

# Acute Poisoning in Children: A Hospital-Based Study in Arak, Iran (2008-2012)

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## ABSTRACT

**Background:** Poisoning is one of the important reasons for children's admission to hospital. Knowledge of epidemiology of poisoning in each region plays an important role in planning prevention, care, and treatment of patients. This study was conducted to determine the characteristics of acute poisoning epidemiology in children attending pediatric wards of Amirkabir Hospital in Arak in a five-year period (March 2008 to March 2012).

**Methods:** This descriptive cross-sectional study was conducted on 224 children admitted for poisoning. Data were retrospectively collected from patients' files and analyzed using SPSS 16 software.

**Results:** Of the total population, 54.9% were boys and the rest were girls. Mean age of children was  $3.54 \pm 2.99$  years, and the most common age range was 1-3 years (50.9%). The highest rate of children's admission due to poisoning was in the winter (30.8%). The most common causes of poisoning included drugs (65.2%), kerosene (7.1%), and food poisoning (5.4%). The most common poisoning drugs, included benzodiazepines (21.9%), gastrointestinal drugs (19.9%), opioid analgesics (15.1%). The most prevalent drugs were methadone, metoclopramide, and clonazepam. At admission, the most common presenting symptoms were neurological (51.3%), and gastrointestinal symptoms (38.4%).

**Conclusion:** High prevalence of poisoning with groups of drugs mentioned could indicate community-wide excessive use of these drugs, as well as negligence of families in keeping them out of children's reach. Therefore, raising knowledge and awareness about variety of poisoning and how to prevent them, through holding workshops, national media, schools, and health centers can be a valuable step toward upkeep of children's health.

**Keywords:** Children, Epidemiology, Poisoning.

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## INTRODUCTION

In many countries, poisoning is a major public health hazard and the most common cause of hospital admissions [1]. Epidemiological studies on poisoning in children have found that the most common risk factors in exposure to poisons include young age, female gender, low education level of patients and family members, and low socioeconomic status [2]. Although poisoning is considered a global problem, the nature of the poisoning in developed and developing countries is different, due to the variation in access to poisonous substances. Access to poisonous substances depends on demographic characteristics, social beliefs and customs, education, economic status of family, and ease of access to opium and drugs [3].

Therefore, cultural, social, and economic characteristics, access to medical facilities, and quality of services affect the pattern of poisoning and its consequences [4]. Various substances can cause poisoning in children, and according to studies conducted, these substances vary from one part of the world to the next. In many studies, drugs have been presented as the most common cause of poisoning in children [1, 5-8]. Other studies have reported organophosphorus pesticides in farming [3], pesticide [9] neurological system drugs and cleaning products [2], and kerosene [4,10, 11] as the most common causes. Knowledge of regional poisoning epidemiology can play an important role in planning for prevention, care and treatment of patients. To date, no study has been conducted in

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Arak, and there is no information on the prevalence of poisoning and its types. Thus, determining the poisoning pattern in this area can be an effective step toward prevention, early diagnosis, effective treatment, and subsequent reduction in mortality rate due to poisoning.

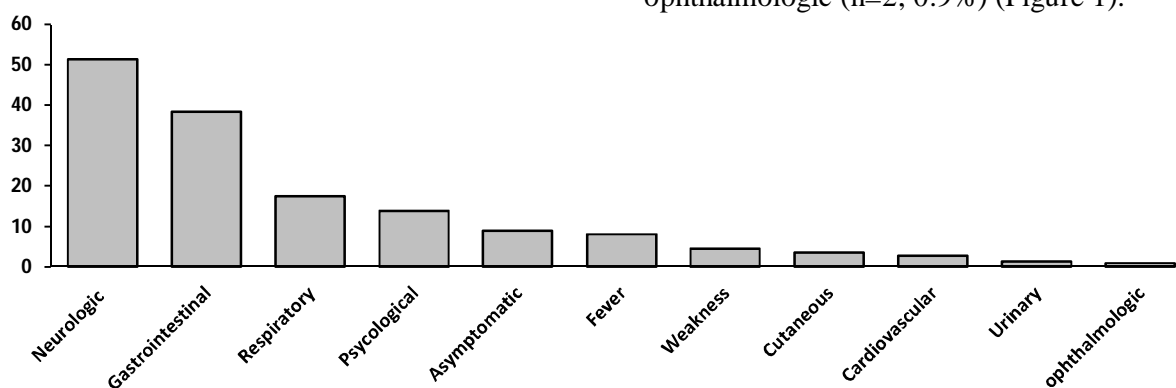
This study was conducted to determine the characteristics of acute poisoning epidemiology in children attending pediatric wards of Amirkabir Hospital in Arak during five years (March 2008 to March 2012).

## MATERIALS AND METHODS

This descriptive cross-sectional study was conducted on all children admitted for acute poisoning to the pediatric wards of Amirkabir Medical Center in Arak during the 5 years from March 2008 to March 2012. In this study, all children with acute poisoning diagnosis were investigated and those with non-definitive diagnosis were excluded. Data were retrospectively collected from patients' files. Acute poisoning epidemiology was categorized according to age, gender, symptoms at admission, child's or others' role, poisonous substance, duration of hospitalization, season, and outcome. After obtaining approval of Ethics Committee of Arak University of Medical Sciences, study team members attended medical documents department of Amirkabir teaching hospital, and examined files of children diagnosed with acute poisoning. Required data were extracted from patients' files using data register form, and analyzed with SPSS-16 software.

## RESULTS

A total of 224 children with acute poisoning had been admitted to pediatrics wards of



**Figure 1.** Relative frequency distribution of children with acute poisoning according to clinical symptoms.

Amirkabir Medical Center in Arak during a five-year period from March 2008 to March 2012.

## Gender and Age

Of all children, 123 (54.9%) were boys and 101 (45.1%) girls, with mean age  $3.54 \pm 2.99$  years, and with 114 children (50.9%) the most common age range was 1-3 years. The youngest and oldest children were aged 0.01 and 17 years, respectively (Table 1).

**Table 1.** Frequency distribution and percentage of children with acute poisoning, according to age.

| Age (years) | N (%)     |
|-------------|-----------|
| <1          | 18(8)     |
| 1-3         | 114(50.9) |
| 4-6         | 58(25.9)  |
| 7-12        | 26(11.6)  |
| 13-17       | 8(3.6)    |
| Total       | 224(100)  |

## Exposure Season

With 69 (30.8%) children, the highest rate of admission for acute poisoning was reported in Winter, and next were Autumn ( $n=65$ , 29%), Summer ( $n=53$ , 23.7%), and Spring ( $n=37$ , 16.5%) respectively.

## Clinical Symptoms

Studying clinical symptoms showed 20 patients (8.9%) were asymptomatic. The most common symptoms included neurological ( $n=115$ , 51.3%), gastrointestinal ( $n=86$ , 38.4%), respiratory ( $n=39$ , 17.4%), psychological ( $n=31$ , 13.8%), fever ( $n=18$ , 8%), weakness ( $n=10$ , 4.46%), cutaneous ( $n=8$ , 3.6%), cardiovascular ( $n=6$ , 2.7%), urinary ( $n=3$ , 1.3%), and ophthalmologic ( $n=2$ , 0.9%) (Figure 1).

The most common neurological symptoms (51.3%) were changes in consciousness level (n=70, 31.3%) and extrapyramidal symptoms (n=19, 8.4%). Among gastrointestinal symptoms (38.4%), the most common was nausea and vomiting (n=67, 30%), and the most common respiratory symptom (17.4%) was coughing (n=20, 9%). The most common psychological symptom (13.8%) was agitation (n=21, 9.4%).

### Poisonous Substance

The most common causes of poisoning included: drugs (n=146, 65.2%), kerosene (n=16, 7.1%), food (n=12, 5.4%), bleaches (n=9, 4%), methamphetamine (n=7, 3.1%), rodenticides (n=6, 2.7%), herbal (n=5, 2.2%), unknown (n=5, 2.2%), opium (n=3, 1.3%), drain cleaning solution (n=3, 1.3%), and Insecticides (n=2, 0.9%). Of the 224 children, 159 (71%) lived in the city, and the rest lived in rural areas. All children poisoned with rodenticides were from rural areas, and all children poisoned with bleaches (n=9) and drain cleaning solution (n=3) were from urban areas (Table 2).

**Table 2.** Frequency distribution and percentage of children with acute poisoning according to poisonous substance.

| Poisonous substance     | Urban<br>N(%) | Rural<br>N(%) | Total<br>N(%) |
|-------------------------|---------------|---------------|---------------|
| Drugs                   | 110(49.1)     | 36(16.1)      | 146(65.2)     |
| Kerosene                | 6(2.7)        | 10(4.4)       | 16(7.1)       |
| Food                    | 8(3.6)        | 4(1.8)        | 12(5.4)       |
| Bleacher                | 9(4)          | 0(0)          | 9(4)          |
| Methamphetamine         | 5(2.2)        | 2(0.9)        | 7(3.1)        |
| Rat poison              | 0(0)          | 6(2.7)        | 6(2.7)        |
| Herbal                  | 3(1.3)        | 2(0.9)        | 5(2.2)        |
| Unknown                 | 4(1.8)        | 1(0.4)        | 5(2.2)        |
| Opium                   | 2(0.9)        | 1(0.4)        | 3(1.3)        |
| Drain cleaning solution | 3(1.3)        | 0(0)          | 3(1.3)        |
| Insecticides            | 1(0.4)        | 1(0.4)        | 2(0.9)        |
| Others                  | 8(3.6)        | 2(0.9)        | 10(4.6)       |
| Total                   | 159(71)       | 65(29)        | 224(100)      |

The most common type of poisoning in children was drug poisoning. Type of drug was unknown in 18 (12.3%) out of 146 children poisoned with drugs. Common drug groups in poisoning of children included benzodiazapines (n=32, 21.9%), gastrointestinal (n=29, 19.9%), opioid analgesics (n=22, 15.1%), and phenothiazine (n=6, 4.1%). Also, each of the following drug groups is reported to have

poisoned 4 children with prevalence of 2.7%: anticonvulsants, antidepressants, antihistamines, penicillins, and anticoagulants. In terms of drug type, the most common were: methadone (n=22, 15.1%), metoclopramide (n=20, 13.7%), and clonazepam (n=15, 10.3%).

### Number of Hospitalization Days and Poisoning Outcome

Mean number of children's hospitalization days was  $1.33 \pm 0.69$  days. Minimum hospitalization was reported 1 day and maximum 4 days. Two patients (0.9%) poisoned with drain cleaning solution had complications, and were transferred to Tehran for further treatment, the rest were discharged without complications (n=222, 99.1%).

### DISCUSSION

In this study, most cases of poisoning in children under 5 years (78.6%) were caused by taking poisonous substances inadvertently. Also, the most common patients' age range was 1-3 years old. This result is in line with results obtained in Zahedan (86.8%, under 5 years), Isfahan (89.5% under 6 years, and 44.6% 1-3 years old), and Shiraz (45.5%, between 8 months old and 5 years) [5, 6, 12]. Similar results have been reported in developed and developing countries [1,7,10]. One of the reasons for these results could be children's (1-3 year-old) tendency to put things in their mouths. In this age group, children are exposed to drug poisoning because of their activity and curiosity also they cannot distinguish the substances. Special attention of parents and child-minders to this age group is necessary. The findings of a study indicate that the nature of the caregiver-child relationship and caregiver attributes play an important role in poisoning risk in children aged 1-3 years [13]. Thus, for prevention, more emphasis should be placed on education of parents and child-minders.

Of 224 patients, 123 (54.9%) were boys and the rest (45.1%) were girls, thus boy to girl ratio was 1.2:1. Results of studies in Pakistan also agreed with the present study results [14]. In a study in Shiraz boy:girl ratio was 1:2 [12].

Children are easily exposed to drug poisoning. Quick and easy access to drugs, not knowing adverse outcomes and unruly consumption are among causes of drug

poisoning. Drug poisoning is the most common type of poisoning in children (65.2%). In many studies, drugs are presented as the most common cause of poisoning in children [1, 5-8, 15, 16]. In this study, common drug groups in child poisoning included: benzodiazepines (21.9%), gastrointestinal (19.9%), and opioid analgesics (15.1%), and common drugs included methadone and metoclopramide. Results of a study in Spain showed that drug ingestion was involved in 54.7% of cases (paracetamol was the most common drug) [17]. In a study in Taiwan, the most common drug groups were neurological system agents (52.2%), analgesics (17.9%), and respiratory system agents (7.5%) [2]. In a study conducted in Kosovo on children with acute poisoning in special care unit, the most common drugs used were benzodiazepine and metoclopramide [18]. In the present study, high prevalence of drug poisoning with benzodiazepines, methadone, and metoclopramide could indicate excessive use of these drugs in the study population and negligence of families in safe-keeping them. Educating parents or child-minders in relation to safe-keeping medications seems necessary.

In the present study, 15 (10.3%) cases of drug poisoning related to lack of parents' or child-minders' knowledge that used drugs without doctor's prescription or overdosed. The most common drug that caused children poisoning due to parents' or child-minders' negligence was metoclopramide. Thus, the need for education is deeply felt in relation to medication treatment when hospitalized and discharged from hospitals, clinics, doctor's offices, and pharmacy. In the present study, only 8.9% of patients were asymptomatic. The most common symptoms were neurological (51.3%) and gastrointestinal (38.4%), and the most common neurological symptoms were changes in consciousness level and extrapyramidal symptoms, and the most common gastrointestinal symptom was nausea and vomiting. In a study in Isfahan, neurological (42.6%) followed by gastrointestinal (22.2%) symptoms were the most common symptoms children presented, and only 14.9% showed no symptoms [6]. In another study, the most common symptoms reported were nausea and vomiting (42.3%) followed by reduced consciousness level (18.1%) [7]. Results of the

above studies are similar to those in the present study. In a study in Hong Kong, 68% of patients were asymptomatic, and in symptomatic ones, the most common symptoms were gastrointestinal (52%) and neurological (44%) symptoms [19]. In another study, the most common symptoms reported were respiratory symptoms (62.8%) [11]. One of the causes of variations in clinical symptoms of patients could be the type of poison and amount taken by children. In the present study, the most common symptom in patients poisoned by kerosene was respiratory symptom, in those poisoned by metoclopramide, the most common symptom was extrapyramidal, and in those poisoned by methadone, impaired consciousness was the most common.

## CONCLUSION

The present study showed the high prevalence of drug poisoning among children. Poisoning with benzodiazepine, methadone, and metoclopramide is considered a warning sign in acute poisoning in childhood. Enhancing knowledge and awareness through setting up workshops, national media, schools, health and medical centers about types of poisoning and how to prevent and deal with them can be a valuable step in maintaining children's health. Drugs should be stored out of reach of children. A study in Brazil showed that storage of drugs lower than 150cm increase the chances of drug poisoning in children [20]. Based on the present study results, the following recommendations are made:

- Pharmaceutical companies should make their packaging child proof.
- In preventative, treatment and care of poisoning, nursing and other medical staff, child, family, child-minders, and society should be paid to attention.
- Parents and child-minders should be educated on keeping drugs away from children, correct use of drugs, and not taking them without doctor's prescription, by medical and care personnel.
- Considering dangerous side-effects of drain cleaning solutions, safety measures by producing companies or change in composition of these solutions appear necessary.

- Finding the root causes of drug poisoning can provide basis for further studies.

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