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Original Article

Clinical profile and outcome of poisoning in children admitted to a tertiary referral center in South India

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Abstract

Background: Childhood poisoning covers the entire gamut from accidental ingestion in toddlers and preschool children to intentional overdosage in adolescents. The poisons range from fuel to drugs and other chemicals. **Objective:** To determine the epidemiology, clinical profile, and outcome of children presenting with acute poisoning in a tertiary care center in south India. **Materials and Methods:** All patients from the age of 1 month to 18 years, admitted during the 1-year study period with a history of poisoning, were included. Animal bites, snake, and scorpion envenomation were excluded. The data were analyzed using SPSS software, version 16. A multivariate analysis was also done and a $p<0.05$ was considerer significant. **Results:** There were 75 cases of poisoning out of the total 4074 admissions. Accidental poisoning constituted 73.3% cases and the remaining 26.7% were suicidal. In most of the cases, poisoning was due to fuel (28%) or drugs (21.3%), and kerosene oil was the most common causative substance (28.0%) followed by camphor (14.7%). The higher incidence of poisoning was found in lower middle socio-economic class (56.0%). An analysis of the outcome showed that 92.0% were discharged home, 4.0% with sequelae, and death in 4.0% cases. **Conclusion:** The highest incidence of poisoning was observed in the lower middle socio-economic group. Most of the poisons were household products, and the most common nature of exposure was accidental. In most of the cases, recovery was complete.

Key words: *Accidental poisoning, Fuel and drugs, Household products*

Poisoning in children is one of the most common emergencies encountered in pediatric practice. With the increasing use of various chemical substances in households, the incidence of acute poisoning episodes has also increased. Most of the poisoning in children is accidental, and most cases of accidental poisoning are preventable [1]. Continuing morbidity and mortality due to poisoning is a serious challenge to pediatricians and public health officials.

In most of the cases, accidental poisoning in children is a result of oral ingestion of poisonous substances (household products, chemicals, drugs, pesticides, etc.) [2]. The risk of accidental poisoning is further augmented when some of these toxic substances are removed from their original containers and stored in drinking water bottles or food containers [3]. These substances are often mistaken by children for water and ingested.

Environmental factors such as education, socio-economic status, local beliefs, and customs and also the types of population, whether urban or rural play a role in accidental poisoning. The reported incidence of childhood poisoning in various studies varies from 0.3% to 7.6% [2-6], and this constitutes a significant number of admissions to the pediatrics wards. The incidence and type of poisoning also differ from place to place and has a special bearing on the emergency pediatrics care of the area [7,8]. We planned this study to determine the epidemiology, clinical profile, and outcome of pediatric patients presenting with acute poisoning in a tertiary care center.

MATERIALS AND METHODS

This prospective descriptive study was conducted in the Department of Pediatrics of Sri Ramachandra Medical College over a 1-year period (June 2009-May 2010). The study was approved by the Institutional Ethics Committee. All patients from the age of 1 month to 18 years, who were admitted during the period with history of poisoning, were included in the study. Animal bites, snake, and scorpion envenomation were excluded from the study. Children who had food poisoning, toxic, or idiosyncratic reaction to the prescribed drugs were also excluded from the study. The data were collected on a proforma after getting a signed informed consent from the parent/caregiver.

We studied the demographic profile, clinical presentation, treatment methods, and outcome of pediatric patients who

presented with acute poisoning during the study period. Data regarding age, sex, socio-economic status, type and quantity of the substance consumed, time of ingestion, nature of ingestion, time of symptom onset, time of presentation to hospital, symptoms and signs, investigations, diagnostic and therapeutic interventions, and outcome were noted on a predesigned proforma.

All the data from the duly filled proforma were transferred to a Microsoft Excel spreadsheet. We analyzed the data using SPSS 16. For statistical analysis, Fisher's exact χ^2 test was used where appropriate and $p<0.05$ were taken to be significant.

RESULTS

Total 4074 patients were admitted to our department during the study period including 943 (23%) admissions in the pediatric intensive care unit (PICU) or high dependency unit (HDU). Out of 4074 these, 75 (1.85%) cases were admitted with poisoning. The maximum number of cases (37.3%) was seen in the 1-3 year age group (28/75) and followed by the 12-18 years age group (20/75; 26.7%) as described in Table 1. The youngest and oldest patients were 2 months and 17 years old, respectively. The most common route of poisoning was by ingestion (n=71, 94.7%) of the toxic substances followed by inhalational route (n=3, 4%) and through skin contact (n=1, 1.3%).

The study population consisted of equal numbers of males (37/75) and females (38/75). Higher incidence (93.3%) was found in urban population (70/75). Higher incidence of poisoning was found in lower middle class (56.0%). The cases were mostly from nuclear families (54/75; 72.0 %). In 94.7% of the cases (71/75), only one parent was working. In 81.3% of the cases, mother was the caregiver at the time of poisoning. Out of the 75 cases, accidental poisoning constituted 73.3% (55/75), and the remaining 26.7% were suicidal (20/75). In 97.3% cases, the poisonous substance was available in the house (73/75) and was consumed indoors. Only 2.7% poisoning occurred with substances which were obtained from outside when 2 teenagers bought tablets (alprazolam and diazepam) from a medical shop.

Most of the poisoning was due to fuel (21/75; 28%) or drugs (16/75; 21.3%). Drugs that were consumed included carbamazepine, lorazepam, paracetamol, enalapril, deriphylline, alprazolam, diazepam, and chlorphenamine maleate. The incidence of poisoning due to insecticides and pesticides was cumulatively only 10%. Kerosene oil was the most common substance that led to poisoning (28.0%) followed by camphor (14.7%). The cases of such poisoning were more in the lower middle class group, 21.3% and 12%, respectively (Table 2). The highest incidence in the 1-3 years age group was of kerosene poisoning (14; 18.7%), whereas the 13-17 age group showed a higher incidence of poisoning due to drugs (7; 9.3%) and pesticides (5; 6.7%).

The predominant system involved was the gastrointestinal system (34/75) followed by the central nervous system (29/75). The common presenting features of poisoning were vomiting (38.7%) followed by seizures in 22.7% of the patients as shown in Table 3. 9.3% presented with respiratory distress while 6.3% cases had hematemesis. Camphor and neem oil poisoning presented with seizures and corrosive acid poisoning presented with hematemesis. 69.3% (52/75) of patients sought medical advice between 30 and 60 min of exposure to the poison. In 46.7% (35/75) first aid was given before they came to the hospital. Most of the cases required only symptomatic treatment (31/75, 41.3%) while specific treatment was given in 20% (15/75) cases and 5% (4/75) cases were put on a ventilator.

As per our hospital policy, all the patients with poisoning were admitted initially in PICU; however, most of the cases were shifted out to the wards between 24 and 48 h (59/75, 78.7%) and 81.3% were discharged in next 24 h. Significantly prolonged duration of PICU stay was seen with corrosive acid ($p=0.001$) and pesticide poisoning ($p=0.000$) (Table 4). Most of the cases (92.0%) improved without any sequelae while 3 (4%) children survived with sequelae. Three cases of corrosive

Table 1: Type of poisoning and age groups

Type of poison	<1 year (%)	1-3 years (%)	3-6 years (%)	6-12 years (%)	12-18 years (%)	Total (%)
Kerosene	0	14 (18.7)	4 (5.3)	0	3 (4.0)	21 (28.0)
Camphor	2 (2.7)	5 (6.7)	3 (4.0)	1 (1.3)	0	11 (14.7)
Corrosive acid	0	0	2 (2.7)	0	1 (1.3)	3 (4.0)
Corrosive alkali	0	2 (2.7)	2 (2.7)	0	1 (1.3)	5 (6.7)
Neem oil	1 (1.3)	1 (1.3)	1 (1.3)	0	0	3 (4.0)
Eucalyptus	0	1 (1.3)	1 (1.3)	0	1 (1.3)	3 (4.0)
Drugs*	3 (4.0)	2 (2.7)	2 (2.7)	2 (2.7)	7 (9.3)	16 (21.3)
Insecticide repellant	0	2 (2.7)	0	1 (1.3)	2 (2.7)	5 (6.7)
Pesticides	0	1 (1.3)	1 (1.3)	0	5 (6.7)	7 (9.3)
Miscellaneous	0	0	1 (1.3)	0	0	1 (1.3)
Total	6 (8.0)	28 (37.3)	17 (22.7)	4 (5.3)	20 (26.7)	75 (100.0)

***Drugs included: Carbamazepine, lorazepam, paracetamol, enalapril, deriphylline, alprazolam, diazepam and chlorpheniramine maleate**

Table 2: Type of poisoning versus Socio-economic status

Type of poisoning	Upper class (%)	Upper middle (%)	Lower middle (%)	Upper lower (%)	Total (%)
Kerosene	0	(4)	16 (21.3)	1 (1.3)	21 (28.0)
Camphor	0	0	9 (12.0)	2 (2.7)	11 (14.7)
Corrosive acid	0	0	1 (1.3)	2 (2.7)	3 (4.0)
Corrosive alkali	1 (1.4)	2 (2.7)	2 (2.7)	0	5 (6.7)
Neem oil	0	0	2 (2.7)	1 (1.3)	3 (4.0)
Eucalyptus	1 (1.3)	1 (1.3)	1 (1.3)	0	3 (4.0)
Drugs	4 (5.3)	7 (9.3)	5 (6.7)	0	16 (21.3)
Insecticide repellant	0	3 (4.0)	2 (2.7)	0	5 (6.7)
Pesticides	0	2 (2.7)	3 (4.0)	2 (2.7)	7 (9.3)
Miscellaneous	0	0	1 (1.3)	0	1 (1.3)
Total	6 (8.0)	19 (25.3)	42 (56.0)	8 (10.7)	75 (100.0)

Table 3: Presenting features

Presenting features	Number of cases	Percent
Vomiting	29	38.7
Respiratory distress	7	9.3
Hematemesis	5	6.7
Drowsiness/altered sensorium	12	16.0
Seizures	17	22.7
Asymptomatic	5	6.7
Total	75	100.0

Table 4: Type of poisoning and duration of ICU stay

Type	f (%)			χ^2	p
	<24 h	24-48 h	>48 h		
Kerosene	2 (9.5)	18 (85.7)	1 (4.8)	5.068	0.079
Camphor	0 (0)	11 (100)	0 (0)	3.496	0.174
Corrosive acid	0 (0)	0 (0)	3 (100)	14.904	0.001
Corrosive alkali	1 (20)	4 (80)	0 (0)	4.358	0.113
Neem oil	0 (0)	1 (33.3)	2 (66.7)	5.329	0.070
Eucalyptus	0 (0)	3 (100)	0 (0)	0.847	0.655
Drugs	0 (0)	14 (87.5)	2 (12.5)	1.289	0.525
Insecticide repellant	0 (0)	5 (100)	0 (0)	1.453	0.484
Pesticides	0 (0)	2 (28.6)	5 (71.4)	15.806	0.000
Miscellaneous	0 (0)	1 (1.7)	0 (0)	0.275	0.872

ICU: Intensive care unit

acid poisoning had a Grade III corrosive injury of esophagus, stomach, and duodenum and later developed strictures. Total 3 (4%) children died during the study period. Two children, one each with eucalyptus oil and neem oil ingestion developed severe pneumonia and died due to respiratory failure while one child with paracetamol poisoning had developed acute liver failure and died due to multi-organ dysfunction syndrome.

DISCUSSION

In the 1-year study period, poisoning constituted about 1.85% of the total pediatric admissions. The incidence of poisoning in various studies varies from 0.3% to 7.6% [2-6]. The highest number of cases occurred in the 1-3 years age group followed by in 12-18 years age group. The youngest patient in our study was a 2 months old baby who was accidentally given surgical spirit by the grandmother. Most studies that included children up to 12 years found that the incidence of poisoning is common in 1-5 years age group [1,6-11] while studies that included adolescents found a similar pattern as seen in the present study [2,9,10,12]. Children in 1-3 years age group are most vulnerable to accidental poisoning because of their increased curiosity leading to increased exploratory activity, and their inability to differentiate between toxic and harmless substances.

In our study, male to female ratio was 1:1 which is similar to the pattern seen in a few studies [3,10]; however, most of the studies found a male preponderance [1,6-14]. Significantly high incidence of poisoning (56.0%) was found in the families from lower middle socio-economic class according to Kuppusamy scale. This could be due to more illiteracy, more siblings, and poor storage space in these families. A similar pattern was observed in a study done by Ahmed et al. [15]. The incidence of poisoning was high in the urban population (93.3%). This could possibly be because our hospital was located in a semi-urban area.

Poisoning was more common in nuclear families, and 94.7% of poisoning occurred in families where only one of the parents was working with the mother being the caregiver in most of the cases. 97.3% of the substances ingested were available at home while only 2.7% had to been obtained from the shop. Other studies from India and other countries have also observed that household substances to which a child has easy access are the most common causes of poisoning [1,3,5,8].

As most cases of poisoning occur with household substances and are preventable. The medications and poisonous substances must be stored in child proof containers and kept out of reach of children. The practice of using soft drink bottles and

containers of edible things for storage of kerosene and other harmful substances must be discouraged. Parent education and counseling programs should be initiated to increase awareness about prevention of childhood poisoning.

As most of the patients belonged to lower socio-economic status, the most common fuel used in household practice was kerosene, and it was stored in the kitchen floor in water bottles or soft drink bottles. In a number of studies from India and Pakistan, kerosene was found to be the most commonly consumed substance [1,3,5,6,10,16]. Although, one study in Nepal found organophosphorus compounds [2] and another study from Pakistan found medications as the most common poisoning agent [7]. In our study, the second most common cause of poisoning was ingestion of drugs. These were medicines taken for therapeutic purposes either by the child or adults and kept in easily accessible areas.

In our study, approximately three-fourth of the incidences were accidental and remaining one-fourth were suicidal. Among the accidental cases, 19 mothers had administered an overdose of a drug prescribed for the patient or had given medications which were part of native treatment. The suicidal deaths were mainly in adolescents. It was an impulsive behavior after their parents reprimanded them for poor scholastic performance or other conflicts with parents. This observation was similar to various other studies [2,9,12]. In our study, vomiting was the most common symptom as seen by Kohli et al. [1]. The most common system involved was gastrointestinal system followed by the central nervous system, which was similar to the findings seen in other studies [1,11].

Most of the patients required only symptomatic treatment while 20% received specific antidotes and this finding was similar to the study done by Kohli et al. [1]. The majority of the patients required a short stay in PICU or HDU and only corrosive acid and pesticide poisoning cases stayed for the longer duration. In our study, 92.0% cases were discharged home within 72 h of hospital stay. There were sequelae in 4.0% of the cases and death occurred in 4.0% of the cases. The mortality rate in the present study was similar to that seen in various other studies [2,3,9,10,15].

The present study had few limitations such as it was done over a short duration of time, so a total number of poisoning cases was small. Larger numbers of patients may provide better analysis of the data. Second, the population was predominantly an urban one.

CONCLUSIONS

The most common age of poisoning was 1-3 years followed by the 12-18 years, and the highest incidence of poisoning was observed in the lower middle socio-economic group. Most of the poisons were obtained from the house, and the most common nature of exposure was accidental. The most common type of poison was kerosene oil. The most common presenting feature was vomiting, followed by seizures. In most of the cases, recovery was complete. Prolonged PICU stay and increased morbidity were observed in corrosive acid poisoning and pesticide poisoning.

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