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ORIGINAL ARTICLE

Demographic Characteristics and Etiological Distributions of Poisoning Cases Admitted to Pediatric Emergency Clinic: A Retrospective Cross-Sectional Study

Çocuk Acil Kliniğine Başvuran Zehirlenme Vakalarının Demografik Özellikleri ve Etiyolojik Dağılımları: Retrospektif Kesitsel Çalışma

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ABSTRACT

Aim: Poisoning, defined as exposure to harmful substances leading to organ dysfunction, is a prevalent global health concern, particularly affecting children under the age of five. Understanding the demographics and etiological distributions of poisoning cases is crucial for effective diagnosis. We aimed to ascertain the demographic characteristics and etiological distributions of individuals presenting to the pediatric emergency due to acute poisoning.
Methods: This retrospective study evaluated the clinical data of patients aged 0-18 years admitted to the Pediatric Emergency Clinic at Konya Beyhekim Training and Research Hospital for poisoning between January 1st, 2023, and September 15th, 2024.
Results: Among the patients, 229 (88.4%) were asymptomatic, while 30 (11.6%) exhibited one or more symptoms (Median age: 3.9 years, interquartile range: 12 years). In cases of accidental poisoning, the most frequently ingested substances were caustic or corrosive agents (55 cases, 25.7%) and analgesic-antipyretic medications (36 cases, 16.8%). Gender-based comparisons revealed that the frequency of poisoning due to pharmacological agents was significantly higher in females (odds ratio [OR]: 2.837, 95% CI: 1.682-4.785, p<0.0001). Among the age groups, those aged 2-6 years showed a significantly higher prevalence of pharmacotoxic poisonings compared to other groups (p < 0.0001). Seasonal analysis indicated that summer had the highest occurrence of significant increases in cases (60 out of 162, 37%). Pharmacological agents, notably analgesics, were more frequently involved in poisonings, with a higher prevalence in females and preschool children. In contrast, non-pharmacological poisoning cases were more common in males and infants, particularly attributed to caustic substances.
Conclusions: This study highlights the significant prevalence of acute poisoning among children, particularly in preschool-aged individuals, with a notable increase in cases during the summer months. The majority of poisoning incidents were accidental and predominantly involved pharmacological agents, especially analgesics and antipyretics, while intentional poisonings were more common among female adolescents.

Keywords: Analgesic, child, infant, poisoning, season

ÖZ

Arka Plan/Amaçlar: Zehirlenme, zararlı maddelere maruz kalmanın organ disfonksiyonuna yol açması olarak tanımlanmakta olup, özellikle beş yaş altındaki çocukları etkileyen yaygın bir küresel sağlık sorunudur. Zehirlenme vakalarının demografik özelliklerini ve etiyolojik dağılımlarını anlamak, etkili tanı ve önleme stratejileri için kritik öneme sahiptir. Bu çalışmanın amacı, akut zehirlenme nedeniyle pediatrik acil servise başvuran bireylerin demografik özelliklerini ve etiyolojik dağılımlarını belirlemektir.
Yöntemler: Bu retrospektif çalışma, 1 Ocak 2023 ile 15 Eylül 2024 tarihleri arasında Konya Beyhekim Eğitim ve Araştırma Hastanesi Pediatrik Acil Kliniği'ne zehirlenme nedeniyle başvuran 0-18 yaş arası hastaların klinik verilerini değerlendirmiştir.
Bulgular: Hastaların medyan yaşı 3,9 yıl olup, interkuartil aralığı 12 yıldır. Hastaların %88,4'ü asemptomatik, %11,6'sı ise bir veya daha fazla belirti göstermiştir. Kazara zehirlenme vakalarında en sık alınan maddeler koroziv veya kostik ajanlar (55 vaka, %25,7) ve analjezik-antipiretik ilaçlar (36 vaka, %16,8) olmuştur. Cinsiyete dayalı karşılaştırmalar, farmakolojik ajanlardan kaynaklanan zehirlenme sıklığının kızlarda önemli ölçüde daha yüksek olduğunu ortaya koymuştur (Odds oranı [OR]: 2,837, %95 Güven Aralığı: 1.682-4.785, p <0.0001). Yaş grupları arasında, 2-6 yaş arası çocukların diğer gruplara kıyasla farmakotoksik zehirlenmelere maruz kalma sıklığı daha yüksektir (p <0.0001). Mevsimsel analiz, yaz aylarında vakalarda belirgin bir artış olduğunu göstermektedir (162 vaka arasından 60, %37). Farmakolojik ajanlar, özellikle analjezikler, zehirlenmelerde daha sık yer almakta olup, bu durum kız çocukları ve okul öncesi çocuklarda daha yaygındır. Farmakolojik olmayan zehirlenmeler ise erkek çocuklar ve bebeklerde daha sık görülmüş, bu vakalar özellikle kostik maddelere bağlı olarak tanımlanmıştır.
Sonuçlar: Bu çalışma, çocuklar arasında akut zehirlenmenin yüksek prevalansını, özellikle okul öncesi yaş grubunda ve yaz aylarında vaka sayısındaki belirgin artışı vurgulamaktadır. Zehirlenme olaylarının çoğu kazara gerçekleşmiş olup, genellikle analjezik ve antipiretik gibi farmakolojik ajanlarla ilişkilendirilmiştir; bunlara ek olarak, kasıtlı zehirlenmelerin kız ergenler arasında daha yaygın olduğu gözlemlenmiştir.

Anahtar Kelimeler: Analjezik, bebek, çocuk, mevsim, zehirlenme

Introduction

Poisoning is generally defined as exposure to a substance resulting in signs and symptoms of organ dysfunction (1). Acute poisoning is notably prevalent in children, presenting within 24-hour exposure, and remains a significant global health issue. It is among the leading causes of pediatric emergency department

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visits, contributing to both morbidity and mortality. The majority of these cases occur in children under the age of five (2).

In Türkiye, poisoning accounts for approximately 0.7-5% of pediatric emergency admissions (3). Such incidents often arise from the ingestion of medications and chemical substances. Notably, accidental poisoning is more frequently reported in early childhood, whereas intentional poisoning, typically associated with suicidal behaviors, is more common among adolescents. Education plays a vital role in preventing accidental poisonings (4).

The etiology of poisoning varies by country and across different socio-economic regions within the same nation. Understanding the types, characteristics, and severity of poisonings in specific areas is crucial for diagnosis, treatment, and the implementation of preventive measures (1). Previous studies have evaluated poisoning cases in pediatric emergency departments in Konya, identifying drug-related toxicity as the most common causal factor (5). Another study highlighted corrosive agents, followed by medications, as the primary types of poisonings observed (6). Our study aims to ascertain the demographic characteristics and etiological distributions of individuals presenting to the pediatric emergency department due to acute poisoning.

Materials And Methods

The study design was approved by the Karatay University Ethics Committee under approval number 2024/006, dated 31/10/2024. This retrospective study evaluated the clinical data of patients aged 0 to 18 years admitted to the Pediatric Emergency Clinic at Konya Beyhekim Training and Research Hospital for poisoning between January 1st, 2023, and September 15th, 2024. Inclusion criteria were based on a diagnosis of poisoning and the availability of complete clinical records, while patients with no prior history of poisoning or incomplete documentation were excluded.

Data were extracted from the automated information system of the hospital and included variables such as admission dates, demographic details, clinical signs and symptoms, clinical progression, treatment methods, and particulars regarding the nature of the poisoning and exposure circumstances. Cases of poisoning were classified into three distinct categories: pharmacological agents, non-pharmacological agents, and other substances as reported in a previous study (6). Additionally, patients were organized into four age groups: 0-2 years (infants), >2-6 years (preschool children), >6-12 years (school-aged children), and >12-18 years (adolescents). The resulting findings were subsequently analyzed by gender, age group, month, and season of admission.

Statistical Analysis

Numerical data were presented as counts and percentages. The Shapiro-Wilk and Kolmogorov-Smirnov tests were employed to assess the normality of distribution. Given that the parametric data did not conform to a normal distribution, they were expressed as median values with interquartile ranges [IQR]. Comparisons of non-normally distributed data were performed using the Mann-Whitney U test. The chi-square test was applied for binary comparisons of categorical data. A p-value of less than 0.05 was considered statistically significant. Statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS), version 21.0 for the Windows software (IBM Corp., Armonk, NY, USA).

Results

Throughout the study period, 259 patients presented to the pediatric emergency clinic with a diagnosis of poisoning. Among these patients, 127 (49%) were male and 132 (51%) were female, resulting in a female-to-male ratio of 1.04:1. The overall median age of the patients was 3.9 years, with an IQR of 12 years, and ages varied from 0.6 to 17.9 years. For males, the median age was recorded at 3.2 years (IQR: 3.9 years; minimum-maximum: 0.6-17.9 years), whereas females had a higher median age of 5.5 years (IQR: 13.05 years; minimum-maximum: 1.1-17.9 years). The comparison of median ages between genders demonstrated a statistically significant difference, with females being older on average ($p<0.0001$). When categorized by age groups, there were 66 patients (25.5%) aged 0-2 years, 101 patients (39%) aged over two to under six years, 19 patients (7.3%) aged 6-12 years, and 73 patients (28.2%) aged over 12 to under 18 years. Monthly analysis revealed that presentations included 24 patients (9.3%) in January, 13 (5%) in February, 19 (7.3%) in March, 22 (8.5%) in April, 33 (12.7%) in May, 29 (11.2%) in June, 41 (15.8%) in July, 25 (9.7%) in August, nine (3.5%) in September, 10 (3.9%) in October, 10 (3.9%) in November, and 24 (9.3%) in December.

The seasonal distribution of poisoning cases revealed that the majority of presentations occurred during the summer months, with 97 cases (37.5%), followed by spring with 76 cases (29.3%), winter with 60 cases

(23.2%), and autumn with 26 cases (10%). Among the patients, 229 (88.4%) were asymptomatic, while 30 (11.6%) exhibited one or more symptoms. Specific symptoms recorded included abdominal pain in eight patients, nausea or vomiting in 21, difficulty swallowing in two, altered consciousness in seven, dizziness in seven, cramps in one, cough in one, palpitations in three, and coexisting psychiatric disorders in 13 patients. Notably, among those with psychiatric disorders, 11 (84.6%) were female and two (15.4%) were male, all within the 12-18 age group. The median time to hospital presentation following poisoning was 56 minutes (IQR, 60 minutes; range 7-593 minutes). When examining the hours of admission for children with poisoning to the pediatric emergency department, it was found that 113 cases (43.6%) occurred between 08:00 am and 04:00 pm, 121 cases (46.7%) occurred between 04:00 pm and 00:00, and 25 cases (9.7%) occurred between 00:00 and 08:00 am.

Regarding the classification of poisoning cases, 45 (17.4%) were identified as intentional, while 214 (82.6%) were categorized as accidental. Gender analysis indicated a significantly higher incidence of intentional poisoning among females (odds ratio [OR]: 5.793, 95% confidence interval [CI]: 2.576-13.028, p<0.0001). Furthermore, the age group of 12 to 18 years exhibited a significantly elevated rate of intentional poisoning compared to other age groups (p<0.0001). Among accidental poisoning cases, 66 patients (30.8%) were aged 0-2 years, 101 (47.2%) were aged over two to under six years, 18 (8.4%) were aged 6-12 years, and 29 (13.6%) were aged between over 12 and under 18 years. When examining gender distribution, one male patient (12.5%) with intentional poisoning was in the 6-12 age group, while seven (87.5%) were in the 12-18 age group. All 37 female patients with intentional poisoning were also in the 12-18 age group. Of the 45 cases of intentional poisoning, one (2.2%) was in the 6-12 age group and 44 (97.8%) were in the 12-18 age group, with no cases identified in those under 6 years of age. A significant difference was observed between age groups regarding intentional poisoning (p<0.0001).

In cases of accidental poisoning, the most frequently ingested substances were caustic or corrosive agents (55 cases, 25.7%) and analgesic-antipyretic medications (36 cases, 16.8%). In contrast, among patients with intentional poisoning, all but two cases were related to medication ingestion, with the most common cause being the intake of multiple medications (17 cases, 37.8%).

Among the total patient population, vital risk was identified in 144 (55.6%) patients, and forensic reports were prepared for 253 (97.7%) patients. Analysis of causative agents revealed that 162 cases (62.5%) involved pharmacological substances, 78 (30.1%) involved non-pharmacological agents, and 19 (7.3%) were attributable to other causes (Table 1). In gender-based comparisons, the frequency of poisoning due to pharmacological agents was significantly higher in females (OR: 2.837, 95% CI: 1.682-4.785, p<0.0001). Among the age groups, those aged >2-6 years showed a significantly higher prevalence of pharmacological poisonings compared to other groups (p<0.0001). In terms of specific pharmacological agents, incidents were most frequently associated with analgesic-antipyretics, polypharmacy, antipsychotics, and antidepressants. Monthly analysis indicated that July had the highest number of pharmacological poisonings (23/162, 14.2%). Seasonal analysis showed that summer contained the highest occurrences of pharmacological poisonings (60/162, 37%). However, no significant seasonal difference in pharmacological poisoning rates was identified (p>0.05).

Table 1. Distribution of poisoning agents

Pharmacological factors	**n**	**%**
Analgesics-Antipyretics	40	15.4
Multiple Drug Intake	25	9.7
Antipsychotics	18	6.9
Antidepressants	16	6.2
Vitamins	10	3.9
Gastrointestinal Drugs	10	3.9
Hormonal Preparations	8	3.1
Asthma Medications	6	2.3
Antihistamines	4	1.5
Antiarrhythmics	3	1.2
Iron Supplements	3	1.2
Antibiotic	3	1.2
Antivirals	2	0.8
Psychostimulant	2	0.8
Anticholinergics	2	0.8
Oral Antidiabetics	2	0.8
Zinc	1	0.4
Antiparkinsonian Medications	1	0.4
Colchicine	1	0.4
Myasthenia Gravis Medication	1	0.4
Aspirin	1	0.4
Antiepileptic	1	0.4
Muscle Relaxants	1	0.4
Antihypertensives	1	0.4
Non-Pharmacological Factors		

Caustic/Corrosive Substances	56	21.6
Hydrocarbons	7	2.7
Alcohols (Ethanol/Methanol)	4	1.6
Insecticides	2	0.8
Carbon Monoxide	2	0.8
Detergents	1	0.4
Antifreeze	1	0.4
Mercury	1	0.4
Naphthalene	1	0.4
Organophosphates	1	0.4
Thinners	2	0.8
Others	**19**	**7.3**
Total	**259**	**100**

In terms of gender comparison, instances of poisoning due to non-pharmacological agents were found to be significantly higher in males (OR: 0.352, 95% CI: 0.209-0.594, p<0.0001). When analyzed by age groups, the frequency of poisoning from non-pharmacological sources was significantly elevated in the under 2 years category (39/97, 40.2%) compared to other age groups (p<0.0001).

The most frequently identified non-pharmacological agents contributing to poisoning included caustic/corrosive substances, hydrocarbons, alcohol, and insecticides. Monthly data indicated that the highest frequency of non-pharmacological poisoning occurred in July (18/78, 23%). Seasonal analysis further revealed that summer showed the peak occurrence of non-pharmacological poisonings (37/78, 47.4%), although no statistically significant seasonal differences were found (p>0.05). Specifically, poisoning cases related to caustic/corrosive substances were most commonly reported in July (10/56, 17.9%) and were predominantly observed during the summer season (22/56, 39.3%).

Among all patients, a toxicology consultation was sought for 251 individuals (96.9%). Additionally, 85 patients (32.8%) underwent gastric lavage, while 98 patients (37.8%) received activated charcoal treatment.

Discussion

The findings from our study reveal that the majority of patients presenting with poisoning diagnoses were preschool children, with a notable increase in cases occurring in July during the summer months. Accidentally caused poisonings were identified as the most prevalent reason for these presentations. Furthermore, instances of intentional poisoning were found to be significantly higher among females and adolescents. Our analysis indicated that poisonings related to pharmacological agents occurred at a rate twofold higher than those associated with non-pharmacological substances. Notably, poisonings due to pharmacological agents were particularly elevated in preschool children and females. Within this category, analgesic and antipyretic medications emerged as the leading drugs. In contrast, non-pharmacological poisonings were notably higher in males and infants, with caustic and corrosive substances being the primary responsible agents. These insights underscore the need for targeted prevention strategies and educational efforts aimed at reducing the frequency of poisoning in vulnerable populations, particularly during the summer months.

The literature on the gender distribution of children presenting to emergency departments for poisoning reveals notable variability. A study in India identified a male-to-female ratio of 1.32:1 among pediatric poisoning cases (7). In contrast, a more recent report from the same region found a balanced ratio between females to males (8). An earlier investigation in Türkiye documented a male-to-female ratio of 1.39 (9), whereas another study from Türkiye noted comparable rates between genders (10). Additionally, a previous study in Konya found a ratio of 1.3 (5). Our findings show a gender distribution in poisoning cases aligning closely with these studies, suggesting that the proportions of males and females presenting to emergency departments are relatively equal. This consistency across different geographical contexts implies that while cultural and socio-demographic factors might shape the patterns of pediatric poisoning, they do not seem to significantly affect gender representation in emergency cases. Furthermore, a study conducted in India indicated that the average age of poisoned children was significantly higher in females compared to males (11). In line with this observation, our research similarly found that male patients were significantly younger than their female counterparts. These results underscore the importance of considering both age and gender in the assessment of children presenting with poisoning, as these factors may play a crucial role in understanding the epidemiology of such incidents.

Previous studies have demonstrated that most children presenting to emergency departments for poisoning do so within a few hours of exposure. For instance, Lee et al. (12) indicated that a significant proportion of pediatric patients arrived at the pediatric emergency department shortly after ingestion. Similarly, Dağ et al. (13) found that nearly two-thirds of poisoning cases

were reported within the first-hour post-exposure. The average time from poisoning to presentation was reported as 89 minutes in a study conducted by Yorulmaz et al. (5), with a range of 5 to 600 minutes. In our study, the time interval ranged from a minimum of 5 minutes to a maximum of 593 minutes, with a median of 56 minutes, aligning closely with findings from prior research. In the same study (5), the timing of pediatric emergency department visits due to poisoning was analyzed, revealing that 35.1% of cases occurred during daytime hours, while 52.6% occurred in the evening and 12.3% at night. Our findings align closely with this earlier work; we observed that 43.6% of presentations took place during the day, 46.7% in the evening, and 9.7% at night.

As established in earlier investigations, children may exhibit a range of symptoms after poisoning, although some may present asymptomatically. In a previous study conducted in Konya, it was noted that one-third of poisoned children exhibited no symptoms (5). The most common symptoms identified in that study were nausea and vomiting. Conversely, a recent analysis revealed that among poisoned children, 73.8% were asymptomatic, while symptomatic cases predominantly displayed gastrointestinal symptoms (13). In our findings, 88.4% of the poisoned children were asymptomatic, with only 8.1% exhibiting symptoms such as nausea and vomiting.

Accidental poisoning remains the most prevalent form of toxicity in children, particularly among those aged 5 months to 12 years, during which they display increased oral exploration and a limited grasp of potential dangers. This age group, especially infants and toddlers, is particularly at risk due to their developmental stage and susceptibility to toxic substances, often attracted by appealing packaging and enticing flavors. While the highest rates of accidental poisoning occur in children under 5, intentional poisoning incidents tend to rise during adolescence. Contributing factors include inadequate supervision and negligent behaviors exhibited by older family members (14). A study conducted in China analyzing the age distribution of 1,755 children with acute poisoning found that 34.6% were in early childhood and 37.3% were of preschool age (15). In Brazil, a study revealed that 48.7% of children presenting with poisoning were in the 1-4 age group, indicating a notable prevalence of incidents within this demographic (16). An Italian study by Berta et al. (17) identified that 72.9% of poisoning cases occurred in children aged 1-4 years. Additionally, Sahin et al. reported that 65.2% of children presenting with poisoning were younger than five (18). Our findings are in line with this literature, as we found that 64.5% of the reported poisoning cases involved children aged under 6, all of which were classified as accidental incidents. This evidence highlights the critical need for preventative measures across various age groups to mitigate the risks associated with pediatric poisoning.

Seasonality and monthly variations in pediatric emergency visits due to poisoning have also been documented in previous studies. In China, it was noted that poisonings predominantly occurred in the spring, suggesting that regional seasonal differences may influence incidence rates (15). A study in Egypt indicated that the summer and spring months recorded the highest incidence of pediatric poisonings (19). Furthermore, Sahin et al. found that poisoning cases peaked in January during the winter months (18). In a study conducted in Konya, the majority of pediatric poisonings were observed in the summer and spring (5). Moreover, previous research from Konya highlighted that non-pharmacological corrosive substances were mainly associated with poisonings in the spring and autumn (6). In our study, the most significant number of presentations to the pediatric emergency department occurred in July, specifically during the summer months, for both pharmacological and non-pharmacological agents. These findings emphasize the importance of considering regional characteristics when addressing the epidemiology of pediatric poisoning.

Poisoning in children predominantly occurs through oral ingestion, although other routes, such as inhalation, are also recognized. Öner et al. reported an oral poisoning rate of 97.3% among pediatric cases (20). Similarly, Dağ et al. found an oral ingestion rate of 97%, with inhalation accounting for 2.8% of cases (13). In our study, the rate of oral ingestion was even higher, at 99.2%, with only two patients (0.8%) diagnosed with inhalation-related carbon monoxide poisoning.

A multicenter study by Mintegi et al. reported that 68.5% of pediatric emergency visits for poisoning were due to accidental exposure, while intentional poisoning accounted for 13.8% (21). A recent study in Istanbul found a similarly high rate of accidental poisoning at 83.8%, with suicide attempts comprising 13.6% of cases (13). Our findings corroborate these results, as we identified accidental poisoning in 82.6% of cases, while intentional poisoning was present in 17.4%. In the context of adolescent suicide,

medication overdoses represent the most frequently employed method. Studies indicate that girls exhibit higher rates of suicide attempts, often utilizing less lethal means compared to boys, a trend linked to increased feelings of loneliness and hopelessness, as well as more severe psychopathological issues (9). Our analysis shows a notable prevalence of intentional poisoning among adolescent girls relative to their male peers. These findings are consistent with previous studies (9, 22). Additionally, a noteworthy proportion of the intentional poisoning cases in our study were associated with multidrug ingestion, with 13 cases having accompanying psychiatric disorders, the majority of whom involved female adolescents.

In a study conducted in Taiwan, poisoning due to pharmacological agents was detected in 42.2% of children, marking it as a leading cause of poisoning (12). Prior studies have implicated pharmacological agents in many poisoning cases, with analgesics and antipyretics being the most common culprits (23). Azab et al. conducted a comprehensive study reinforcing this trend across all age groups, identifying analgesics and antipyretics as the most frequently responsible medications (24). Furthermore, Dağ et al. reported that these agents accounted for 22.7% of poisoning cases (13). In line with earlier findings (9, 23), our study revealed that 15.4% of drug-related poisonings involved analgesics or antipyretics. Overall, 62.5% of poisoning cases in our cohort were attributable to pharmacological causes, with a significantly higher incidence of pharmacological poisonings observed among girls compared to boys. Notably, pharmacological poisonings were significantly elevated in preschool children, suggesting that preventive measures could be effectively implemented at this developmental stage.

In a study conducted in Italy, non-pharmacological agents were identified as the primary substances involved in childhood poisoning cases, accounting for 59% of incidents among children with a median age of 2.2 years; notably, 63% of these cases involved male subjects (17). Similarly, a study in Konya highlighted that non-pharmacological causes were the leading factors in pediatric poisonings, with caustic and corrosive substances responsible for 42.8% of cases (6). In our investigation, we observed that the proportion of poisonings attributable to non-pharmacological agents was 30.1%, while caustic and corrosive agents accounted for 21.6%. Our results align with previous findings, demonstrating a significantly higher incidence of non-pharmacological poisonings among males and infants.

The management of childhood poisoning can vary widely, particularly concerning the application of interventions such as gastric lavage and activated charcoal, depending on the type and rationale of poisoning. In the study by Dağ et al., gastric lavage was performed in 21.6% of cases, while activated charcoal was administered to 32.8% of patients (13). Conversely, another study reported gastric lavage in 34.7% of cases and activated charcoal in 42.8% (5). In our study, gastric lavage was utilized in 32.8% of poisoning cases, with activated charcoal applied in 37.8% of instances. These findings underscore the continued need for protocol optimization in the management of pediatric poisonings to enhance patient outcomes.

In conclusion, our study highlights the significant prevalence of acute poisoning among children, particularly in preschool-aged individuals, with a notable increase in cases during the summer months. The majority of poisoning incidents were accidental, predominantly involving pharmacological agents, especially analgesics and antipyretics, while intentional poisonings were more common among female adolescents. These findings underscore the critical need for targeted educational initiatives and preventive strategies aimed at reducing the incidence of poisoning, particularly in vulnerable age groups.

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