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## AN EVALUATION OF ACUTE INTOXICATIONS IN CHILDHOOD AT THE EMERGENCY DEPARTMENT: A SINGLE CENTER EXPERIENCE

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**Objective:** The aim of this study is to identify epidemiological and clinical characteristics of childhood patients who were brought to our hospital emergency service due to intoxication.

**Methods:** Cases were evaluated in terms of gender, age, month of application, hours of application, way of arrival to the hospital, cause of intoxication, way of entrance to the body (oral, dermal, inhaler), type of intoxication (suicide, accident), treatments, result (discharge, hospitalization, referral) and length of hospital stay. Chi square test and Mann-Whitney U Test were used for comparison of groups.  $p < 0.05$  was considered statistically significant in all analyzes.

**Results:** 147 pediatric patients admitted to our emergency service with intoxication. Average age of patients was  $6.61 \pm 5.9$ . Intoxication was most common among 0-5 age group. Most common type of intoxication was accidental. Most common causes of intoxication were drugs (66%). Most common medication type in drug intoxications were analgesics-antipyretics (29.7%). The most case occurred in winter (32%).

**Conclusion:** More care should be taken in the care of children between the ages of 0-5 and adolescent girls. We think that it will be beneficial for emergency physicians to have information about the epidemiological and clinical features of intoxications in the region they work.

**Keywords:** Intoxication, emergency, childhood.

Резюме

## ОЦЕНКА ОСТРЫХ ОТРАВЛЕНИЙ У ДЕТЕЙ В ОТДЕЛЕНИИ НЕОТЛОЖНОЙ МЕДИЦИНЫ: ОПЫТ ОДНОГО ЦЕНТРА

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**Цель:** определение эпидемиологических и клинических характеристик пациентов детского возраста с отравлениями, доставленных в нашу больницу неотложной медицинской помощи.

**Методы:** случаи отравлений оценивались по полу, возрасту, месяцу и часам, когда произошло отравление, способу доставки в больницу, причине интоксикации, способу попадания интоксиканта в организм (пероральный, кожный, ингаляционный), типу интоксикации (самоубийство, несчастный случай), методам лечения, результатам (выписка, госпитализация, направление в другие учреждения) и продолжительности пребывания в больнице. Для сравнения групп использовали критерий хи-квадрат и U-критерий Манна-Уитни;  $p < 0,05$  считалось статистически значимым во всех типах анализа.

**Результаты:** 147 педиатрических больных поступили в нашу службу неотложной помощи в состоянии интоксикации. Средний возраст пациентов составил  $6,61 \pm 5,9$  года. Отравления были наиболее распространены в возрастной группе от 0 до 5 лет. Чаще всего отравления происходили случайно. Наиболее частыми причинами отравления были лекарства (66%). Наиболее распространенным типом медикаментозных средств при лекарственной интоксикации были анальгетики-жаропонижающие (29,7%). Чаще всего это произошло в зимнее время (32%).

**Вывод:** следует уделять больше внимания уходу за детьми в возрасте от 0 до 5 лет и девочками-подростками. Считаем, что врачам скорой помощи будет полезно иметь информацию об эпидемиологических и клинических особенностях отравлений на региональном уровне.

**Ключевые слова:** интоксикация, неотложная помощь, детский возраст.

Түйіндеме

## ШҰҒЫЛ МЕДИЦИНА БӨЛІМШЕСІНДЕГІ БАЛАЛАРДАҒЫ ЖЕДЕЛ УЛАНУЛАРДЫ БАҒАЛАУ: БІР ОРТАЛЫҚТЫҢ ТӘЖІРИБЕСІ

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**Мақсат:** Біздің шұғыл медициналық көмек ауруханасына уланумен әкелінген бала жасындағы науқастардың эпидемиологиялық және клиникалық сипаттамаларын анықтау.

**Әдістер:** Улану жағдайлары жынысымен, жасымен, улану болған айы және уақытымен, ауруханаға жеткізілген әдісімен, интоксикация себебімен, интоксиканттың организмге түсу түрімен (пероральды, терілік, ингаляциялық), интоксикация типімен (өз-өзіне қол жұмсау, оқыс жағдай), емдеу әдістерімен, нәтижелермен (шығару, жатқызу, басқа мекемелерге жіберу) және ауруханада болу ұзақтылығымен. Топтарды салыстыру үшін хи-квадрат критерийін және Манна –Уитни U – критерийін қолданды;  $p < 0.05$  анализдердің барлық түрлерінде статистикалық маңызды болып саналған.

**Нәтиже:** Біздің шұғыл көмек қызметіне интоксикациялық жағдайымен 147 педиатриялық науқас түскен. Науқастардың орта жасы  $6,61 \pm 5,9$  жасты құрады. Улану көбінесе 0 мен 5 жас аралығында таралған. Улану көбінесе кездейсоқ болған. Уланудың ең жиі себебтері дәрілерден болды (66%). Дәрілік интоксикация кезінде ең жиі таралған медикамент түрі ауруды басатын және ыстықты түсіретін дәрілер болған (29,7%). Бұл көбінесе қысқы уақытта болған (32%).

**Қорытынды:** Қыз-жасөспірімдер және 0 мен 5 жас аралығындағы балаларды қарауда көбірек көңіл бөлу керек. Аймақтық деңгейде жедел жәрдем дәрігерлері уланудың эпидемиологиялық және клиникалық ерекшеліктері жайлы ақпарат білгені пайдалы болады деп санаймыз.

**Түйінді сөздер:** интоксикация, шұғыл көмек, балалық жас.

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**Introduction**

Intoxication is the adverse effects on functioning of any system in the organism due to a substance that enters the body by any means. While intoxication may happen in any age group, it is more common and more fatal in childhood age group [1]. In developed countries, 2% of child mortality is due to intoxication while this ratio is more than %5 in developing countries [2]. Intoxications are still a common problem in childhood in our country, as in the rest of the world [3]. According to national data, 60.14% of cases who apply to emergency departments due to intoxication are under 18 years of age [4]. While the annual frequency of intoxications caused by suicide and accidents is between 0.02-0.93% in developed countries, this rate is known to be 0.46-1.57% in our country [5]. In our country, intoxication follows traffic accidents, falls and burns as a type of accident seen in childhood [6].

The causes and form of intoxication and type of consumed agents differ between countries and even between different parts of same country [1]. Intoxication factors differ according to the geographical region, seasons, customs and traditions of society, age groups and socio-cultural level. Each region needs to identify and update its own epidemiological data to develop appropriate prevention and treatment methods, to educate health personnel and to raise awareness of the society [1,7,8].

The aim of this study is to identify epidemiological and clinical characteristics of 0-18-year-old patients who were brought to our hospital emergency service due to intoxication and to determine pediatric intoxication data of our city with possible precautions according to this acquired data.

**Methods**

After the approval of the local ethics committee (approval number: 2019-23/221), our study was conducted retrospectively in 147 patients in accordance with Helsinki Declaration. The medical charts of 147 patients aged 0-18 years who were admitted to the emergency service of Kirsehir University Training and Research Hospital between 01 January 2018 and 30 April 2019 were evaluated. The study was conducted according to the criteria set by the World Medical Association Declaration of Helsinki 'Ethical Principles for Medical Research Involving Human Subjects'

Cases were evaluated in terms of gender, age, month of application, hours of application, way of arrival to the hospital, cause of intoxication, way of entrance to the body (oral, dermal, inhaler), type of intoxication (suicide, accident, abuse), treatments, result (discharge, hospitalization, referral) and length of hospital stay. Intoxications were grouped according to the agent as drug, organophosphate, corrosive substances, carbon monoxide, rat poison, alcohol, chemical agents, pesticide, insecticide and psychostimulants. In cases with intoxication due to drug intake, we also evaluated the type of drug and whether drug intake was singular or multiple. Cases who applied to emergency service due to snake bite, scorpion and bee stings and food poisonings were excluded from this study.

**Statistical Analysis**

For descriptive statistics, mean standard deviation, median, minimum and maximum values were given for continuous variables, while categorical variables were given as numbers (n) and percentages (%). Data was analyzed with SPSS package software (IBM SPSS Statistics for

Windows, Version 22.0. Armonk, NY: IBM Corp.). Chi square test and Mann-Whitney U Test were used for comparison of groups. Bar graphs were used for graphical representation.  $p < 0.05$  was considered statistically significant in all analyzes.

**Results**

During the study period, 64.684 pediatric patients applied to our emergency service and 147 of these patients (0.22%) were included in the study for intoxication. 75 (51%) of cases were male and 72 (49%) were females and female/male ratio was 0.96. Average age of patients was  $6.61 \pm 5.9$  while average ages of female and male patients were  $8.01 \pm 6.6$  and  $5.25 \pm 4.8$  ( $p = 0.015$ ), respectively. Intoxication was most common among 0-5 age group. When age groups were compared with gender, intoxication was more common in 0-5 and 6-12 age groups for males while it was more common in 13-18 age group for females (Table 1).

Table 1.

**Distribution of patients by age groups and gender.**

Age Group	Gender	
	Female	Male
0-5 years	39 (42,9%)	52 (57,10%)
6-12 years	4 (28,60%)	10 (71,40%)
13-18 years	29 (69%)	13 (31%)

Most common type of intoxication was accidental ( $n = 114$ , 76.9%), suicidal intoxication was observed in 32 patients (21.8%) and abuse with intoxication was observed in 1 patient (0.7%). Accidental intoxication type was more common in 0-5 age group and males, while suicidal intoxication type was more common in 13-18 age group and females (Table 2).

Table 2.

**Distribution of patients according to intoxication type and age group**

Age group	Intoxication type		
	Accidental	Suicidal	Abusive
0-5 years (M/F)	52/39	0/0	0/0
6-12 years (M/F)	9/4	1/0	0/0
13-18 years (M/F)	5/5	7/24	1/0

However, age group and gender comparisons of accidental ( $p = 0.618$ ) and suicidal ( $p = 0.250$ ) intoxications didn't reach statistically significant values ( $p > 0.05$ ). 31 patients (21.1%) were brought to emergency department by 112 emergency services after intoxication, while 116 patients (78.9%) applied with their own means.

14 of patients (9.5%) were discharged from emergency service, while 124 patients (84.4%) were hospitalized. In addition to this, 9 patients (6.1%) were referred to other centers for various reasons. Average length of hospital stay was 48 hours and we found that 11 patients (7.5%) were discharged in less than 24 hours. No case of death was identified in our study.

Most common causes of intoxication were drugs (66%), followed by corrosive substance (11.6%) and carbon monoxide (10.9%) intoxications (Figure 1).

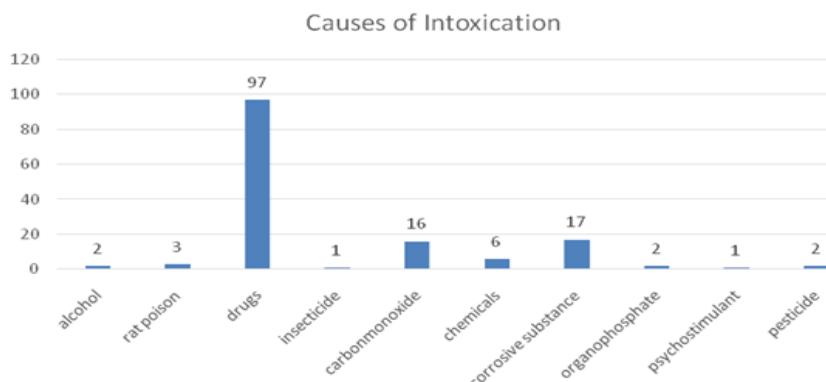
Among the patients who were intoxicated by drugs 70 patients (72.2%) took single drug, 15 patients (15.4%) took multiple drugs and number of drugs used were unidentified in 12 patients (12.4%).

Most common medication type in drug intoxications were analgesics-antipyretics (29.7%) (Table 3)

Frequencies of intoxication agents' way of entrance to the body were as followed: Oral (86.4%), inhalation (11.6%) and dermal (2%). Most frequent interventions made to intoxication cases in the emergency services were gastric lavage with activated charcoal (47.6%), support with IV fluids (24.5%) and oxygen treatment (10.9%).

Also, 6 patients were treated with IV N-acetylcysteine (NAC) for paracetamol intoxication and 3 patients received K vitamin as antidote for rat poison.

Fig.1. Structure of poisoning in the studied children)



Distribution of drugs that cause intoxication.

Drug Type	Frequency	%
Analgesic- antipyretic	35	29,7
Unknown	14	11,9
Antidepressant	13	11,0
Cardiovascular System Drug	10	8,5
Gastrointestinal System Drug	9	7,6
Antipsychotics	5	4,2
Antibiotics	4	3,4
Hormones	4	3,4
Myorelaxants	4	3,4
Antiepileptics	3	2,5
Vitamins	3	2,5
Antihypertensives	2	1,7
Nasal Drops	2	1,7
Iron Supplements	2	1,7
Central Nervous System Drug	2	1,7
Respiratory System Drug	2	1,7
Antidiabetic	1	0,8
Anti-inflammatories	1	0,8
Gout Drugs	1	0,8
Moisturizers	1	0,8

According to data from 2018, when frequency of intoxications was evaluated according to months, it was most common in January (15.2%) followed by July (12%). Least cases of intoxication were detected in September (3.2%). When intoxication frequencies were evaluated according to seasons it was as it follows: Winter (32%), Summer (28%), Spring (28.8%) and Fall (11.2%).

#### Discussion

Intoxication, which is among the important causes of applies to emergency services, is a significant problem for emergency services at present because it requires rapid diagnosis and treatment. Intoxications which are also observed frequently among childhood, are crucial for public health because they progress with severe mortality and morbidity if they are not diagnosed and treated rapidly.

Rates of pediatric intoxication cases applying to emergency services were reported as 3% in China and 1% in England [9, 10]. It is known that this rate is between 0.46% and 1.57% in our country [5,6,11-13]. This rate was 0.22% in our study and was much lower than the average rate in Turkey. We believe this rate was low due to high

Table 3.

number of urgent and inappropriate applications to our emergency service because our hospital is the only hospital and tertiary care center in our city.

Importance of age and gender in intoxications were emphasized in many studies and intoxications were more common in male children and 0-5 age group in these studies [14-17]. The reason why these intoxications are most frequent in first 5 years of life is that these children are energetic, curious, mischief and tend to recognize every item by taking it to their mouth [3, 18]. Careless and unconscious family elders leaving their medications and other toxic substances at places in children's reach or in boxes that doesn't belong to them and not following their children adequately might contribute to this situation [19]. In line with the literature, we found that intoxications were more frequent in male children (51%) and 0-5 age group (61.9%) in our study.

There are studies that show intoxications rates increase until 12 years of age in males and after 12 years of age in females when age and gender groups were compared [11, 15-17, 20]. Intoxications were more frequent at 0-5 and 6-12 age groups in males and 13-18 age groups in females in our study, too. Childhood intoxications especially concerns two age groups: first 6 years of life and adolescent. Intoxications observed in play age are mostly due to accidents and more common in males, while they are due to suicide and more common in females in adolescent [21]. In adolescent age, mental and physical changes, discussions between family and friends, academic and social success anxiety might increase suicidal tendencies. Accidental intoxications were more frequent in 0-5 age group and males while suicidal intoxications were more frequent in 13-18 age group and females also in our study.

It was found that generally 90-95% of childhood intoxications were due to accidents and %5-10 were due to suicides in previous studies [3, 15, 17-19, 21]. However, there are studies with high suicide rates such as studies of Karacı et al. (24.8%) [12], Kelebek et al. (56.7%) [6] and Dereci et al. (36%) [20]. In our study accidental type intoxications were found 76.9% and suicidal type intoxications were 21.8%. We believe suicidal intoxications were high because number of intoxications in 12-18 age group was the second highest age group following 0-5 age group and most of the intoxications in 12-18 age group are due to suicides.

As in most studies, most frequent entrance way of intoxicant agents to body was oral (86.4%) in our study [6, 12, 17]. We believe the fact that oral intoxication rate was high is due to higher rates of oral intoxications in two age groups with highest intoxication rates which are 0-5 age group with children tend to take everything to their mouth and 12-18 age group with higher rates of suicidal intoxications with drugs. In our study, children exposed to intoxications were brought to emergency service by their own means (78.9%), while 21.1% of patients were brought by 112 emergency services. According to these data, there are mostly only relatives of the patient from the time of intoxication to arrival to the hospital. Under these circumstances, we believe people should be educated about not only protective measures but first aid for intoxications at home too during public educations.

In studies of Biçer et al made in 2003 and 2005, 85% and 82% of intoxication cases was treated and followed up in emergency services, respectively [22, 23]. Also, similar studies found that most of intoxication cases were discharged from emergency service [6, 17, 19, 24]. In our study, 84.4% of intoxication cases was hospitalized, 6.1% was referred to other centers due to various reasons and only 9.5% was discharged from emergency service. We believe high rate of hospitalization in our study is due to not having a separate pediatric observation unit so cases that can be observed only for a short time period are followed up in emergency service and other cases are hospitalized.

Average length of hospital stay of patients hospitalized for intoxication was 22.8 hours in the study of Konca et al. [13], 44 hours in the study of Sümer et al. [16] and 48 hours in the study of Güzel et al. [19]. In our study, also in line with the literature, average length of hospital stay was found 48 hours.

Age, time to arrive to the hospital, type and amount of intoxicant agents were the most significant factors affecting mortality [25]. Studies made recently in our country show that mortality rates gradually get lower and there are several studies with a mortality rate of 0 [6, 11, 14, 15, 20, 26]. Mortality rate was also found as 0 in our study. Gradually decreasing mortality rates might be due to increased use of Drug and Poison Information Center, rapid and effective diagnose and treatment process.

Intoxication factors might change according to region, season, age, sociocultural and economic conditions. Several studies made in our country found that the most frequent cause of intoxications were drugs [6, 11-13, 16, 17, 19, 20]. When intoxication factors are evaluated it is found that paracetamol intoxications replaced salicylate intoxications and intoxications with tricyclic antidepressants and corrosive substances increase significantly [27]. In the studies of Kondolot et al [15] and Bükülmez et al [14] intoxications with corrosive substances were the most common cause of intoxications while Kendirci et al [24] found that carbon monoxide intoxications were the most common cause. In our study most common cause of intoxications were drugs (66%) followed by corrosive substances (11.6%) and carbon monoxide intoxications (10.9%).

In the study of Karcioğlu et al [28] 53.6% of drug intoxications was with single drug and 46.4% was with multiple drugs, while in the study of Kaygusuz et al [29]

these rates were 41.2% and 53.5%, respectively. In the study of Yorulmaz et al. [11], rate of intoxications with multiple drugs was lower (17.87%) as in our study (15.4%).

Previous reported studies found that analgesic-antipyretic medications are the most common medications for intoxication, followed by antidepressants as second most common [6, 17, 19, 20]. In the literature, there are studies that found antidepressant group medications as the most common medication group for intoxication [12, 15, 16]. In our study most common medication group for intoxications was analgesic-antipyretic group (29.7%). 11% of the cases were intoxicated with antidepressants but we were unable to identify the group of drug taken by patients in 11.9% of cases. We believe easy access in pharmacies and unregulated sales contribute to high rates of both analgesic-antipyretics and antidepressants intoxications.

Major treatment methods for intoxication cases are preventing or lowering absorption of toxic agent, treating with systemic antidotes, alternating metabolism of toxic agents, accelerating elimination from body and non-specific treatments as support and symptomatic treatments. In most studies, most used treatment methods were gastric lavage, activated charcoal use, O<sub>2</sub> treatment and intravenous fluid treatment [6, 12, 13, 15, 17, 20]. We treated 47.6% of our cases with gastric lavage and activated charcoal, 24.5% with support treatment and 10.9% with O<sub>2</sub> treatment. Also, we used IV NAC (4.1%) and K vitamin (2%) as antidote treatment in our study.

In the literature, it is found that intoxications mostly occur in spring and summer seasons [12, 13, 20, 30]. In our study winter (32%) and spring (28.8%) were the seasons with highest rates of intoxication. In our study, we believe the increased use of analgesic-antipyretic drugs especially in the winter months, which are found to be the most common cause of intoxication, might be the cause of increased rates in winter.

In conclusion, identifying epidemiological specifications of each region and even cities and early and rapid treatment are important for taking preventive measures. Also, more care should be taken in the care of children between the ages of 0-5, which constitutes an important part of childhood intoxications and the psychology of girls should be treated accordingly in especially the adolescent period, another important age group and expert support should be provided if necessary. We think that it will be beneficial for emergency medicine specialists and emergency physicians to have information about the epidemiological and clinical features of intoxications in the region they work.

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**Contribution of the authors to the study:**

*Ersoy S.* – literature search, writing a review, developing ideas and concepts; *Celik B.* – developing ideas and concepts, methodologically assessing the quality of the articles included, writing a review; *Kavalci C.* – writing a review, counseling correspondence with the editorial office; *Caliskan H.M.* - literature search, writing; *Kavalci G.* - literature search, writing a review.

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