Pattern of acute poisonings in childhood in Ankara: what has changed in twenty years?

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Poisoning represents one of the most common medical emergencies in childhood, and epidemiological properties differ from country to country. Thus, special epidemiological surveillance for each country is necessary to determine the problem according to which preventive measures can be taken. The purpose of this study was to clarify the characteristics of acute poisoning cases admitted to a pediatric referral hospital. All poisoned patients under 17 years of age, except for cases food poisoning, presenting to the Emergency Department (ED) from January 1995 to December 2000 were determined. The information about each case was recorded on standardized forms and a retrospective chart review survey was done. Complete epidemiological and clinical data were obtained for 489 patients. The mean age of all poisoned patients (mean ± standard deviation) was 5.96±4.87 years, and the age range was 0.01 to 17 years. Three hundred and thirty-one children, forming 63.6% of all patients, were under five years of age. Slightly more boys (52.3%) than girls were intoxicated at ages less than 10 years, after which more girls (79%) than boys were involved. The majority of all cases were due to accidental poisoning (78.1% of all poisonings) which occurred mostly in children under five years of age (73.3%). While accidental poisonings (97.1%) were the most common mode of poisoning between 1-5 years, self-poisonings (67.3%) had the highest ratio in cases over 10 years of age. In patients younger than one year of age, 74.2% of all poisonings were due to therapeutical error. Drugs were the most frequent offending agent (57.7%), followed by ingestion of a caustic/corrosive substance (16.8%) and carbon monoxide (CO) intoxication (9.4%). Analgesics were the most common agents, forming 23.7% of all poisonings due to drugs, followed by ingestion of multiple drugs and tricyclic antidepressants at ratios of 21.6% and 9.6%, respectively. The most common route of poisoning was ingestion of the poison (437/489 patients, 89.4%) and most were ingested inside the house (93.3%). About half of all poisoned patients (50.9%) were admitted to the ED within the first two hours of ingestion, and gastric lavage was performed on about half of the poisoned children (48.7%). In most of the cases, hospital treatment was non-specific, including general measures of decontamination and supportive-symptomatic therapy. During the six-year study period, two patients were lost due to acute poisoning, yielding an overall mortality rate of 0.4%.

While most of the poisonings were due to accidental ingestions in infancy and primary school ages without sex predilection, the incidence of self-poisonings, especially in girls, was found to be increased. Analgesics, tricyclic antidepressant drugs (which seemed to form a new and dangerous group) and caustic/corrosive substances were the most commonly ingested agents. The early awareness of poisoning and appropriate therapeutic measures taken seemed to be efficacious with a very low mortality rate. The epidemiological and preventive properties of childhood poisonings should be further searched by prospectively designed multicentered studies throughout our country.

Key words: poisoning, childhood, drugs, caustic/corrosive substance.

In spite of the success of some interventions to prevent accidental or suicidal poisoning in the pediatric population, toxic ingestions continue to be a common occurrence. According to the American Toxic Exposure Surveillance System, more than 2.2 million poison exposures were reported in 1998, of which 1.5 million were children[1]. Therefore, the pediatrician is often faced with the need to determine the likelihood of toxicity and to initiate appropriate interventions.

The pattern and main risks of acute poisonings change with time according to age, and they differ from country to country[2-6]. Thus, epidemiological surveillance specific for each country is necessary to determine the extent and characteristics of the problem, according to which related preventive measures can be taken. Epidemiological data on poisonings in Turkey are extremely limited[7-9].

The present retrospective study describes the epidemiology of a pediatric population with accidental and suicidal poisonings admitted to the Emergency Department of Hacettepe University Children's Hospital during a six-year period. The purpose of this study was to describe the epidemiology, pattern, duration and the results of the treatment of poisoned patients who were admitted to a pediatric referral hospital.

Material and Methods

All poisoned patients under 17 years of age, except for cases of food poisoning, presenting to the Emergency Department (ED) from January 1995 to December 2000 were determined from doctor's lists, ED and police records about criminal cases. The information about each case was recorded on standardized forms, and a retrospective chart review survey was performed. For statistical analysis, Fisher's exact χ^2 test was used where appropriate and a p value less than 0.05 was accepted to be significant.

Results

Six hundred and fifteen patients applied to the hospital due to acute poisonings during the study period. However, due to an improper registration system, complete epidemiological and clinical data were obtainable only for 489 patients. During the study period, the mean number of patients using acute care facility of the hospital annually was 30,147. Thus, the poisoned patients represented 0.34% (615/180,882) of overall ED visits in this period.

Age and Sex

The mean age of all poisoned patients (mean ± standard deviation) was 5.96 ± 4.87 years and the age range was 0.01 to 17 years. Three hundred and thirty-one children, forming 63.6% of all patients, were under five years of age and 280 of them (57.3% of all patients) were between 1 and 5 years of age. One hundred and twenty-four patients were over 10 years of age (25.3% of all patients) (Fig. 1).

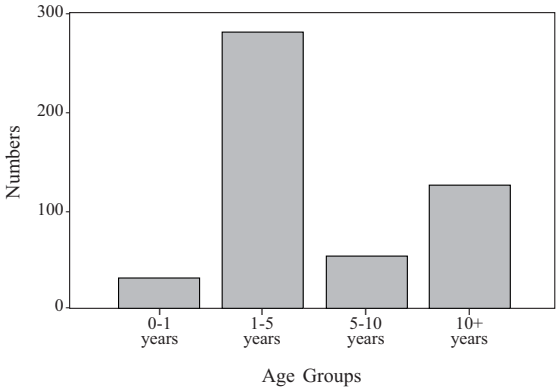

Fig. 1. Age distribution of poisoned children.

There were more female than male patients (55.6% vs 44.4% respectively). When we examined sexual distribution according to age groups, slightly more boys (52.3%) than girls were intoxicated at ages less than 10 years, after which more girls (79%) than boys were involved (Fig. 2). In the poisoned patients over 10 years of age, female to male ratio was significantly higher when compared with the other age group (χ^2=37.61, p=0.000).

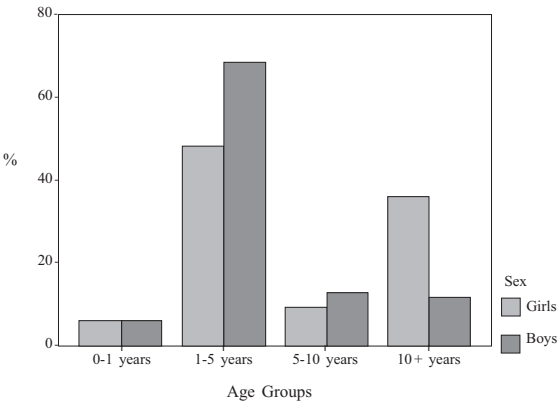

Fig. 2. Frequency distribution of acute poisonings according to age groups and sex.

Mode of Poisoning

Table I shows the mode of poisonings according to age groups. The majority of cases were due to accidental poisoning (78.1% of all poisonings), 73.6% (281/382) of which occurred in children under five years of age.

Under one year of age, 71.0% (22/31) of all poisonings were due to therapeutical error, due to either faulty prescriptions or dosaging by physicians and/or families. Between 1-5 years of age accidental poisonings (99.3%) and over 10 years of age self-poisoning (63.7%) had the highest ratio as expected (Table I). When the mode of poisoning was compared according to age groups, differences between groups were statistically significant ($\chi 2=306.13$, $p=0.000$).

Agents Involved

The frequency distribution shows that drugs were the most frequent offending agent (57.7%) followed by ingestion of a caustic/corrosive substance (17.2%) and carbon monoxide (CO) intoxication (9.4%) (Fig. 3).

The most common drugs were analgesics, accounting for 23.7% of all poisonings due to drugs. Ingestion of multiple drugs and tricyclic antidepressants followed, at ratios of 21.6% and 9.6%, respectively (Table II). Paracetamol (45% of all analgesics) and amitriptyline

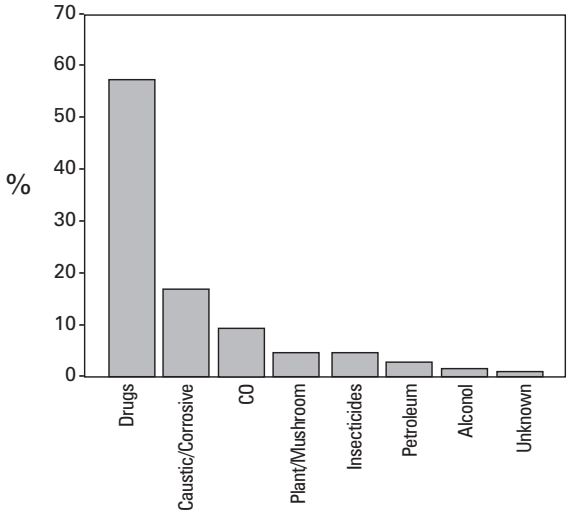

Fig. 3. Distribution of major substances involved in poisonings in children.

Table I. Mode of Acute Poisonings According to Age Groups

	Mode of poisonings			
Age (years)	Accidental Number (%)	Self-poisoning Number (%)	Therapeutic Error Number (%)	Total Number (%)
0-1	9 (29)	0 (0)	22 (71)	31 (100)
1-5	278 (99.3)	0 (0)	2 (0.7)	280 (100)
5-10	52 (96.2)	1 (1.8)	1 (1.8)	54 (100)
10+	43 (34.7)	79 (63.7)	2 (1.6)	124 (100)
Total	382 (78.1)	80 (16.4)	27 (5.5)	489 (100)

Table II. Major Drugs Involved According to the Mode of Poisoning

Drugs	Accidental poisoning	Self-poisoning	Therapeutic error	Total occurrence number (%)
Analgesics	52	15	0	67 (23.7)
* Paracetamol	23	7	0	30 (10.6)
* Salicylates	16	6	0	22 (7.8)
* Others and NSAID	13	2	0	15 (5.3)
Barbiturates	2	1	7	10 (3.6)
Other anticonvulsive drugs, sedative and hypnotics	6	4	6	16 (5.7)
Tranquilizers	0	1	2	3 (1.0)
Neuroleptics	8	1	1	10 (3.6)
Tricyclic antidepressants	18	8	1	27 (9.6)
Cardiovascular drugs	13	3	0	16 (5.7)
Anticholinergics	1	2	0	3 (1.0)
Myorelaxants	7	0	0	7 (2.5)
Endocrine drugs	6	0	1	7 (2.5)
Bronchodilators and antitussives	2	1	0	3 (1.0)
Antiemetics	2	0	2	4 (1.4)
Antibiotics	6	2	0	8 (2.8)
Multiple drugs	24	36	1	61 (21.6)
Other drugs	23	4	1	28 (10)
Unknown	11	1	0	12 (4.3)
Total	181	79	22	282 (100)

(NSAID=non-steroidal antiinflammatory drug).

(Laroxyl®) were the most common ingested analgesic and tricyclic antidepressant drugs. In 59% of patients with multiple drug ingestion, the mode was self-poisoning.

The high ratio of therapeutic error, 70% (7/10) and 37.5% (6/16), respectively, of all poisonings due to barbiturates versus other anti-convulsive, sedative and hypnotic drugs, was also noticeable (Table II).

Seasonal Distribution

When the seasonal distribution pattern of poisonings was considered, an excess of poisoning in spring (32.7% of all poisonings) was observed. Frequency of poisonings in other seasons was similar (in summer, winter, and autumn as 23.1%, 22.3% and 22.9% of all patients, respectively (Fig. 4). The frequency of poisoning in spring was significantly higher than the other seasons when statistically compared ($\chi 2=15.69$, $p=0.001$).

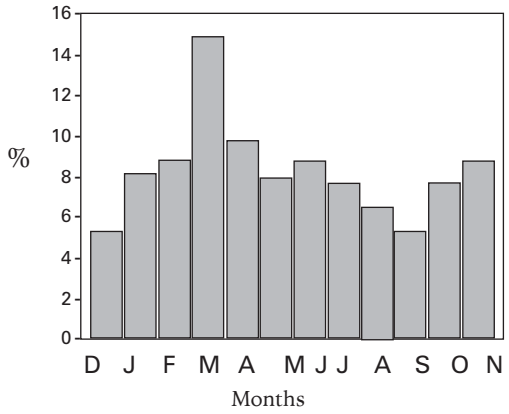

Fig. 4. Seasonal distribution of acute poisonings.

The Route and Place of Poisoning

The majority of all patients (456/489) (93.3%) were inside the house, while 28 patients (5.7%) were outside the house (e.g. in garden, school, disco...) during the event of poisoning. Interestingly, five patients were in a hospital or in a private health service when they were poisoned as a result of over dosages of drugs.

The most common route of poisoning was the ingestion of poison (437/489 patients, 89.4%). Poisoning due to inhalation as CO poisoning was the second most common route (48/489, 9.8%). In the other four patients poisoning was via a parenteral injection (intramuscular or intravenous).

Time Elapsed Before Admission

It was seen that 50.9% of all poisoned patients presented to the ED within the first two hours and 82.4% in the first six hours following poisoning.

Twenty percent of all patients underwent mechanical emesis; 9% were given yoghurt or milk as first-aid treatment at home before admission to the hospital.

Treatment and Duration of Stay in the Hospital

One hundred and fifty-one patients (30.9% of all poisonings) were observed and treated in the ED, 228 patients (46.6%) were admitted to the Intensive Care Unit, and 82 patients (16.8%) were treated in the pediatric surgery wards. The remaining 28 patients were referred to other hospitals due to over-capacity.

In most of the cases, hospital treatment was non-specific, including general measures of decontamination and supportive-symptomatic therapy. However, specific antidotes such as N-acetylcysteine, thiamine, physostigmine, atropine, pyridoxine, naloxone and deferoxamine were given to 35 patients in total (7.2% of all patients) when indicated.

Gastric lavage was performed on about half of the children (48.7%) who ingested poison. Activated charcoal treatment, with 30% receiving multiple dosages, was given to more than half of the patients (55.1%). Invasive methods to enhance the elimination of toxins, such as hemodialysis, peritoneal dialysis, exchange transfusion and plasma exchange, were used in eight patients during the treatment.

Esophagoscopy was performed on 82 patients who ingested a caustic/corrosive substance and demonstrated esophageal burns in 28 and esophageal perforation in two patients. Gastrostomy and multiple esophageal dilatations were performed in 14 (17.0%) and 16 (19.5%) patients, respectively, with caustic/corrosive substance ingestion. Colon interposition was performed in two patients with esophageal perforation.

The mean duration of hospitalization, except for cases with caustic/corrosive substance ingestion, was 3.23 ± 2.05 days and the range was 1 to 25 days, including the day of admission.

Mortality

During the six-year study period, two patients were lost due to acute poisoning, yielding an overall mortality rate of 0.4%.

One of these patients was a three-year-old girl who ingested an unknown drug 12 hours prior to application. On admission, she was unconscious with a shallow and irregular respiration, and developed cardiopulmonary arrest within 10 minutes and was unresponsive to the intensive resuscitation.

The other patient was a nine-month-old boy admitted to ED unconscious one hour after ingestion of several Gamaflex® (phenprobamate) tablets prescribed for treatment of musculoskeletal disease of grandmother. Hemodialysis was performed, but the patient died at 12 hours of admission.

Discussion

Identification and documentation of epidemiological aspects and other variables in childhood poisonings are of great importance for treatment plan and determination of proper preventive measures. However, it is very difficult to estimate the total number and epidemiology of childhood poisonings in Turkey as well as in most other developing countries, due to the lack of centralized data collection.

Hacettepe University Children's Hospital in Ankara is the biggest referral hospital for children in Turkey. This study although single-hospital based as were the previous studies from our country[7-9], gives a general idea about the epidemiology of childhood poisonings. Also, the results of this study can be compared with a previous one, which examined hospitalized patients with poisoning from 1975-1984 in the same hospital[8], to determine differences in the profile of childhood poisonings approximately 20 years, later.

First, the total annual number of poisoned patients admitted to the hospital and the ratio of the patients coming from other cities declined dramatically during this interval. It does not actually mean that the incidence of childhood poisonings decreased in general. One reason for the decline may be the direct co-operation of families or doctors with Poison Information Centers, which were established in 1986, enabling some poisoned patients to be treated outside the hospital environment. The significant decrease in the ratio of admitted patients from cities other than Ankara can also be explained by the current availability of treatment in other cities and in rural areas. The shorter elapsed time before admission seen in this study when compared to the previous one could be due to the decreased ratio of patients coming from other cities and to the, education of the population about poisonings.

Although accidental poisonings were the leading cause in both studies from our hospital, the increase in the incidence of self-poisonings was remarkable in our study as in the world[10-16]. On the other hand, when the two periods were compared, the incidence of therapeutical error as a cause of poisoning decreased significantly, which is probably due to the increased skill of the population regarding drug usage. However, this study showed that being a child between 0-1 year of age and the necessity for chronic drug usage like anti-convulsants still increase the risk of poisonings due to therapeutical error, in spite of the decrease seen in the overall incidence.

Children younger than five years of age accounted for more than half of the patients (1975-1984, 60.4% and 1995-2000, 63.6%) in both studies. In this age group, males were predominant, and accidental poisoning 881% and 90% in 1975-1984 and 1995-2000 periods, respectively) was the most common mode of poisonings. After 10 years of age, self-poisonings were the leading cause, with females predominant. As a result, age and sex distributions of patients were similar in both periods, which is comparable to the literature[10-16].

Today, it is known that gastric lavage should not routinely be employed[17]. There is no definite evidence that it improves outcome, and it may cause significant morbidity[17]. It should be considered only within the first 60 minutes of ingestion and in cases where a potentially life-threatening amount of poison was ingested[18]. Gastric lavage was performed on about half of the poisoned patients in this study, although only about this number of patients had applied to the ED within the first two hours of ingestion. It was thus concluded that gastric lavage had been traditionally over-performed.

In general, the treatment modalities were mostly supportive and completed uneventfully except for the two lost patients admitted in a severe clinical condition, accounting for the 0.4% mortality rate in this study.

As in the literature[6,11-13,16], drugs were the most common agents in acute poisonings. Although analgesics were the leading drugs in both periods, multiple drugs and tricyclic antidepressant ingestions (which formed dangerous groups), had significantly higher ratios when compared to the first period (5.9 vs 21.6% and 4.0 vs 9.6%, respectively). Caustic-corrosive substance ingestion also showed about a ten-fold increase in the second period (1.8 vs 16.8% respectively). This most probably resulted from the storage of many drugs and household chemicals within easy reach at home.

There was a significant decrease in the mortality rate due to acute poisonings, from 7.6% to 0.4%, over the twenty years. Although there was an increased tendency to over-perform gastric lavage in our center, it may be one of the underlying causes of the low incidence of fatal cases if it was applied in a timely and appropriate manner.

In conclusion, the establishment of Poison Control Centers, early co-operation between families and physicians, the higher intelligence of parents in correctly administering prescriptions, and increased awareness of poisoning are the promising advances in the scope of our center. However, the increased incidence of the cases of self-intoxication as seen throughout the world highlights the need for some additional measures to be taken from the pharmaceutical, individual and sociological points of view.

Child-resistant containers for drugs and other household products in one of the most important interventions in the reduction of childhood poisoning incidence. On the other hand, public education about poisoning, which is of major importance, should be provided. Also, especially for the sake of the infant age group, the dosage of each drug preparation should be carefully designed by the drug industry, and prescribed and defined by the physicians.

Prospectively designed multicentered studies are needed to reflect the epidemiological properties of childhood poisonings throughout our country, and would be very valuable for the determination of preventive measures.

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