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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

Acute poisoning in children; Evaluation of cases admitted to Marmara University Hospital in 2015

Çocuklarda akut zehirlenme; 2015 yılında Marmara Üniversitesi Hastanesi'ne başvuran olguların değerlendirilmesi

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ABSTRACT

Objectives: According to Turkish Statistical Institute (TurkStat), 6477 children aged between 1 and 17 years, died in 2015 and 29.5% (n=1909) of these deaths were because of injuries due to external causes and poisoning. Our aim is to produce solutions to this problem by evaluating demographics, clinical features of patients and the causes and consequences of poisoning.

Materials and Methods: The hospital medical records of children who were admitted with acute intoxication to Pediatric Emergency Service at Marmara University Hospital in 2015, were evaluated retrospectively.

Results: In 2015, a total of 1110 patients applied to the hospital due to poisoning. Of these cases, 31.6% (n = 351) were children, about half of them were male (n = 173) and half were female (n = 178). The mean age of males was 6.24 years and mean age of females was 8.47 years. Sixty percent (n=213) of patients were in 0-6 age group, 8% (n=28) of patients were in 7-11 age group, 32 % (n=110) of patients were in 12-18 age group. Forty-six point one percent (n = 162) were poisoned with medications. Among the pharmaceuticals, paracetamol was the most commonly used agent (14.8%). In non-pharmaceuticals, caustic/corrosive substances (detergent, bleach, acetone etc.) were the most frequently used agents (54%).

Conclusion: In this study, 80.3% of the cases were preventable accidental poisoning. Regulations on child-resistant packaging should come into force as soon as possible.

Keywords: Forensic origin, Child, Intoxication

ÖZ

Amaç: Türkiye İstatistik Kurumu 2015 verilerine göre; 1-17 yaş grubunda 6477 çocuğun öldüğü, bu ölümlerin %29,5'inin (n=1909) dış sebeplere bağlı yaralanmalar ve zehirlenmeler nedeniyle olduğu belirtilmiştir. Amacımız, çocukların demografik bilgilerini, klinik özelliklerini, zehirlenmenin sebep ve sonuçlarını değerlendirerek bu soruna çözüm üretmektir.

Gereç ve Yöntem: Marmara Üniversitesi Hastanesi Çocuk Acil Servisi'ne 2015 yılı buyunca akut zehirlenme ile başvuran çocukların hastane kayıtları retrospektif olarak değerlendirilmiştir.

Bulgular: 2015 yılında zehirlenme nedeniyle toplam 1110 olgu başvurmuştur. Bunların %31,6 (n=351) çocuktur, bu çocukların yaklaşık yarısı erkek (n= 173) yarısı da kızdır (n= 178). Erkeklerin yaş ortalaması 6,24 yıl, kızların ise 8,47 yıldır. Hastaların %60'ı (n=213) 0-6 yaş aralığında, %8'i (n=28) 7-11 yaş aralığında, %32'si (n=110) 12-18 yaş aralığındadır. %46.1'i (n=162) ilaçla zehirlenmiştir. İlaçlarda parasetamol %14,8'i ile en sık kullanılan etkendir. İlaç dışı etkenlerde ise kostik/koroziv maddeler (deterjan, çamaşır suyu, aseton vb) %54 ile en sık kullanılan etkendir.

Sonuç: Bu çalışmadaki olguların %80,3'ünü (tüm olgulardaki kazaya bağlı zehirlenme oranı) gerekli düzenleme ve tedbirlerle önlenebilir nitelikte olan zehirlenmeler oluşturmaktadır. Çocuğa dirençli paketleme ile ilgili düzenlemeler bir an önce yürürlüğe konmalıdır.

Anahtar kelimeler: Adli orijin, Çocuk, Zehirlenme

Introduction

In the last century with rapid industrialization, toxic chemical products have spread rapidly all over the world. The sale of these products without adequate control poses a great risk for children to be exposed to these products [1]. As a reflection of this situation, acute poisoning has been one of the most important causes of hospitalization indications in children and this situation causes serious symptoms or even death in children. In the National Toxicology Consultation Center's 2008 Study Report, it was stated that a total of 77.988 people applied to the center and 46.894 (60.13%)

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of them were children [2]. Moreover, according to data from the Turkey Statistical Institute in our country in 2015, 6477 children between the ages of 1 and 17 died and the cause of death in 1909 (29.5%) of them was "injuries due to external causes and poisoning". No prevalence study has been done in our country until this time. Current studies are not enough to explain the frequency and causes of poisoning in our country.

In this study, it was aimed to produce a solution proposal to prevent acute poisoning problems in children by evaluating the demographic, clinical features, causes, and consequences of poisoning of children admitted to our hospital with a forensic perspective.

Materials and Methods

The forensic and clinical records of children admitted to Marmara University Hospital Pediatric Emergency Service between 01.01.2015 and 31.12.2015 for acute poisoning were evaluated retrospectively. From the hospital data; the gender and age of children, the cause of poisoning, the origin of the poisoning, the blood values, the date of the application were obtained. Patients were divided into 3 age groups according to the period of childhood development; 0-6 years (preschool period), 7-11 years (school period), 12-18 years (adolescence period). The obtained data were analyzed statistically with SPSS version 21.0. Chi-square and Student's t test were used for statistical analysis. A P value of less than 0.05 was considered statistically significant.

Results

In 2015, a total of 1110 people applied to Marmara University Hospital for poisoning. 351 of these (31.6%) were children. 173 of the children were boys and 178 were girls. The average age of boys was 6.24 years and that of girls was 8.47 years. 60% (n = 209) were between 0-6 years of age, 8% (n = 28) between 7-11 years of age and 32% (n = 114) between 12-18 years of age. The distributions of cases by age and gender are shown in Figure 1.

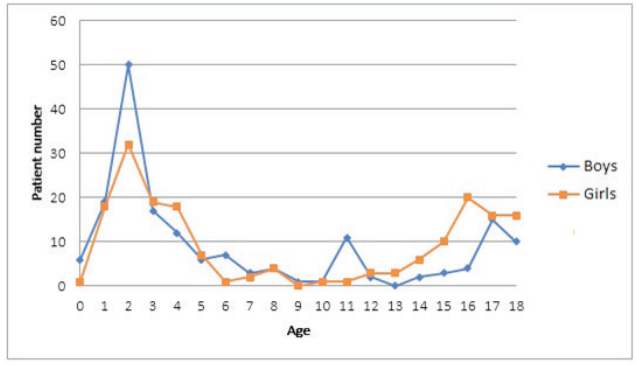

Figure 1. Distribution of poisoning cases by age and gender.

When poisoning cases were evaluated according to the judicial origin, 80.3% were accidents, 19.4% were suicides, 0.3% were homicides. Since, the data obtained according to age groups showed a significant difference, data were divided into age groups. Table I shows the distribution of cases according to age groups, the poisoning effect, and gender.

Table I. Distribution of the Cases According to Age Groups, Poisoning Agent and Gender.

Age				Used Agents		Total	Gender	
				Medications	Non-Medication Agents		Boys	Girls
0-6 years	**Origin**	**Accident**	n (%)	93 (44.5%)	116 (55.5%)	209 (100%)	116 (55.5%)	93 (44.5%)
7-11 years	**Origin**	**Accident**	n (%)	2 (7.4%)	25 (92.6%)	27 (96,4%)	20 (74.1%)	7 (25.9%)
		Suicide	n (%)	0 (0%)	1 (100%)	1 (3.6%)	0 (0%)	1 (100%)
12-18 years	**Origin**	**Accident**	n (%)	8 (17.4%)	38 (82.6%)	46 (40.3%)	26 (56.5%)	20 (43.5%)
		Suicide	n (%)	58 (86.6%)	9 (13.4%)	67 (58.8%)	10 (14.9%)	57 (85.1%)
		Homicide	n (%)	0 (0%)	1 (100%)	1 (0.9%)	1 (100%)	0 (0%)

In terms of age groups, among the 0-12 age groups the accident covered almost all cases (99.6%) but in the 12-18 age group, suicide (58.8%) was more prominent. This change was statistically significant (P <0.00001). There was no statistically significant difference between pharmaceutical and non-pharmaceutical factors in terms of poisoning effect in 0-6 age group (P> 0.05). Apart from the 0-6 age group, in other age groups, 86.3% of the accidental poisonings were due to non-pharmaceutical factors. 85.3% of suicide cases were composed of girls and this difference between genders was statistically significant (P <0.00001). 85.3% of suicide cases were attempted suicide by using medication. Of the 58 patients who committed suicide, 25 used multiple medications and 14 used medications that affected the central nervous system. In addition, 161 (45.8%) children were poisoned due to medications and 190 (54.2%) children were poisoned due to non – medication factors. Paracetamol (n = 26, 16%) was the most frequently used among the medications and among the non-pharmaceutical agents caustic and corrosive fluids were the most frequently used agents (n = 103, 54.5%). Table II shows the distribution of poisonous substances.

Particularly, in the 12-18 age group addictive substances were used. The distribution of non-pharmaceutical intoxication agents is shown in Table III.

There were 27 cases of poisoning due to the use of addictive substances, only 5 (18.5%) of them were girls and this difference between genders was statistically significant (P <0.00001). Two of the 351 patients died. When it came to the causes of death, one case aspired thinner and in the other, synthetic marijuana called "bonsai" caused death. In addition, no statistically significant differences were found when the results of routine blood and urine analysis (complete blood count, biochemistry, arterial blood gas) were compared.

Table II. Distribution of medication-induced and non-medication poisoning agents

Medication Related Poisoning Agents	Number	Percentage	Non-Medication Poisoning Agents	Number	Percentage
Multi-medication use	34	21%	Caustic and corrosive substances	103	54%
Central nervous system	34	21%	Addictive substances	27	14%
Nonsteroidal antiinflammatory	30	19%	Food	18	9%
Hormones	16	9%	Carbon monoxide	14	7%
Vitamins	8	5%	Thinner	10	5%
Antihistamines	8	5%	Mouse poison	6	3%
Antibiotics	7	4%	Solvents	3	2%
Cardiovascular system	8	5%	Idiopathic	3	2%
Herbal medicines	5	3%	Paint	3	2%
Gastrointestinal system	5	3%	Hydrocarbon	2	1%
Antitussive	1	1%	Disinfectant	1	1%
Anticholinergic	1	1%	Total	190	100%
Antiseptic	2	1%			
Decongestant	1	1%			
Unknown	1	1%			
Total	161	100%			

Table III. Percentage distributions of the poisoning agents of non-medication poisoned cases in 12-18 age group

12-18 Age Group Non-Medication poisoning agents	Number	Percentage
Addictive substances	27	56%
Caustic and corrosive substances	7	15%
CO (Carbon monoxide)	6	13%
Food	3	6%
Idiopathic	2	4%
Solvents	1	2%
Hydrocarbon	1	2%
Disinfectant	1	2%
Total	48	100%

Discussion

Poisoning is one of the most important causes of mortality and morbidity in childhood. Approximately one-third (31.6%) of the poisoning cases admitted to the emergency department of our hospital were children. The majority of children with acute poisoning cases in our study were grouped in two age groups (0-6 (60%) and 12-18 (32%) age groups, respectively) in accordance with the literature [3-8]. According to the age distribution of genders, males in 0-6 years and females in 12-18 years were more prominent. Many of the similar studies have reached the same conclusion [9-11].

In our study, more than half of the poisonings were observed in the 0-6 age group (60%). It is known that children in this age group are more fragile and vulnerable to accident-related intoxication because of their curiosity, tendency to explore their environment or inexperience with harmful substances [12]. In addition, it had been reported that labeling of containers with warning labels did not have any deterrent effect on children under 6 years of age, and may even attract them [13]. In another study, it was reported that pills with a good taste and candylike appearance caused deaths in 90's [14]. When studies that seek solutions to children poisoning are reviewed; In a study on children aged 5 years and younger, conducted by Ramos et al., it was found that hiding poisonous substances under 150 cm increased the poisoning rate by 17 times when compared to the control group, and also prevention of this condition reduced the poisonings in this age group by 19%. As a precautionary measure, special packaging for children under 5 years that make opening and obtaining their contents difficult, came into force in many developed countries [1,15,16]. In England, the rate of death due to poisoning in children under 10 years of age was 151 in 100.000 in 1968, with this arrangement, this ratio had dropped to 23 in 100.000 until 2000 [16]. In the United States, this regulation was put into effect in 1970, and from that time on significant reductions in the frequency of poisoning due to accidental digestion of substances have been observed [1]. Following after some prevention measures taken between 1960 and 1968 in Finland, deaths due to poisoning decreased rapidly in children under 5 years of age, and this trend of decline continued between 1969 and 2003, and was even zeroized at a certain time. In this time interval, there was no obvious decrease in deaths due to suicide and substance abuse in adolescents [8]. The above-mentioned studies and the World Health Organization report have shown that accident-related poisoning can be avoided [1,8].

In our study, we found that 58.8% of self-poisoning cases were suicide-related in the 12-18 age group. 85.3% of suicide cases were girls. 81.5% of the poisonings due to addictive substance use in the 12-18 age group composed of boys. This is consistent with other studies in adolescents. They found that girls had higher rates of suicides and boys had higher rates of substance abuse [5,7,8,17,18].

When we consider the poisoning factors, these factors vary according to socioeconomic and cultural conditions, laws controlling these factors, climate, local industry or agricultural activity. Medication, cosmetic, household cleaning products and alcohol poisoning are common in developed countries and in developing countries, especially in economies based on agriculture, in addition to medication poisoning, poisoning by insecticides and toxic animal bites are also common [1,19]. For example, in a study conducted in India, pesticides predominantly organophosphates were found to be the most frequent poisoning agent (53.3%) and secondly chemical home products (33.7%) [20]. In a study conducted in Finland, terbutaline was the most frequently seen poisoning medication in children under 6 years of age [21]. Most studies conducted in our country and abroad found that the most frequent poisoning agent in children was medication [3,7,15,22-24] but in our study, it was found that the most common poisoning agent was non-pharmaceutical substances (54%). There are studies that reached similar results [25-27]. In our study, paracetamol was found to be the most frequently used agent in medication-induced poisonings and there are studies that show similar findings [2,22-24]. In addition, paracetamol is considered to be the most frequently poisoning medication because it is an over the counter medication and easy to access, moreover, a box of paracetamol can be lethal [28]. The most frequent etiologic factor among the non-pharmaceutical factors is caustic and corrosive fluids as well as in many studies [2,3,7,21,23,25,26,29]. The most common forensic origin of poisoning in our study was accident with 100% in 0-6 age group according to hospital records and in the 12-18 age group it was suicide with 58.8%. Despite there are similar results [5,7] in studies conducted both in our country and in the world, Yin's study found that an average of 510 children under the age of seven intentionally poisoned in the USA between 2000-2008 [30,31]. It is also suggested that intentional intoxications had a much higher mortality, morbidity, and duration of exposure than accident-related

intoxications [32,33]. In our study, according to medical records, all children under the age of seven were poisoned accidentally. In the hospital records which our study was based on, there was no data entry that these cases were assessed due to abuse and negligence, and due to the legal requirement. They were reported to law enforcement officers as only poisoning. In cases where the person who is responsible for taking care of a child does not provide a safe environment and does not look after a child adequately, in these situations the child's poisoning should be considered as negligence [32]. Poisoning the child intentionally by giving him substance with different intentions such as psychopathology of the caregiver (Münchausen syndrome by proxy etc.), sexual abuse or facilitation the assault, killing, training, behavior changing and distraction should be considered as abuse [32]. The literature data suggest that some of the cases which were considered as accidents may have been exposed to neglect or abuse. According to Hines, the first and most important key point to diagnose poisoning-related child abuse and neglect is to doubt [33]. For this reason, in order to protect children from abuse and neglect, it is necessary to examine the suspected cases in more detail and after the notification is made, follow-up should be done by relevant institutions of the state which primary duty is to protect the child.

Our study has several limitations; only the patients who applied to the emergency department of our hospital were included in the study. Due to the presence of other private and public hospitals in the vicinity, the data cannot fully represent the population of the region. Secondly, toxicological screening or concentration determination was not performed for most of the active substances. Active substances were recorded on the basis of anamnesis from the patient or patient's relatives and clinical findings. On the other hand, we were unable to follow the judicial process in cases that judicial notification was made. This caused us not to be able to determine whether the cases entered as "an accident" to medical records were assessed by the authorities as abuse or neglect.

Conclusion

In children, the poisoning-related clinical picture may be easily misdiagnosed or undiagnosed. For this reason, it may delay the treatment and cause severe damage to the child. Therefore, the best fight against poisoning is the prevention studies [34]. Eighty percent point three of the cases in our study (rate of poisoning due to accidents in all cases) can be prevented by necessary regulations and measures. Wide range of groups and sectors must work together in order to prevent poisoning of children effectively. In addition to the health sector, parents and caregivers, education sector, Ministry of Justice, trade and industry institutions, consumer associations, non-governmental organizations related to child safety, manufacturers and sellers of pharmaceuticals, agricultural chemicals and other toxic substances, industrial establishments using toxic substances in which children are employed need to be involved for the successful prevention of incidental poisoning of children. And in order to prevent child poisoning the first thing that needs to be done in our country is the regulations on child-resistant packaging [35], which have been considered to be the most effective method up to now, should be put into effect as soon as possible.

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