SHORT COMMUNICATION

A Hospital-Based Epidemiologic Study on Acute Pediatric Poisonings in Chennai, India

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Abstract

Background: Toxic exposures in childhood are major health concern. In this hospital-based study, we sought to investigate socio-epidemiological factors contributing to acute pediatric poisoning in Chennai, Tamil Nadu, India.
Methods: This prospective cross-sectional study was conducted at the Kanchi Kamakoti CHILDS Trust Hospital (KKCTH), a tertiary care hospital for children in Chennai. Children and adolescents less than 18 years of age with diagnosis of acute poisoning during June 2014 to January 2015 were included in the study.
Results: During the study period, 10500 children were admitted to emergency department of the hospital; among which, 34 children presented with diagnosis of acute poisoning (0.32% of admissions). Eighteen patients (52.9%) were boys. The greatest proportion of patients (52.9%) aged 1 to 3 years. Regarding the intention of poisoning, 27 cases (79.4%) occurred following unintentional ingestion by children, 5 cases (14.7%) following inadvertent administration of medication(s) by a caregiver and 2 cases (5.9%) following inadvertent administration by a sibling. Children had relatively equal chance of being poisoned with medications (n = 18, 52.9%) and common household agents (n = 16, 47.1%). The most common medicines responsible for the poisonings were neuropsychiatric medicines (n = 6, 17.6%). None of the medications responsible for poisoning had childproof containers. On admission, only 14 children (41.2%) were symptomatic. Fifteen patients (44.1%) required admission to hospital wards and 4 patients (11.8%) required intensive care. The remaining patients only needed close observation for a few hours. All children made complete recovery and there was no mortality.
Conclusion: Children especially toddlers of either gender are vulnerable to unintentional exposures and need constant supervision by an adult. Educating caregivers about the fatalities associated with unprotected storage of medications, and dangers of placing hazardous chemicals in the reach of children will reduce a great number of poisoning in children.

Keywords: Epidemiology; India; Pediatrics; Poisoning

How to cite this article: Raman R, Kumar S, Muthukrishnan L. A Hospital-Based Epidemiologic Study on Acute Pediatric Poisonings in Chennai, India. Asia Pac J Med Toxicol 2015;4:156-60.

INTRODUCTION

Toxic exposures in childhood are major health concern with mortality rate of nearly 45000 children per year worldwide (1,2). Acute poisoning is one of the main preventable causes of morbidity and mortality in India and contributes to around 3-6% of pediatric admissions to tertiary care hospitals in the country (3,4). In the majority of cases, poisonous substances are inadvertently ingested at home by children due to their inherent curiosity and exploratory nature (5-7). However, there are also intentional poisoning cases especially in adolescents (2,5).

The pattern of poisoning in different regions might vary according to age group, type of exposure, nature of poisons, and social, cultural and demographic factors (5,6). Knowing these factors helps healthcare authorities improve their planning for poisoning prevention programs, adjust hospital beds utilization and upgrade management of antidote stockpiles. Substantial information is available regarding the clinical presentation, management and outcome for various poisonings in children. However, socio-epidemiologic study on acute pediatric poisoning in India seems to be limited. In this hospital-based study, we sought to investigate socio-epidemiological factors contributing to acute pediatric poisoning in Chennai, in the south eastern part of India.

METHODS

This prospective cross-sectional study was conducted at the Kanchi Kamakoti CHILDS Trust Hospital (KKCTH), a 220-bed tertiary care hospital for children in Chennai, Tamil Nadu, India. This hospital, which functions under the supervision of national board of examinations, enjoys a 13-bed Emergency Department (ED) running a regular postgraduate program in pediatrics and fellowship program in pediatric emergency medicine.

Children and adolescents less than 18 years of age presenting to the ED of KKCTH with diagnosis of acute poisoning during June 2014 to January 2015 were included

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Received 28 May 2015; Accepted 12 December 2015

in the study. The diagnosis of poisoning was based on patients' history and clinical findings. The study was approved by Institutional Review Board and the confidentiality of personal information of the patients was maintained. Moreover, researchers did not interfere with necessary medical care for the patients.

Data pertaining to the type of poison, circumstances of poisoning and sociodemographic information of patients were collected by researchers and documented in a predesigned proforma. Data were analyzed using Microsoft Excel (Microsoft Corp., Redmond, WA, USA). Results are expressed with frequency and percentage for qualitative variables and with mean ± standard deviation for quantitative variables.

RESULTS

Sociodemographic findings

During the study period 22,265 patients were admitted to KKCTH, out of which 10500 children (47.2% of total admissions) were initially admitted to ED. Among ED admissions in these 7 months, 34 children presented with diagnosis of acute poisoning, which means 0.15% of total admissions and 0.32% of ED admissions. Eighteen patients (52.9%) were boys. Mean age of the patients was 3.5 ± 1.8 (min-max: 0.5-15) years. The greatest proportion of patients (18 patients; 52.9%) were toddlers (Table 1). Most cases (67.6%) occurred in nuclear families. Regarding the educational level of mothers, the majority were graduates (61.8%). Nearly all mothers (97.1%) were unemployed.

Circumstances of poisoning

The majority of poisonings occurred at home (30 cases, 88.2%) and when parent(s) was in the vicinity (32 cases, 94.1%), out of whom 14 mothers were engaged in cooking, 11 mothers were doing household works and 7 fathers who were engaged with various routine works. In 67.6% of cases, the substance was easily accessible to the child (e.g. leaving the toxic agents by parent(s) on the floor or table, or in refrigerator). All exposures occurred through oral intake. Regarding the intention of poisoning, 27 cases (79.4%) occurred following unintentional ingestion by children, 5 cases (14.7%) following inadvertent administration of medication(s) by a caregiver and 2 cases (5.9%) following inadvertent administration by a sibling. In most instances, poisoning was noticed by parents and caregivers within 1 hour of ingestion (86.3%). In 1 case (2.9%) the poisoning was noticed after 1 hour of ingestion and in 4 cases (11.8%), it was noticed after more than 24 hours when the symptoms manifested.

Type of poisons

Children had relatively equal chance of being poisoned with medications (n = 18, 52.9%) and common household products such as hydrocarbons, insecticides, cleaning agents and herbal preparation (n = 16, 47.1%). The most common medicines responsible for the poisonings were neuropsychiatric medicines (n = 6, 17.6%). Hydrocarbons and pyretroid insecticides were the next common toxic agents (Table 2). Hydrocarbon ingestions only occurred in children between 3 to 6 years of age. The most common risk factor was storage of the substance in empty discarded bottles and inappropriate storage of medications. None of the medications responsible for poisoning in this study had childproof containers. Kerosene, turpentine and povidone iodine were ingested by children because they were mistakenly considered as fruit juice or water.

Table 1. Sociodemographic profile of patients and circumstances of poisoning

Parameter	N (%)
Age groups (year)	
< 1*	3 (8.8)
1-3**	18 (53.0)
3-6	10 (29.4)
> 6	3 (8.8)
Educational status of mothers	
Graduate	21 (61.8)
Higher secondary	6 (17.6)
Middle school	7 (20.6)
Employment status of mothers	
Employed	1 (2.9)
Unemployed	33 (97.1)
Family type	
Nuclear	23 (67.6)
Joint	11 (32.4)
Place of poisoning event	
At home	30 (88.2)
In the courtyard	4 (11.8)
First aid available at home	
Yes	14 (41.2)
No	20 (58.8)

*Infants
**Toddlers

Treatments and outcomes

Fourteen children (41.2%) had received first aid at home by their caregivers, which included emesis with salt and water solution in 7 cases and emesis by stimulating gag reflex in the rest 7 cases. All patients received basic therapeutic measures for poisoning including activated charcoal and gastric lavage (if poisoning had occurred less than 1-2 hours prior to admission). On admission, only 14 children (41.2%) were symptomatic. Fifteen patients (44.1%) required admission to hospital wards and 4 patients (11.8%) required intensive care. The remaining 15 patients (44.1%) only needed close observation for a few hours and discharged in good health condition. Thirteen patients (38.2%) required admission for 24 hours, 4 patients (11.6%) for 48 hours and 2 patients (5.8%) for 72 hours. The four patients required intensive care included: two toddlers who required endoscopy following ingestion of caustic drain cleaner (alkaline), one of whom eventually underwent gastrostomy; one infant who required assisted ventilation due to respiratory failure following

Table 2. Type of poisons ingested

Type of poison	
Medications	18 (52.9)
Resperidone	1 (2.9)
Clobazam	1 (2.9)
Carbamazepine	1 (2.9)
Phenytoin	1 (2.9)
Levetiracetam	1 (2.9)
Amitryptyline	1 (2.9)
Clonidine	1 (2.9)
Nitroglycerine	1 (2.9)
Ondensetron	1 (2.9)
Dicyclomine	1 (2.9)
Dapsone	1 (2.9)
Thyroxine	1 (2.9)
Levosalbutamol	1 (2.9)
Acetaminophen	1 (2.9)
Povidone iodine	2 (5.9)
Unidentified	2 (5.9)
Hydrocarbons	7 (20.6)
Turpentine	3 (8.8)
Camphor	3 (8.8)
Kerosene	1 (2.9)
Pyrethroids	6 (17.6)
Cleaning agents (alkaline)	2 (5.9)
Herbal preparation (unknown)	1 (2.9)

poisoning with an unknown herbal preparation given by her grandparent; and one child with clonidine ingestion who developed shock and bradycardia. Finally, all children made complete recovery and there was no mortality in our study population.

DISCUSSION

Knowledge about the various contributing factors for poisoning in each region is vital for effective prevention measures. The natural tendency of toddlers to constantly explore the environment and taste objects with their mouth puts them at an increased risk for accidental poisoning and we observed that poisoning was more common in toddlers (7-11). Infants are physiologically immature and at a greater risk for fatal poisoning as the toxicity of most substances depends on the dose per kilogram of bodyweight (1,12). In the present study, poisoning was not related to gender, although higher incidence has been reported in male children in different studies (11,13-15). According to the latest population census available, in Chennai children below 15 years of age form 23.5% of population of 459,324, where 34 acute poisoning cases required tertiary medical care in this age range in 7 months.

We found that children are at risk for poisoning at home despite their parents(s) or caregiver(s) being in their vicinity. Similar pattern was reported in other studies (13,16,17). Accidental ingestion of a substance is the common form of poisoning in children; however, inadvertent administration by a parent or a sibling may occur. Intentional poisoning was not seen in our study probably because our study population mainly consisted from patients below 10 years of age and deliberate self-harm in children below 12 years is reported to be very uncommon (18,19).

In most instances in the present study, the substance was easily accessible to the child as it was left on the floor by parent(s) or was placed on common household objects such as a table, television or refrigerator. Ramos et al concluded that despite caregiver awareness of the possibility of poisoning, substances might be stored below a height of 150 cm, more frequently in the bedroom, making them in a weak position to be touched and grabbed by children (17). Generally, parents are preoccupied to anticipate that their child might try to ingest dangerous household substances. Moreover, in most houses, detergents and household cleaning agents are available unprotected in lower level cabinets and in sachets or containers without a child safety mechanism or stored in containers without a childproof lid (20,21). The attractive color and package of harmful liquids in soft drink bottles was a probable cause of poisoning for some of our patients. Accessibility to hazardous chemicals and medicines due to unsafe storage has been highlighted in the studies by Ahmed et al and Yaqoob et al (12,14). Poor storage of substances in empty soft drink bottles and lack of appropriate storage of medications are preventable risk factors for pediatric poisoning.

Although we observed that over two thirds of children with poisoning were from a nuclear family; without a control group, it cannot be concluded whether extended or joint families have any influence on the incidence of acute poisoning or not. The most common causes of poisoning in high income countries are pharmaceuticals and household products (1,6,17). A similar pattern was observed in this study which shows changing in lifestyle and increase in use of over the counter medications as well as easy availability of chemicals in the houses (9). Variation in the types of poisoning in different geographical areas depends on industrialization, agricultural activities, social and cultural practices related to the supervision of children and local customs and beliefs (1,11).

Accidental ingestion of antiseptic formulations in liquid form which are usually non-palatable was also observed in the present study. Poisoning with kerosene was negligible in our study which is contrary to studies from other parts of India (4,5), probably because the study setting was an urban tertiary care center, and the duration of the study was limited. Pediatric poisoning with over-the-counter medications, insecticides and household products are frequently observed across the world according to a WHO report (1). Poisoning with non-pharmaceutical products is common among children of 1 to 6 years of age. The higher likelihood of younger children being poisoned with non-medicinal household substances compared with older children has been

reported in several studies (2,6,8,12).

In this study, a great number of children were asymptomatic either because of ingestion of negligible amount of poison or early decontamination by parents. Hence, the majority of patients only needed close observation. Krenzelok and Mrvos reported similar observations from children poisoned with ornamental household plants in the United States (7). These 2 factors as well as higher prevalence of unintentional exposures in children might be the reasons behind low mortality rates reported in multiple epidemiologic studies on pediatric poisonings across the globe (1,2,4-6,9,12,19,22,23). Nonetheless, the scenario is totally different when caustic ingestions are taken into account. Morbidities and mortality related to caustic ingestion are relatively high among children (24,25). However, fortunately the prevalence of such exposures is low in this age group. In the present study, 2 children with corrosive ingestion had esophageal erosion and bleeding who both needed intensive care and one of them eventually underwent gastrostomy.

All in all, children especially toddlers of either gender are vulnerable to unintentional exposures and need constant supervision by an adult. Childproof containers for medications and hazardous household products can prevent poisoning in children (21,26). Educating caregivers about the fatalities associated with unprotected storage of medications, inappropriate storage of household substances in containers of food products, and dangers of placing hazardous chemicals in the reach of children will reduce a great number of poisoning in children. Parents must be educated about appropriate first aid measures in poisoning events. In addition, childhood poisoning prevention should be considered as a national priority to implement preventive measures.

LIMITATIONS

This study was carried out at a tertiary care pediatric hospital in an urban setting and may not represent epidemiologic profile of all children involved with acute poisoning in the region. Moreover, only 7 months of data collection was possible during the ED rotation of the 1-year fellowship of the authors of this article. Nonetheless, our findings may give an insight to the actual situation in an urban setting in southeast India and pave ways for future prospective longitudinal studies.

CONCLUSION

Children especially toddlers of either gender are vulnerable to unintentional exposures and need constant supervision by an adult. Educating caregivers about the fatalities associated with unprotected storage of medications, inappropriate storage of household substances in containers of food products, and dangers of placing hazardous chemicals in the reach of children will reduce a great number of poisoning in children.

Conflict of interest: None to be declared.
Funding and support: None.

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