Emergency Medicine: Open Access
ISSN: 2165-7548

Martínez et al., Emerg Med (Los Angel) 2015, 5:6
DOI: 10.4172/2165-7548.1000290

Research Article Open Access

Unintentional Intoxications in Children: Detecting Risks

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Received date: October 08, 2015; **Accepted date:** November 12, 2015; **Published date:** November 19, 2015

Abstract

Introduction: Poisonings are an important problem in children. Identifying risk factors related with unintentional poisonings can help reduce their incidence and severity. The objective of this study was to define the characteristics of unintentional poisonings in children, with particular attention on drugs and household products.

Materials and Methods: Observational retrospective study performed in a Spanish urban maternity and children's hospital from June 2012 to December 2014. We reviewed the computerized clinical history of suspected unintentional poisonings in patients under 18 years old, analyzing epidemiological and clinical variables.

Results: 908 patients consulted due to suspected poisoning; in 558 of them (61.4%) the mechanism was unintentional. Males were 55%, and the median age was 2.5 years (IQR: 1.7-4.4). Drugs represented the most frequent group involved (49.6%) followed by household products (37.1%). The main pharmacological group involved was psychotropic drugs. These were the ones which most often associated clinical symptoms, as well as requiring medical treatment and admission. Dose error was more frequent in poisonings due to analgesics than in other groups. Among household products, the main group involved was caustics. Of the 25 detergents involved, 8 were laundry detergent pods. In 17.9 % of the cases the product was out of its packaging. Three patients presented caustic esophagitis, while 2 of them developed stenosis. None of the patients died.

Conclusions: Although poisonings are not frequent, they represent a high risk and may cause persistent sequelae. It is important to insist on well-known preventive measures like correct packaging and careful written prescription.

Keywords: Intoxications; Unintentional; Children; Drugs; Household products; Prevention

Introduction

Poisonings are a relevant health problem in children. Although they tend to resolve after light, reversible symptomatology, in some cases they can be dangerous for the patient, produce disabling sequelae and even death [1]. Moreover, especially in some cases, healthcare expenses may be enormous. Identifying risk factors related with unintentional poisonings must be a major target for physicians since this can help us to reduce their incidence and severity.

Suspected toxic exposures represent approximately 0.3% of the visits attended in pediatric emergency departments (PED) of Spanish hospitals according to the data reported by the Intoxication Workgroup of the Spanish Pediatric Emergency Society (SEUP) [3]. This percentage has remained practically invariable in recent years [4,5]. The majority of suspected toxic exposures in pediatric age under 12 years old are unintentional [3]. Drugs and household products are responsible for the majority of them [4,5]. The characteristics of pediatric toxic exposures change continuously, especially considering changes in medical prescriptions [6] and with the appearance of new domestic products available in the market [7,8]. In the specific case of unintentional poisonings due to abuse substances, these change according to the distribution pattern of the substances available [9].

There are general prevention measures and regulations, but they may be not enough. Therefore, it is important to understand the epidemiology of the poisonings in order to create preventive measures for these events.

The objective of this study was to define the epidemiological and clinical characteristics of unintentional poisonings in children, with particular attention on drugs and household products.

What is already known on this subject: Suspected toxic exposures in children are a relevant health problem that represents approximately 0.3% of the visits attended in pediatric emergency departments of Spanish hospitals. Drugs and household products are responsible for the majority of them.

What this study adds: Poisonings represent a high risk for children and may cause persistent sequelae. It is important to insist on well-known preventive measures such as correct packaging of toxic substances and careful written prescription of drugs. Learning about new risk factors related to unintentional poisonings in children may allow for the proposal of better preventive measures in the future.

Materials and Methods

Observational retrospective study performed in a Spanish urban maternity and children's hospital attending a catchment area of 300,000 inhabitants which receives about 100,000 visits at the PED per year. The period of the study was from June 2012 to December 2014 (30

months). We selected all the patients that consulted in the PED with either reason for visit or final diagnosis of toxic contact, after which we included those in whom the mechanism was unintentional. We reviewed the computerized clinical history of the patients under 18 years old.

The epidemiological variables analyzed were age, sex, place of the poisoning, toxicological group involved (drugs, household products, ethanol, illegal drugs, gases, metals, plants, and poisonous animals), number of substances involved in the poisoning, and means of transport to the hospital. In drug exposures we also analyzed the mechanism of intoxication (dose error versus other unintentional mechanisms). In the case of domestic products we recorded whether the substance was in or out of its original container.

The clinic variables were presence and kind of symptoms, general management, complementary tests required, need for admission, transfer to another hospital, and clinical evolution. All the variables were analysed from the global sample and separately for drugs and domestic products, which are the most frequent groups of unintentional poisonings in children reported in the literature [10,11].

Each individual PED visit was used for the demographic description, while each substance involved was a unit of the epidemiological analysis (considering that in some cases there was more than one substance involved).

Data analysis was conducted using SPSS software v 20.0 for Windows (IBM Corp., Armonk, NY). Descriptive statistics were reported in terms of absolute frequencies or rates for categorical variables and in terms of median value with interquartile range (IQR: 25th percentile-75th percentile) for continuous variables. The Kolmogorov-Smirnov test was used for the data distribution study. Statistical comparisons were made using Pearson $\chi 2$ test or Fisher's exact test for categorical variables, and Student's t-test or Mann-Whitney U test for continuous variables. The confidence interval (CI) was calculated at 95%. P values less than 0.05 were considered significant.

The study was approved by the ethics committee of the hospital. Since the data were extracted from the registry, the information contained in it was anonymous, and as no intervention was performed on patients, informed consent was not required or requested.

Results

During the study period, 908 patients consulted due to suspected poisoning, representing 0.4% of the total number of visits to the PED. In 558 of them (61.4%) the mechanism was unintentional. Products involved are shown in Table 1. In 40 cases (7.2%) there was more than one toxic substance involved. General epidemiological data are compiled in Table 2.

Product	N (%)	Product	N (%)
Drugs	309 (51.3)	**Household products**	219 (36.4)
Psychotropic drugs	78 (25.2)	Caustics	69 (31.5)
Benzodiazepines	31 (39.6)	Cosmetics or personal care products	32 (14.6)
Antidepressants	11 (14.1)	Detergents	25 (11.4)
Antiepileptic drugs	8 (10.2)	Pesticides	13 (5.9)
Other psychotropics	28 (35.8)	Other cleaning products	25 (11.4)
Analgesics	69 (22.3)	Air fresheners	10 (4.6)
Paracetamol	43 (62.3)	Nontoxic products	8 (3.7)
Ibuprophen	14 (20.3)	Glues	7 (3.2)
Other analgesics	12 (17.4)	Hydrocarbons	6 (2.7)
Anticatarrhals	37 (12.0)	Other household products	24 (11.0)
Cardiovascular drugs	26 (8.4)	**Others**	74 (12.3)
Other drugs	99 (32.1)	Gases	30 (40.5)
Antihistamines	25 (25.3)	Poisonous plants	12 (16.2)
Oral contraceptives	16 (16.2)	Homeopathic/natural products	8 (10.8)
Others	58 (58.5)	Metals	7 (9.5)
		Poisonous animal bites	5 (6.7)
		Ethanol	8 (10.8)
		Illegal drugs	3 (4.1)
		Others/unknown	1 (1.4)

Table 1: Products involved in the 558 visits to the PED due to unintentional poisonings (n = 602).

Characteristic*	Drugs (n=277)	Household products (n=207)	Others (n=74)	Total (n=558)
Age (years)	2.9 (1.9 – 4.6)	2.0 (1.4 – 3.1)	3.8 (1.6 – 7.6)	2.5 (1.6 – 4.4)
Male sex	162 (58.5)	109 (52.7)	36 (48.6)	307 (55)
Place of poisoning				
Parents' residence	174 (62.8)	146 (70.5)	46 (62.1)	366 (65.6)
Other relatives' residence	17 (6.2)	4 (1.9)	0 (0.0)	21 (3.8)
Public area	1 (0.5)	3 (1.4)	11 (14.8)	15 (2.7)
Car	1 (0.5)	2 (1.0)	4 (5.5)	7 (1.3)
Missing information	84 (30.3)	52 (25.1)	13 (17.6)	149 (26.7)
Means of transport to get to the hospital				
Own vehicle	241 (87)	170 (82.1)	45 (60.8)	456 (81.7)
Ambulance	18 (6.5)	21 (10.1)	24 (32.4)	63 (11.3)
Other	1 (0.4)	0 (0.0)	0 (0.0)	1 (0.2)
Missing information	17 (6.1)	16 (7.7)	5 (6.8)	38 (6.8)
Clinical characteristics				

Presence of symptoms	59 (21.3)	85 (41.1)	32 (43.2)	176 (31.5)
Complementary tests performed	108 (39)	99 (47.8)	41 (55.4)	248 (44.4)
Treatment administered	107 (38.6)	42 (20.3)	39 (52.7)	188 (33.7)
Hospital admission	41 (14.8)	45 (21.7)	14 (18.9)	100 (17.9)

*Qualitative variables are expressed in frequencies and percentages and continuous variables are expressed in median and interquartile ranges.

Table 2: Unintentional poisonings in children: Epidemiological characteristics.

There were 309 substances involved in the 277 cases of suspected drug poisonings (Table 1). In 14.1% (39) the mechanism was a dosage error. As shown in Table 2, 59 (21.3%) of the children had clinical signs or symptoms, with neurological alterations the most common (39 - 66.1%), followed by digestive (23 - 39%) and others (3 - 5.1%). Complementary examinations were performed in 108 patients (39.4%) of cases. These were electrocardiogram (69 - 63.9%), basic blood test (48 - 44.4%), urine toxicological test (19 - 17.6%), blood toxicological test (16 - 14.8%), x-ray (6 - 5.6%) and others (11 - 10.2%). One hundred four patients (37.5%) required medical treatment, 97 (93.3%) received activated carbon, 4 (3.8%) antidotes, and 3 (2.9%) support measures (oxygen or fluid therapy). Forty-one children needed hospital admission (14.8%), one of them in the Intensive Care Unit. There were no deaths and no patient had sequelae after a drug poisoning. Table 3 presents differences between drug subgroups in terms of the presence of clinical symptomatology, complementary examinations performed, medical treatment administrated, and hospital admission.

Drug group*	Psychotropics	Analgesics	Anticatarrhals	Cardiovascular drugs	Others	p
(n=277)	(n=72)	(n=71)	(n=36)	(n=24)	(n=74)	
Dose error	15.4%	35.9%	15.4%	10.3%	23.1 %	0.247
Presence of symptoms	54.2%	6%	6%	0%	15%	< 0.001
Need for complementary tests	30.6%	14.8%	15.7%	14.8%	24.1 %	0.001
Need for treatment	30.2%	24.5%	17.9%	10.4%	17%	0.007
Need for admission	51.2%	7.3%	4.9%	17.1%	8%	<0.001

Table 3: Unintentional intoxications in children by drugs (n=277): Differences between drug groups.

There were 207 cases of suspected unintentional intoxication by domestic products (Table 1). Of all detergents involved, 8 were laundry detergent pods (32%). In 17.9 % of cases (37) the product was out of its original packaging. Previous actions were performed at home in 40.1% (83) of cases: giving water (36 - 43.4%), milk (45 - 54.2%), or oil (7 - 8.4%) to the patient, inducing vomiting (17 - 20.5%), and others (4 - 4.8%). Symptoms appeared in 87 cases (42%), with a predominance of digestive (77 - 88.5%) followed by respiratory (7 - 8%), neurological (4 - 4.6%), ocular (4 - 4.6%), skin (3 - 3.4%), and other symptoms (1 - 1.1%). A total of 45 subjects (21.9%) received medical treatment: 2 (4.4%) received activated carbon and 9 (20%) other treatments such as fluid therapy, gastric protection, and/or analgesia. Three patients with domestic product intoxication presented caustic esophagitis and 2 of them developed esophageal stenosis as a consequence of the ingestion. None of the patients in the group died as a result of the poisoning.

Discussion

This study notes that the exposure to toxic substances attended in the PED is unintentional in most cases. It affects children younger than 3 years old, without finding statistically significant differences in sex.

Age is an important risk factor to consider in child poisoning. Children able to walk can access many corners and containers in the home. Moreover, they progressively improve their motor skills to open packages and lead objects to mouth for tasting or swallowing, unaware of the potential risk of a poisoning. In addition, they are not always supervised by an adult, which can increase the risk and delay medical attention.

As reported in previous studies, these poisonings generally take place at the parental residence and in almost all cases only one substance is involved [2,6]. Families consult of their own initiative and the symptoms and action taken depend on the toxic substance involved [1,12].

As shown in other studies, the most frequent group in poisonings is drugs, followed by household products [2,3,5,6].

Analyzing the intoxication group by drugs, this study shows an association between the diversity of drug poisoning and the vast distribution and accessibility of drugs, even those dispensed without prescription.

Psychotropic drugs are the substances most frequently involved in unintentional poisonings by drugs in children, surpassing analgesics. We attribute this to the increasing distribution of psychotropic medicine in our environment [13]. This explains why neurological alteration was the most common finding in the physical exploration. Psychotropics are the drugs that imply the greatest toxicity because of their narrow therapeutic range. This may explain why they are the drugs with the highest rate of hospital admission and the ones that entail the greatest medical spending [11]. In consequence, doctors who prescribe psychotropic drugs need to stress to parents the importance of not taking drugs in the presence of children, because they tend to imitate adult behavior, and also of storing drugs in a safe place, out of range of children [12-14].

Analgesics and antipyretics are the second group in frequency, and the ones in which dosage error was most frequently a factor in the mechanism of poisoning. Analgesics are the most frequently used drugs in children and it is known that almost 75 % of pediatric patients seen in the PED are already receiving drugs before they arrive at the hospital, in many cases as a result of self-medication (on the part of the parents) [13]. Even so, the percentage of dosage error could be higher considering that many times parents are not aware of the dosage mistake, so they do not consult at the PED. Moreover, analgesics have a wide therapeutic range so they are drugs that less frequently produce

symptoms of toxicity. As a preventive recommendation, physicians should adjust analgesic dosage according to age and weight of the child and remind parents of this dosage, in writing.

We should stress the important percentage of consultations for anticatarrhal poisoning. In our environment there is considerable over the counter use of cough and cold medicines, especially for children [15]. Anticatarrhals have doubtful effectiveness and a high rate of poisoning, so their use is not advisable.

Exposure to household products stands out from other toxicological groups because they affect young children. This is because there is easy accessibility to these products. They are frequently stored in cabinets at floor level and out of their original packing. There is insufficient awareness of the dangerousness of these products in the general population. Yet this study shows that they are the only ones that produce sequelae.

Caustics are the most frequent subgroup of household product implicated in unintentional poisonings and the appearance of sequelae.

Furthermore, the emergence of new products stands out, especially laundry detergent pods. They represent one third of the exposure to laundry detergents. The pods are widely available and tend to have an attractive appearance without a safety system. These products have an increased morbidity risk compared to traditional laundry detergents, although the components are practically the same [7,8].

Our study also reveals that parents tend to take measures before consulting at the PED, which can aggravate the injuries. Inducing vomiting is contraindicated; the patient should fast and it is essential to consult at the PED or poisoning center. Household product labels should include the basic management of caustic ingestion in simple, clear language, in addition to the official iconographic warning [16].

Like all retrospective studies, ours has some limitations. Some cases of poisoning don't go to the PED, so it is difficult to estimate the real incidence of poisoning in the area. Some suspected poisonings weren't coded as such, so they were not included in the study. And in some cases some of the items recorded in the database were missing.

Conclusions

Although poisonings are not frequent, they represent a high risk for the patient and may cause persistent sequelae. It is important that physicians and authorities insist on well-known preventive measures such as correct packaging of toxic substances; avoid taking drugs in front of children and careful written prescription. To improve in children security, better health education and broadcasting general knowledge of preventive measures is required. Moreover, legislation has to be updated in order to punish those responsible for children poisoning. Learning about new risk factors related to unintentional poisonings in children may allow for the proposal of better preventive measures in the future.

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