epidemiology of Pediatric Acute Poisoning in Southern Iran: A Hospital-Based Study. Bull Emerg Trauma. 2013;1:28-33.
28. Friedman N, Shoshani-Levy M, Brent J, et al. Fatalities in poisoned patients managed by medical toxicologists. Clin Toxicol (Phila). 2020;58:688-91. [Crossref]