

UNINTENTIONAL POISONING WITH DRUGS IN A MEXICAN PEDIATRIC POPULATION

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ABSTRACT

In Mexico, more than 70 % of acute pediatric poisoning is caused by medications. The age groups at greatest risk of drug poisoning are those between 2 to 5 years and 14 to 18 years; although in this last group, drug ingestion is usually intentional. The purpose of our study was to determine the frequency of unintentional drug poisoning in the pediatric population in a tertiary care hospital in Mexico, and to review the treatment procedures applied in specific cases. A retrospective and descriptive study was performed through revision of clinical records, obtained from patients at the National Pediatrics Institute from January 1995 to June 2005. One hundred and thirty nine (139) records, 62 females and 77 males, median age 2 years with a clinical diagnosis of drug poisoning were reviewed. Poisoning was confirmed in 23.7% of the cases by determination of drug plasma concentration. The most frequent causes of drug poisoning were analgesics (42.3 %), from which 60 % corresponded to acetylsalicylic acid and 40 % to acetaminophen; antiepileptics (22.9 %), anxiolytics (17.9 %) and other drugs (16.3 %). From our results, we concluded that self-medication was unlikely due to the early age of patients, unless ingestion of the drug was accidental. No case needed more than 24 h of hospitalization, and no patient died due to poisoning. Dosing errors that result in unintentional poisoning are a major concern with the use of drugs in infants and young children.

Key Words: *Children; drug poisoning; analgesics; antiepileptics; anxiolytics; emergency*

In Mexico, more than 70 % of acute pediatric poisoning is caused by medications.¹ According to a report from the American Association of Poison Control Centers (AAPCC), children younger than 6 years of age are accidentally exposed medication, often because they put into their mouth practically everything they lay their hands on.² The age groups at greatest risk of drug poisoning are those between 2 to 5 years and 14 to 18 years; although in this last group, drug ingestion is usually intentional.³ Analgesics i.e. acetylsalicylic acid and acetaminophen, have been reported among the drugs commonly used in the pediatric population that commonly cause poisoning.⁴ These drugs are usually available to the general public, since they are not controlled, and are found in most drug stores. Other studies have reported drug poisoning with antiepileptics, such as phenytoin, carbamazepine, phenobarbital

and valproic acid⁵, i.e. benzodiazepines have been involved in both unintentional and intentional poisoning.⁴

Drug poisoning has also been reported to occur with antihistamines such as chlorphenamine, diphenhydramine and astemizole.^{6,7} Similarly, digoxin is a drug that causes many poisonings due to the narrow margin between therapeutic and toxic plasma concentrations, which start at 3.0 ng/mL.⁸

To study the drugs that most frequently produce poisoning in the pediatric population is important for all clinical situations, and adequate intervention by the treating physician is required. Unfortunately, there are few studies on this topic not only in pediatric population but also in the general population. We set as objectives of this study to determine the frequency of unintentional drug poisoning in the pediatric population attended at a Mexican tertiary care hospital over a period of ten

years and to review the treatment procedures applied in specific cases.

METHODS

The study was performed at the National Pediatrics Institute (INP, for its initials in Spanish), a tertiary care hospital and a major children's medical center in Mexico City. The institute, with about 8,000 inpatients, conducts approximately 200,000 consultations, does more than 6,000 surgical interventions, and performs 500,000 laboratory tests each year. A significant percentage of the patients have chronic and complex diseases, and a small number are admitted due to acute conditions. Many patients require multiple treatments, hospitalization, and subsequent follow-up, some of which are long term. INP admits children who require specialist attention in all medical areas, including patients

with suspicion of poisoning. The present study included all cases reported as unintentional drug poisoning, from January 1995 to June 2005. We defined as unintentional drug poisoning as an accidental intake of drug due to a mistake in dosage.

The records of the patients diagnosed with drug poisoning were obtained from a database of the Clinical Record Department. All diagnoses were established according to the International Statistical Classification of Diseases and Related Health Problems.⁹ Demographic data of patients such as age and gender were considered for later analysis. It was important to detect the drug that caused the poisoning; the respective treatment and the severity of the injury (*see* Table 1).

Plasma concentrations found in the files were registered. Results were analyzed based on the frequency of poisoned children.

TABLE 1 Treatment measures used for unintentional drug poisonings^a

Drug class	Treatment	% of poisoned children
Analgesics	Gastric lavage	26.5 % (37 cases)
	Activated charcoal	
	N-acetylcysteine ^b	
Anxiolytic agents	Gastric lavage	10 % (14 cases)
	Activated charcoal	
	Flumazenil ^c	
Antiepileptic agents	Therapeutic Drug Monitoring	23 % (32 cases)
	Neurological monitoring	
Positive inotropic agents	Electrocardiographic monitoring	14 % (20 cases)
	Hemodynamic monitoring	

^a In 33/139 cases, children required the use of a specific antidote and plasma concentrations of the drug were measured; ^b For cases poisoned with acetaminophen; ^c For cases poisoned with diazepam.

RESULTS

One hundred and thirty nine (139) records, with a clinical diagnosis of unintentional drug poisoning according to the International Statistical Classification of Diseases and Related Health Problems were reviewed. Of the pediatric population included in the study, 122 were healthy children, 12 presented with epilepsy, and 5 with congestive heart failure as the underlying disease. Poisoning was present in a varying age range running from 7 days to 13 years of age, with a median of 2 years, 62 were females and 77 males. Of all the cases, only 21 children had a self administered accidental overdose.

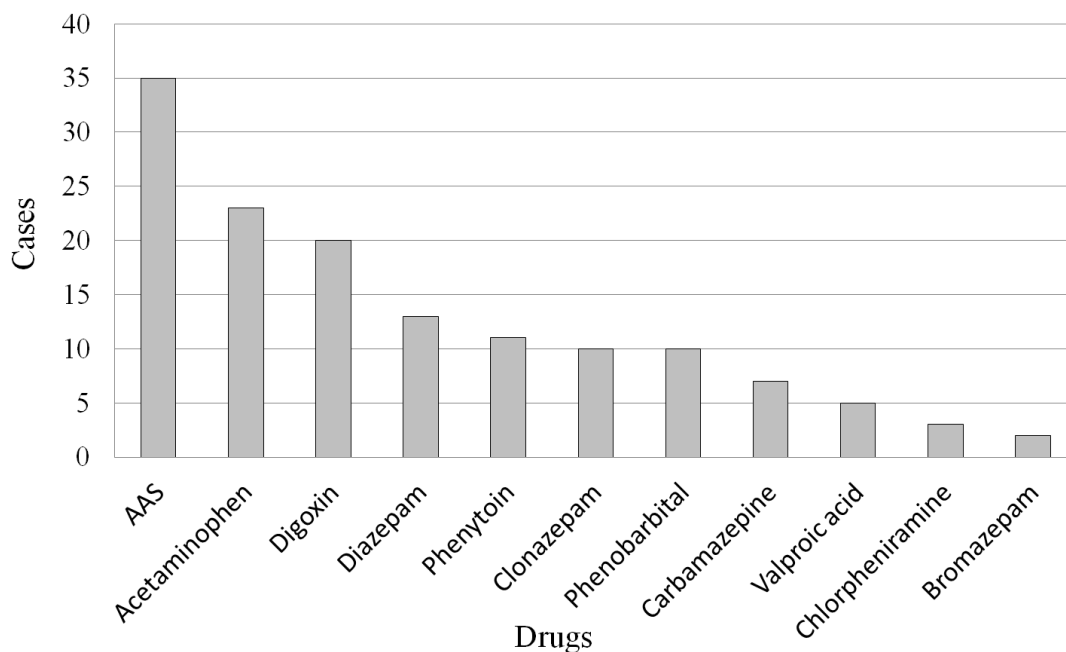
Considering the patient's age, we found that children younger than 2 years old, representing 49.6% of the studied population, were the most vulnerable to drug poisoning. This group was followed by children between 2 and 5 years of age, with 38.1 %, followed by those between 6 and 13 years of age with 12.2 %. Therapeutic drug monitoring was carried out in 33 cases (23.7 %) by

measurement of specific drug plasma concentrations.

The most frequently occurring drug was found to be analgesics 42.3 % (59 cases), followed by antiepileptics with 22.9 % (32 cases); anxiolytics with 17.9 % (25 cases); and positive inotropic agents, such as digoxin with 14.3 % (20 cases). Of the analgesics, acetylsalicylic acid accounted for 35 cases and acetaminophen for 24 cases. Of the 24 cases of acetaminophen, 15 were patients under 1 year of age, 6 were 2-5 years old and 3 patients were older than 6 years. Regarding the antiepileptics, phenytoin accounted for 11 cases, phenobarbital 10 cases, carbamazepine 6 cases, and valproic acid for 5 cases. For anxiolytic drugs, diazepam was responsible for 13 cases, clonazepam for 10 cases and bromazepam for 2 cases. These data are shown graphically in Figure 1.

Based on their clinical condition, patients received non-pharmacologic or specific pharmacological treatment in accordance with the culprit drug, the degree of poisoning and the clinical manifestations of each case.

FIG. 1 Frequency of drug poisoning in Mexican children between 1995-2005



In general, and with previous assessment of the drug ingestion route, measures consisted of gastric lavage and administration of activated charcoal. These procedures were performed in 87 cases of analgesic, anxiolytic and antihistamine poisonings. Twenty-two patients who presented with acetaminophen poisoning, which was later confirmed by plasma concentration determination, received N-acetylcysteine as antidote and their hepatic function was assessed before and after the treatment. The 32 patients with antiepileptic drug poisoning and confirmed by clinical diagnosis, were subjected to therapeutic drug monitoring and neurological monitoring. The 20 cases of children with digoxin poisoning required constant electrocardiography and close hemodynamic monitoring. Finally, 11 children poisoned with diazepam received flumazenil as antidote. Table 1 includes the information of treatment measures commonly used in pediatric population.

DISCUSSION

The results of the present study are similar to those reported previously¹⁰, in which analgesics are most frequently involved in accidental poisoning. Among these drugs, acetylsalicylic acid ranked first followed by acetaminophen^{11,12}; both of which are over-the-counter drugs. The population included in the present study with drug poisoning diagnoses, were clinically assessed according to the state of consciousness defined by the Glasgow scale, and to the ABC of resuscitation.

According to the analyzed population, 122 children were healthy and did not require drugs to treat any disease, which indicated that the poisoning was unintentional. Poisoning due to self-medication is not likely because of the young age of the children, and was probably ingested unintentionally. The lack of infant dosages is an important cause of poisonings. Many drugs are only available as adult formulations. Errors in dosing can occur when dose alterations are made. All cases of poisoning at the Institute were reported as unintentional.

Finally, another factor that might have contributed to drug poisoning was that, at early ages, physiological changes due to growth and development are still present, thus the body is sometimes incapable of metabolizing and

eliminating drugs adequately. However, no case needed more than 24h hospitalization, and none of the analyzed patients died due to poisoning. The use of drugs such as analgesics, antiepileptics and anxiolytics must be used carefully in young children.

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