Original Article

Clinico-epidemiological profile and predictors of in-hospital outcome of acute poisoning cases in children of Northern India

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ABSTRACT

Background: Childhood poisoning is a common but preventable problem worldwide with incidence varying from 0.3% to 7.6%. Demography, socioeconomic status, education, local belief and customs, occupation, religious, and cultural influences determine the cause of poisoning. **Aim:** This study was conducted to understand the recent changes increasing urbanization and rapid socioeconomic development in India during the past decade and to find out the change in pediatric due to poisoning profile. **Materials and Methods:** This study was conducted in a pediatric ward of a tertiary care hospital in North India during the period of January 2016–December 2016. A total of 174 children admitted with acute poisoning in the hospital during the study tenure were enrolled for the study. Clinical and demographic data were recorded in a predesigned proforma and results were compared with the previous studies from the region. **Results:** Mean age at presentation was 3.7 years, wherein males outnumbered females. Accidental mode (97%) was the most common mode of poisoning while ingestion (99%) was the most common route of exposure. The common agents incriminated in decreasing order of frequency were corrosives (24.71%), pyrethroids (12.64%), and kerosene (9.77%). Majority of patients belongs to lower middle class (57%) and urban areas (61%). Most children present with mild symptoms, of them vomiting was the most common (65%) and 12.6% developed complications. Mean duration of hospital stay was 2.5±1.91 days with a mortality of 2.16%. **Conclusion:** There is changing pattern in acute poisoning in children with decline in incidence of kerosene and pesticide poisoning while increase in corrosives and parathyroid poisoning. Low Glasgow Coma Scale and time lapse between poisoning and presentation to the hospital can be a predictor of high mortality.

Key words: *Acute poisoning, Children, India, Outcome*

Acute poisoning, a common pediatric emergency, causes significant morbidity and mortality, especially in developing countries. According to the American Association of Poison Control Centre, nearly 50% of the poisoning occur in children <6 years of age and most of them are unintentional [1]. In India, accidental poisoning is the 12th leading cause of admission in pediatric ward and accounts for about 1.0% of the hospitalized patients with incidence varying from 0.3% to 7.6% [2,3]. The nature of substance incriminated in poisoning is influenced by prevalent social, economic, and cultural practices. Many studies from developing and developed countries show that common household products, rather than drugs, are now implicated in the majority of pediatric poisonings [4,5].

Demography, socioeconomic status, education, local belief and customs, availability of poisonous substance, occupation prevalent in the society, religious, and cultural influences are the various factors that determine the cause and types of poisoning in different parts of the world [4]. Household substances such as kerosene, cleaning agents, and pesticides account for the majority of poisoning in India, whereas drugs are the common offending agents in western countries. With increasing urbanization and rapid socioeconomic development in India during the past decade, change in pediatric poisoning profile and outcome is to be expected, keeping this in mind, we have conducted this study.

MATERIALS AND METHODS

This prospective observational study was conducted in a tertiary care teaching hospital in New Delhi, India, from January 2016 to December 2016. The study was approved by the institutional ethical review board. A written informed consent was obtained from parent/legal guardian before enrollment.

Children in the age group of 2 months–12 years, who were presented with acute poisoning to pediatric emergency, were enrolled for the study. Those with food poisoning, chronic poisoning, allergic reactions to drugs, animal bites, and stings were excluded from the study. Acute poisoning was defined as adverse effects occurring following oral or dermal administration of single or multiple doses of a substance given within 24 h or an inhalation exposure of 4 h. A total of 174 children with acute

poisoning, who presented to pediatric emergency, were recruited for the study.

Clinical and demographic profile of patients was recorded in predesigned proforma. Socioeconomic status classification of the family was done based on modified Kuppuswamy's classification. Details of type and quantity of substance consumed, time, place, route and mode of poisoning, time of presentation, clinical presentation, laboratory findings, treatment, complications, and outcome were recorded. Fluid-electrolyte support, transfusion of blood products, inotropes, antidotes, and ventilatory support were given wherever necessary.

Statistical analysis was done using the SPSS software version 23. Descriptive statistics in terms of frequencies and percentages were used to present the distribution of sociodemographic characteristics of patients, poisoning profile, clinical symptoms, and outcome. Continuous variables were presented as mean ± standard deviation or median (minimum-maximum). For continuous variables, p value was calculated by Student's t-test and Wilcoxon rank-sum test while categorical variables were tested by Chi-square test. $p<0.05$ was considered to be statistically significant.

RESULTS

Of the total 16,239 children admitted in pediatric ward during the study period, 174 children (1.1%) admitted with acute poisoning fulfilled the inclusion criteria and were enrolled in the study. The mean age of our patients was 3.7±2.58 years (range 2 months–12 years) of whom nearly 53% were toddlers (1–3 years). Male-to-female ratio was 2:1. About 61% of the patients resided in urban areas, while 39% hailed from rural areas and nearly half belonged to lower socioeconomic status (57%).

The most common mode of poisoning was accidental (97.13%). All the suicidal poisoning (2.87%) was present in adolescents. Ingestion (98.9%) was the most common route of exposure followed by inhalation (1.1%) route; 85% poisonings occurred indoor, whereas 15% happened outdoor.

The substances incriminated in poisoning were household products in 66.09%, industrial chemicals in 14.37%, and drugs in 12.07% cases. Among the household products, the most common agents involved were corrosives (37%), followed by pyrethroids (19%), kerosene (15%), rodenticides, phenyl, bleaching powder, and naphthalene ball. Pyrethroids included various insect repellents and insecticides. Other agents consumed included potassium permanganate, washing powder, and antiseptics. Miscellaneous agents such as silica gel, hand wash, Ayurvedic oil, and peppermint oil were also involved in poisoning (Table 1).

Next to household products, industrial chemicals were commonly consumed (14.3%), of which majority were thinner (52%) followed by turpentine oil (24%) and diesel (16%). There were 21 cases (12.07%) due to ingestion of drugs, highest being thyroid hormones (19.05%) followed by antipsychotics (14.28%) and paracetamol (9.5%). The incidence of poisoning due to drugs belonging to various groups of antiepileptic and antihypertensive, anti-scabies and anti-inflammatory drugs, hematinics, etc., was low.

Table 1: Etiological agents of acute poisoning in children (N=174)

Category	*n* (%)
(A) Household products	115 (66.09)
Corrosive (toilet cleaner)	43 (24.71)
Pyrethroid	22 (12.64)
Kerosene	17 (9.77)
Phenyl	5 (2.87)
Naphthalene	5 (2.87)
Rat poison	5 (2.87)
Bleaching powder	4 (2 0.30)
Silica gel	3 (1.72)
Washing powder	3 (1.72)
Disinfectant	3 (1.72)
Others: Licel, Hand wash, $KMnO_4$ Ayurvedic oil, Peppermint oil	5 (2.87)
(B)	
Industrial products	25 (14.3)
Thinner	13 (7.47)
Turpentine oil	6 (3.45)
Diesel	4 (2.3)
Hydrocarbon	1 (0.57)
Acid fumes	1 (0.57)
(C) Drugs	21 (12.07)
Tab. Thyroxine	4 (2.30)
Tab. Risperidone	3 (1.72)
Tab. Olanzapine	1 (0.57)
Tab. Paracetamol	2 (1.15)
Tab. Calcium	1 (0.57)
Tab. Diclofenac	1 (0.57)
Tab. Dicyclomine	1 (0.57)
Tab. Ibuprofen	1 (0.57)
Tab. Levosalbutamol	1 (0.57)
Tab. Phenytoin	1 (0.57)
Tab. Propranolol	1 (0.57)
Syp. Iron	1 (0.57)
Permethrin lotion	1 (0.57)
Calamine lotion	1 (0.57)
Diclofenac ointment	1 (0.57)
(D) Agricultural products	3 (1.72)
Organophosphate	3 (1.72)
(E) Plants	2 (1.15)
Oleander	1 (0.57)
Ganja	1 (0.57)
(F) Unknown substance	8 (4.60)

Vomiting (64.94%) was the most common clinical presentation, followed by abdominal pain (14.94%), respiratory distress (13.22%), and hematemesis (8.62%). Few developed serious adverse effects such as altered sensorium (3.45%), seizures (1.72%), and ataxia (1.15%). 10.92% were asymptomatic at the time of presentation (Table 2).

The mean time interval between exposure of poison and arrival to the emergency department was 3.4 h. One-third of

children received pre-referral treatment. In hospital, gastric lavage was done in 45 (25.86%) children. Chest radiograph was done for 31.6% of children, majority in children with kerosene poisoning. Four patients had respiratory failure and required mechanical ventilation. Specific antidote was given in six children for organophosphate, paracetamol, and rodenticide poisoning. Atropine, pralidoxime, Vitamin K, and N-acetyl cysteine were antidotes used. Four children required endoscopy for corrosive poisoning.

Of 174 patients, 136 (78.2%) cases were discharged, 31 (17.8%) absconded, and 4 (2.3%) cases left against medical advice. Mean duration of stay in hospital was 2.5±1.91 days. Nearly 50% of children were discharged within 72 h. Majority of the patients, i.e., 152 cases (87.4%) did not have any complications. 22 of our patients developed complications, nine children with kerosene poisoning developed chemical pneumonitis, and four of them suffered respiratory failure required mechanical ventilation. Eight children with corrosive poisoning developed oral ulceration and one child developed perforation while 3 children (2.16%) died due to respiratory failure. Among the non-survivors, two children were in the age group of 1–3 years and one in 3–5 years and all the three had accidental poisoning. One had ingested corrosive and other two had ingested unknown substance. When compared with survivors, non-survivors presented late (median time to presentation was 3 h [1–11 h] vs. 10 h [9–11 h], p=0.003) had poor Glasgow Coma Score (15 [14–15] vs. 7 [6–7], p=0.001) and had more complications (respiratory failure, n=3) (Table 3).

DISCUSSION

Acute poisoning in children is preventable cause of morbidity and mortality in children. It accounts for 0.33–7.6% admissions to pediatric wards in India [5]. During the study period, 1.1% of children were admitted with acute poisoning in the present study.

Table 2: Clinical features

Symptoms/sign	Number of cases (%)
Vomiting	113 (64.94)
Abdominal pain	26 (14.94)
Respiratory distress	23 (13.22)
Asymptomatic	19 (10.92)
Hematemesis	15 (8.62)
Altered sensorium	6 (3.45)
Tachycardia	5 (2.87)
Fever	3 (1.72)
Cough	3 (1.72)
Seizure	3 (1.72)
Tremor	3 (1.72)
Abdominal distension	2 (1.15)
Loose stool	2 (1.15)
Ataxia	2 (1.15)
Giddiness	2 (1.15)
Salivation	1 (0.57)

Nearly half of the affected children were 1–3 years old as reported in the previous studies [6,7]. Curious and exploratory nature and tendency to mouth objects in toddlers and preschool children predispose them for accidental poisoning.

Majority of the poisoning cases (97.12%) were accidental in nature in concordance with studies reported in the past [6,7]. However, intentional attempts were also noted in 2.88% of children who belonged to the adolescent age group. Impulsive behavior, increase in peer and academic pressure while transitioning to middle school, conflicts with parents, and tendency to become overwhelmed by new challenges all are some of the reasons which make teens vulnerable to suicidal attempts. Since our hospital is situated in urban area, 61% of children were from urban background, but majority belonged to lower socioeconomic class.

Poison was consumed at indoor places by majority of children. Due to urban background, there is a tendency to remain indoors and children engage less in outdoor activities. Hence, poisoning due to plants, their products, and insecticides was reported in only few children. The most common route of poisoning was ingestion followed by inhalation that may be due to the inherent mouthing tendency of toddlers and preschool children who were the most common age group involved, in the present study.

The trend of poisoning was similar to other studies [6,7] as household products accounted for 66% of total cases. However, it was noteworthy that among household products, corrosives were incriminated in one-fourth of poisoning unlike studies reported in the past. Corrosive poisoning was mostly by acid used in toilet cleaning agents which are cheap and readily available. Pyrethroids were the second and kerosene was the third most common agent. With growing menace of mosquito-borne fever (dengue, malaria, etc.) in the region every year, the use of pyrethroids as mosquito repellants has increased and, hence, the number of poisoning in children too. The previous studies from India and adjoining regions have shown that kerosene was the major culprit in majority (25.34% and 27.1%, respectively) of childhood poisonings [8,9]. Kerosene is used in Indian rural and urban poor households as lighting and cooking fuel. It is frequently stored in empty soft drink bottles that are kept on the floor, within easy reach of the children. Recent schemes launched by Government of India to promote the use of liquid petroleum gas, increase in kerosene prices, decreasing subsidies on kerosene oil and use of alternatives such as solar-assisted solutions for lighting has resulted in drastic decline in its use and possibly in poisoning cases in children as well.

Lack of availability of the child-proof containers and packing, and storage within easy reach of children predisposes many children to accidental poisoning by drugs. Over-the-counter availability of drugs and lack of stringent policies and regulations also lead to many cases of suicidal poisoning in older children. Poisoning due to pesticides was low as most of the cases belonged to urban areas in our study.

The average time to presents after exposure was 3.4 h in our study which was comparable to the previous studies [9]. In our

Table 3: Association between clinical parameters and outcome

Clinical parameters	Survivors (*n*=136) median (min, max)	Expired (*n*=3) median (min, max)	*P* value
Age (years)	3 (2 m, 12)	2 (2,4)	0.634
GCS	15 (14, 15)	7 (6,7)	0.001*
MAP (mm of Hg)	60 (56, 72)	70 (68, 71)	0.004*
Interval between poisoning and presentation (h)	3 (1,11)	10 (9, 11)	0.003*
Duration of hospital stay (days)	2 (1,15)	4 (1,5)	0.379
Asymptomatic	14 (10.29)	0 (0)	0.725
Altered sensorium	3 (2.21)	3 (100)	0.001*
Vomiting	95 (69.80)	2 (66.67)	0.680
Seizure	2 (1.47)	1 (33.33)	0.064
Respiratory distress	16 (11.76)	3 (100)	0.002*
Hematemesis	14 (10.29)	0 (0)	0.725
Abdominal pain	22 (16.18)	0 (0)	0.594
Complications	17 (12.5)	3 (100)	0.003*

GCS: Glasgow Coma Scale

study, 34% of cases received pre-referral treatment; nearly two-third of children developed mild symptoms after exposure, and only few developed serious adverse effects after poisoning. Vomiting was the most common symptom reported. Most of children improved with close observation and supportive care alone and were discharged within 72. Mortality was low (2.16%) in our study which was comparable to other studies reported from region [10,11].

Children who were presented with central nervous system depression, delayed presentation and those with complicated course had poor outcome. Low Glasgow Coma Scale (GCS), complications at presentation, and increased time to present to the hospital significantly predicted mortality. Supportive treatment and antidotes were not much effective if there is a significant delay in presentation to the hospital. Our results show changing pattern in acute poisoning in children with decline in incidence of kerosene and pesticide poisoning while increase in corrosives and pyrethroid poisoning due to urbanization, industrialization, and change inhabits of people.

The limitation of this study was that it was a single-center study. Poisoning in children is influenced by demography, socioeconomic status, education, local belief and customs, availability of poisonous substance, religious, and cultural beliefs.

The household products pose a potential risk to children and their easy accessibility should be controlled to prevent pediatric exposures. Proper parental education, use of alternative non-toxic agents, and safe storage of drugs in childproof containers can minimize the risk of poisoning to a larger extent. Large multicentric studies are required for the evaluation of the changing trends of childhood poisoning in India.

CONCLUSION

Poisoning is still a significant cause of admission and mortality in India. Low socioeconomic status and decreased awareness among parents also increase the risk of poisoning. Low GCS and time lapse between poisoning and presentation to the hospital can be a predictor of high mortality. Proper parental education, school- and community-based awareness programs, and safe storage of drugs and chemicals could be an effective measure in preventing the risk of acute poisoning in children.

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