Epidemiological and clinical pattern of acute poisoning in children: A hospital based study in northern Iran

Original Article

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Abstract

Background: Pediatric poisoning is a common and predictable cause of morbidity worldwide. It is necessary to determine the pattern of this problem in order to take preventive measures. The aim of this study was to determine the epidemiological and clinical pattern of children poisoning.

Methods: This cross-sectional, descriptive-analytical study was carried out on 408 children hospitalized due to poisoning in Amirkola Children's Hospital from 2008 to 2013. The hospital information system was used to recognize children with a definite diagnosis of poisoning. Individual and epidemiological information of the participants was extracted from their medical records and analyzed.

Results: Out of 408 poisoning cases, 97% of cases were unintentional, 55.4% of subjects were male, and the mean age of the children was 36.27±2.8 months. Totally, 56.6% of the children were residing in urban areas (P=0.004), and most cases (56.12%) suffered from medication poisoning. Moreover, 30.4% of them had no abnormal clinical manifestations, and the most common manifestation was loss of consciousness (29%). Besides, 61% of medical measures taken included the prevention of gastrointestinal absorption of the poison. The mean hospital stay duration was 2.7±2.1 days, and the consequence of poisoning was treatment and discharge in 68.3% of the cases and 1 death (0.2%).

Conclusions: The most common cause of pediatric poisoning was medications. In order to prevent poisoning in children, it is necessary to inform parents and other carers about the proper storage and use of medications, and in case of poisoning, urgent referral of the child to the centers.

Keywords: Epidemiology, Child, Hospital, Poisoning

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Introduction

Injuries are a global concern since they are, by far, the leading cause of death among children and teens [1]. Common causes of childhood injuries include drowning, falls, burns, poisoning, suffocation and road traffic collisions [1, 2]. In fact, pediatric poisoning is one of the leading cause of morbidity and mortality and recurrent emergency department visits among children worldwide [3]. Similar to other types of injuries, poisonings are comprehensible and predictable phenomena [4]. Despite various preventive measures taken in this field, pediatric poisoning has unfortunately remained a major healthcare issue in the world [5]. According to the literature, there has been an increase in the number of

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pediatric poisoning cases due to the rapid industrialization, variety of highly toxic drugs and health products, easy access of children to poisons, mood and behavioral problems of children, increased media viewing and lack of adequate parental supervision. Nevertheless, this type of incident can be prevented since the main cause of any type of accident is the lack of awareness, vigilance and supervision of adults [6, 7]. Pediatric poisoning is classified into two intentional and unintentional groups [8]. Unintentional pediatric poisoning occurs mostly as a result of curiosity of children and their desire to imitate parents [9]. Leaving children unattended by parents or carers might lead to pediatric poisoning, which may have fatal outcomes [10]. The pattern and type of poisons vary over time in different parts of the world and even within geographical areas in the same country depending on demographic characteristics, level of education, socioeconomic status, local beliefs and consumers. Therefore, a higher number of epidemiological studies are required for the country and region to determine the extent and pattern of this problem so that preventive measures can be taken in the country [11-13]. With this background in mind, the aim of this study was to determine the epidemiological and clinical pattern of acute poisoning in children referred to Amirkola Children's Hospital in northern Iran.

Methods

This cross-sectional, descriptive-analytical study was performed in Amirkola Children's Hospital from January 2008 to December 2013. The research population included all (408) children hospitalized in the mentioned hospital due to poisoning during 6-year period. In the current study, the poisoning cases were defined as intentional or unintentional exposure of the child to toxic substances. The types of poisonings were categorized according to 10th revision of International Classification of Diseases (ICD-10). In the present study, the hospital's information system was used to recognize all children > 1 month, admitted for at least six hours with the definite diagnosis of poisoning or transferred into a more specialized center due to the injuries. Patients hospitalized owing to poisoning caused by ongoing medical treatments (e.g., medication and readmission) were excluded to limit the impact of related variables. Moreover, individual and epidemiological characteristics including age, gender, cause of poisoning, place of residence, clinical manifestations, medical measures and the outcome (discharge/death) taken at the center were extracted from the medical files of patients and were recorded in an information form. Data analysis was performed by SPSS 21 using descriptive statistics (frequency, percentage, mean and standard deviation with 95% confidence interval), Chi-square and Pearson's correlation.

P value <0.05 was statistically considered as significant level.

Results

According to the results, out of 408 children hospitalized due to poisoning, 12 cases (3%) were intentional and 396 ones (97%) were unintentional. Although the majority of intentional cases (N=7, 58.3%) were in the age group of 6-11 years, most unintentional ones (N=225, 56.5%) were in the age group of 1-3 years. Statistically, this relationship was significant (p =0.029). In terms of gender, 226 subjects (55.4%) were male and the rest were female. The mean age of children was 36.2±27.8 months, and the minimum and maximum ages were 1 and 204 months, respectively. Regarding the place of residence, 231 children (56.6%) were residing in urban areas, whereas others were living in rural area (table 1). Out of 408 patients hospitalized due to poisoning, 229 (56.12%) children were poisoned due to medications and 179 (43.87%) children were poisoned due to non–medication agents. After the examination of medication poisoning, it was found that the most common poisoning agents were poisoning with analgesics (N=102, 44.1%), sedatives (N=49, 30.8%) and unidentified substances (N=23, 14.4%) as well as among the non-pharmaceutical agents, hydrocarbon (N=53, 29.6 %), others (N=85, 47.48 %) and detergents (N=41, 22.9 %) were the most frequently used agents, respectively. Other causes of poisoning (others) included toxic herbs, raticide and aluminum phosphide so that raticide (N=28, 32.9%) was the most common cause of pediatric poisoning.

Table 1 illustrates the type of poisonings based on gender, age group and place of residence (urban or rural). According to the results, the most frequent type of poisoning in both genders as well as in urban and rural areas was medication poisoning. In addition, most poisoning cases (N=225, 55.1%) were in the age range of one-three years, followed by the participants aged three to six years (N=101, 24.8%). In general, medication poisoning was the most common cause of pediatric poisoning in all age groups. In the present study, there was no significant relationship between the

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type of poisoning and variables of age (p =0.731) and gender (p=0.062). Meanwhile, there was a relationship between the type of poisoning and place of residence (P=0.004).

While 403 poisoning cases (98.8%) occurred at homes, five other cases happened at other places such as schools, parks and farms. Furthermore, 124 (30.4%) children had no abnormal clinical manifestations. Moreover, 118 patients (29%) had loss of consciousness, and 115 participants (28.2%) had gastrointestinal symptoms including vomiting and runny mouth. Furthermore, 33 cases (8.1%) had abnormal clinical signs such as weakness and lethargy, fever, increased or decreased heart rate and blood pressure, restlessness, irritability, tremor, ataxia, dullness, pupillary changes and specific odor inhalation as well as 18 cases (4.4%) had respiratory symptoms. For 194 cases (47.6%), medical procedures including gastric tube insertion, normal saline wash and administration of activated charcoal were performed at the center to prevent gastrointestinal absorption of toxins. On the other hand, 136 patients (33.3%) used supportive treatments such as replacing fluids, antibiotics and antacids to protect the gastric mucosa. Furthermore, 78 subjects (19.1%) applied the poison-specific antidote.

In the present research, the minimum and maximum periods of hospital stay were one and 16 days, respectively, with a mean of 2.7±2.1. However, the highest duration of hospital stay was related to hydrocarbon poisoning with a mean duration of 4.2±3.5 days. (p=0.073) Furthermore, the majority of cases (N=181, 44.4%) were hospitalized for two days, whereas 95 cases (23.3%) were hospitalized for just one day.

In 107 patients (26.2%), poisoning occurred from 18:00 to 24:00 O'clock. Moreover, the peak of the daily pattern was 12:00, whereas the peak of the night pattern was 18:00-19:00 (figure 1). In the present study, the average time elapsed from the emergence of poisoning to hospitalization was 144.3±171 minutes with a minimum and maximum duration of 10 and 1320 minutes, respectively. On the other hand, 150 cases (36.8%) were transferred to the hospital between 60-180 minutes from the occurrence of poisoning.

In 279 (68.3%) cases, treatment and discharge were the outcomes of poisoning. Notably, 122 children (30%) were discharged before treatment with their parents' consent. On the other hand, pediatric poisoning led to the admission of 22 cases (5.3%) in the Pediatric Intensive Care Units. In addition, there was one mortality case (0.2%) caused by methadone poisoning. It is notable that six cases (1.4%) were transferred to more specialized centers due to the major injuries in children, of which we are unaware of the consequences.

According to the results of the present study, in terms of hospitalization frequency of poisoning cases, 131 (32%), 103 (25.2%), 93 (22.8%) and 81 (20%) cases were occurred in summer, fall, spring and winter, respectively (p =0.01) (figure 2).

In this study, the mean of hospitalized poisoning cases per year was 68. So that from 2008 to 2010, 164 cases (40.2%) and from 2011 to 2013,244 cases (59.8%) were admitted, an overall increase of 19.6 % from 2011 to 2013 was observed in all types of child poisoning (P=0.241) (figure 3).

Table 1: Distribution of poisoning cases according to gender, residency area and age group

Variable		Type of poison				Total	Percent	P value
		Medications	Detergents	Hydrocarbons	Etc			
Gender	Male	124	26	33	43	226	55.4	0.06
	Female	105	15	20	42	182	44.6	
Area	Urban	130	28	19	54	231	56.6	0.004
	Rural	60	13	34	31	177	43.4	
Age group >1 years		35	1	1	14	51	12.5	0.7
1-3		96	30	45	54	225	55.1	
3-6		70	10	7	14	101	24.8	
6-11		25	0	0	3	28	6.9	
11-18		3	0	0	0	3	0.7	

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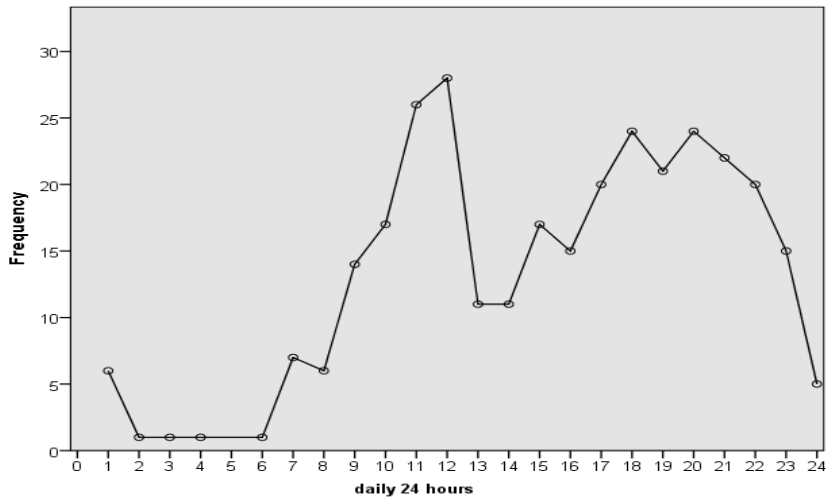

Figure 1: Distribution of poisonings according to hour occurring over the daily 24 hours

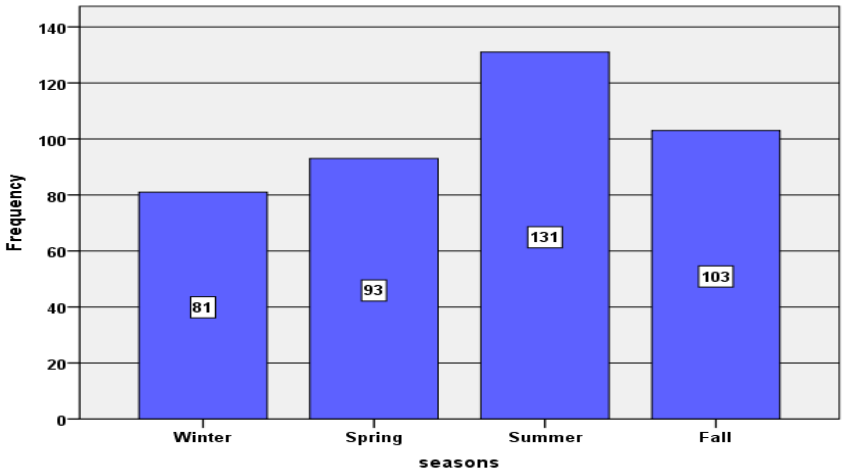

Figure 2: Distribution of poisonings according to season

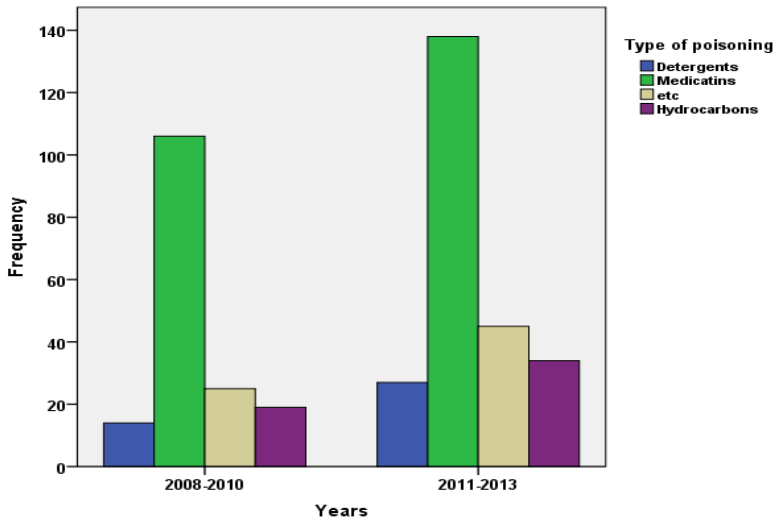

Figure 3: The trend of Children's poisonings from 2008 to 2013

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Discussion

This hospital-based study was performed to determine the epidemiological and clinical pattern of acute poisoning in children, referred to Amirkola Children's Hospital during six years. According to the results, the majority of poisoning cases were unintentional. The most unintentional cases were related to the age range of 1-3 years. Meanwhile, most intentional cases were in the age group of 6-11 years, which is in line with the results obtained by Mendosa et al., who reported that the maximum number of unintentional cases was in the age range of one-four years and all suicidal cases were in the age group of 10-14 years [6]. The number of poisoning cases appears to vary over time in different parts of the world depending on factors such as length of study, demographic factors, socioeconomic status, local beliefs and consumers.

In the current research, the majority of hospitalized cases were male, which is similar to the results of several studies performed in Iran and other countries [5, 14, 15]. Cultural factors such as less family supervision of male individuals appear to lead to greater freedom of action for these people and a higher possibility of accidents in this gender [6].

According to our findings, the most common causes of pediatric poisoning were medication and hydrocarbons. Similarly, Gheshlaghi et al. introduced medications, followed by hydrocarbons, as the most common causes of poisoning [5]. Medications were also recognized as the main cause of poisoning in the studies of Mendosa et al. in Brazil and Gunay et al. in Turkey [6, 16]. Agents causing poisoning appear to be influenced by geographical conditions and economic variables. In developed countries, poisoning mainly occurs with medications, cosmetics, household detergents and alcohol. On the other hand, in developing countries where the country's economy is based on agriculture, the most common cause of poisoning is hydrocarbons, pesticides, traditional medicines and fungi [5].

In the current study, the mean age of the children was 36.2±27.8 months, and most poisoning cases were related to the age group of one-three years, followed by three-six years, which is congruent with the results of other studies. In a research by Haghighat et al. in Iran, the mean age of hospitalized children was 3.86±1.5 years, and the most poisoning cases were observed in the participants aged from eight months to five years [17]. In the research by Mendosa et al., the mean age of the subjects was four years, and the majority of poisoning cases were observed in the age group of one-four years [6]. Children under the age of five appear to be the primary risk group for unintentional pediatric poisoning for reasons including searching in their surroundings, failing to distinguish safe from harmful materials and constantly touching their mouth with their hands. The reason for the prevalence of poisoning at this age, in addition to the child's curiosity, can be due to the lack of proper storage of medicines, detergents and chemicals at home [12].

In the present study, the majority of hospitalized children were residing in the city. In most studies, the proportion of drug-poisoned children was higher in urban areas compared to rural areas [18, 19]. This may be due to the fact that agents causing poisoning may be more available in urban than rural areas. Moreover, differences in population and easier access to hospitals for urban areas can be considered as other reasons for higher hospitalization rates in urban areas.

In the current study, most poisoning cases occurred at homes. Similar results were obtained by Ahmed et al. and by Mendosa et al [6, 20]. The reason for this conclusion can be justified since the majority of poisonings in our study were children in two age groups of one-three and three-six years, who are often kept at home at this age.

In accordance with the results of the ongoing study, 124 cases (30.4%) had no abnormal clinical manifestations. In the research by Haghighat et al, 255 cases (32.9%) had no clinical manifestations [17]. The most common clinical manifestation was dyspnea in children, reported by Manzar et al [14]. In a study by Srinivasa et al., the majority of children had vomiting [21]. In a study by Gheshlaghi et al, the most common manifestations were lethargic neurological symptoms [5]. It seems that the average time elapsed from the incident to the time of hospitalization in our study was 144.3±171 and the majority of poisoning cases were referred to the center during one-three hours from the emergence of poisoning، this short time is a justified reason for the lack of clinical manifestations.

In the present study, the most common medical procedures performed at the center for preventing gastrointestinal absorption of toxins were gastric tube insertion, normal saline wash and administration of activated charcoal. In a research by Naseem et al., the most common medical intervention was supportive therapy [22]. In the study by Yadav et al., the most poisoning cases received antidotes [12]. In the study by Srinivasa et al., the majority of cases had only symptomatic treatment [21]. Certainly, the prevalent

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medical procedures will vary depending on the type of poisonings in each study. In our research, the prevention of gastrointestinal poison absorption was more prevalent since the majority of cases were poisoned with medication.

In the present research, the mean period of hospital stay was 2.7±2.1 days, and most cases were hospitalized for two days. In the research by Mendosa et al., the mean hospitalization duration was three days [6]. On the other hand, most cases were hospitalized for 24-48 hours in the research by Srinivasa et al [21]. It seems that the mean duration of hospital stay will vary based on the type of poisoning.

In the ongoing study, 107 cases (26.2%) had poisoning between 18:00-24, and the peak of day and night patterns was 12:00 and 18:00-19:00 hours, respectively. The peak emergence of poisoning was 13:00-23:00, reported in a research by Ragab et al [23]. Meanwhile, most poisoning cases happened in the evening and at night in the study of Ahmed [20]. Furthermore, Yadav et al marked that most poisoning cases occurred during 14:00-19:00 [12]. It seems that children are less under the supervision of their parents, carers or other family members during these times.

In the present study, the average elapsed time for poisoning cases from the accident until transportation to the hospital was 144.3±171 minutes. The majority of cases were transferred to the hospital 60-180 minutes after the poisoning incidence. In the research by Manzar et al, the average time required for transferring the patients to the hospital was 384.2±894 minutes, and 70% of the children were transferred to the hospital in less than 180 minutes [14]. In the study of Mendosa et al., the average time needed for delivering children to the hospital was three hours [6]. Gheshlaghi et al. reported that children were transferred into the hospital in a mean duration of 6.9±3.1 hours. About half of the children were transferred into the hospital within four hours of poisoning [5]. This time difference could be explained by the longer distance of rural patients from our center. Another reason may be that patients received primary care at our primary health care facility before visiting our facility.

In the present research, treatment and discharge were the outcomes of pediatric poisoning in most cases. In this regard, our findings are consistent with the results of most studies [5, 6, 21]. Certainly, the outcome will be different depending on the type of poisoning. In the current study, treatment and discharge were more frequent considering that the majority of cases were caused by drug poisoning, and there was one case of mortality due to the methadone poisoning.

The results of the present study indicated that the frequency of hospitalized poisonings was higher in summer than in other seasons, which is similar to those of most studies in this field [5, 20, 23, 24]. A higher thirst-quenching intention in the warm seasons seems to be one of the reasons for higher number of pediatric poisoning cases in summer.

In this study, the mean of hospitalized poisoning cases per year was 68. From 2011 to 2013, an overall increase was found in all types of child poisoning (P=0.241). Mendosa et al. suggested that the mean number of poisoning cases per annum was 132, and an increase of 20.8% occurred in 2011, totaling 166 cases [6]. It seems that the reasons for these changing trends are socioeconomic patterns, new development of drugs and chemicals, agricultural modernization and easy access to over-the-counter drugs [25].

The present study illustrated that the most common cause of poisoning in children referred to hospital was drug poisoning, and most poisoning cases were in the age group of one-three years. The curiosity of children at this age along with the improper culture of drug packaging and storage at homes is the main causes of this problem. Therefore, it is recommended that parents and other carers put all medications and poisons out of reach of children and in locked cabinets. In addition, poisons and drugs must be kept in separate places. Carefully, you read the proper use of medications on their labels. In addition, small toddlers must not be left unsupervised. Finally, the use of danger labels on hazardous substances should be mandatory and children should be informed and educated not to touch them [23]. In case of poisoning or even suspected pediatric poisoning, the child must be taken to medical centers as soon as possible, and correct information about the medication must be provided for the health care team in order to treat the child effectively and quickly; hence, the duration of hospitalization and probability of child death will be decreased.

Besides, it is crucial to raise the awareness of healthcare personnel about how to treat drug-poisoned children in a timely manner.

One of the major drawbacks of the present study is the retrospective nature of research and the dependence on the quality of medical records. Moreover, the poisoning cases treated as outpatients were excluded from the present study.

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