

Clinical profile of poisoning due to various poisons in children of age 0–12 years

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ABSTRACT

Background: Majority of childhood poisonings are unintentional. The incidence of poisoning in children has been shown to be reduced by a significant amount. But to develop effective prevention strategies, the state health care planners need better information on the number and types of poisonings, circumstances in which they occur, and how serious the problem is. **Objective:** To study the clinical profile of poisoning in children. **Methods:** A hospital-based cross-sectional study was carried out among children aged 0–12 years with the history of poisoning. Detailed history, clinical examination, and details of poisoning was obtained. Data was analyzed using proportions. **Results:** Majority (77.8%) belonged to the age group of 1–5 years and were males (65.4%). Household chemicals were ingested in 83 cases out of 153, (54.25%) and in 147 cases (96.1%), poisonous substance was easily accessible to victim. In 144 out of 153 cases (94.1%), poisonous substance was accidentally ingested by the child itself, 131 out of 153 cases (85.6%) occurred at home, while 18 (11.8%) cases occurred in home surroundings. Of the 153 cases, 2 patients (1.3%) presented with the history of diarrhoea, 12 patients (7.8%) in altered sensorium, 6 patients (3.9%) had fever, 16 patients (10.5%) presented with cough, 37 patients (24.2%) presented with excessive secretions from mouth. 31 patients (20.3%) presented with vomiting without blood staining and 12 patients (7.8%) had blood stained vomiting as their chief complaint. Mucosal injury was noted in 41 cases (26.8%). **Conclusion:** Poisoning was common in males. Household chemical was most commonly ingested. Majority children had domestic poisoning and self-unintentional.

Keywords: Children, clinical profile, fever, mucosal injury, poisoning

Introduction

WHO has estimated that 3,45,814 people globally died due to accidental poisoning in 2004, of which 13% were below 20 years.^[1,2] Some 45,000 under 20 years died yearly due to acute poisoning. Worldwide estimates suggest that the rate of poisoning in under 20 years is 1.8 per 100,000 population and for India it ranges like 0.6–11.6%. Data on nonfatal outcomes of childhood poisoning is not readily available at present, although

these outcomes are more prevalent and equally worrisome as they may have lifelong burden on the victims considering the young age in which they sustain these injuries.^[3,4]

According to a study published by Ted Miller in USA in 2000, poisoning in children poses burden of around \$300 (as per year 1996 standards) per victim, on the health system.^[5]

Majority of childhood poisonings are unintentional, occur at home, and home surroundings and hence preventable. With modern prevention methods, incidence of poisoning in children reduced significantly. But for effective prevention strategies to develop, state health care planners need better information on number and types of poisonings, circumstances in which they occur, and how serious is problem. Spectrum and epidemiology

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of poisoning in children and their outcome depend a lot on the socioeconomic status, cultural practices, parental education status and availability of health care measures. Studies from developed countries predominantly demonstrate common household products as the most common cause of acute childhood poisonings and lower incidence of drugs and pharmaceuticals, possibly because of use of child-proof blister packing and bottling of medicines. Even studies from South African have shown that the use of child-resistant containers for kerosene use has reduced the incidence of acute childhood poisoning significantly.^[6]

Kerosene poisoning was the most common accidental poisoning in children.^[7] Similar results were obtained in other studies done in urban areas of India. Contrary to this, studies from rural India by Bhat NK *et al.*, in 2011, found that insecticide is the most common cause of poisoning in children.^[8] After the successful implementation of the special scheme “Delhi: A kerosene-free city Scheme, 2012” Delhi was declared as the first kerosene-free city in India on June 17, 2014.^[9] With this declaration in mind, there is scope for assuming that the availability of kerosene in Delhi might have been reduced and, hence, the spectrum of childhood poisoning may have been changed and a change in preventive strategies may be required.

The present study provides data useful for primary prevention and primary care of childhood poisoning. Parents can be educated about the most common modes of poisoning among children and the primary care they need to take to protect their children. Hence, the present study was undertaken to study the clinical profiles of poisoning in children.

Methods

A hospital-based cross-sectional study was carried out in Department of Pediatrics, Chacha Nehru Bal Chikitsalaya. 153 children aged 0–12 years with the history of poisoning were included.

Institutional Ethics Committee permission was obtained on 21-10-2015. Informed consent was taken from parents.

After ensuring the stabilization of airway, breathing, and circulation as per the PALS guidelines 2010, detailed evaluation of the incident was done.

History of Incidence: The detailed history of poisoning incidence was gathered from attendant who witnessed it. History was noted in a predesigned proforma like name, age, sex etc., and the following parameters:

- Characteristics of poisonous substance: attendants were questioned to identify the characteristics of poison. Poison was identified on the basis of history by the attendants and children (whenever possible). Attendants were asked to bring the containers from which poison was taken, whenever possible. The colour and consistency of the poisonous substance was enquired from the attendant.

- Presenting complaints were noted.
- Poisonous substances were divided into 6 major groups as defined in the WHO world report on child injury prevention.
- In case of toilet cleaner ingestion, the content was identified on the basis of Litmus paper test. A wet blue and red litmus paper were used to test the solution. The content was called acidic if blue the litmus paper turned red and alkaline if the red litmus paper turned blue.
- Details of the container were noted as the type of container (whether original or other than original container or loosely kept at the time of incidence), the presence or absence of label to identify poisonous substance, presence or absence of warning signs etc.
- Circumstance in which poisoning incidence occurred was divided into accidental contact (by self or by other person) adulteration with food or drink, intentional contact (either suicidal or homicidal)
- Exact place of poisoning was noted in 4 groups home, surrounding, workplace, and farm.
- Activity of child at the time of poisoning was noted in 3 groups (playing, working, other)
- Accessibility of poisonous substance to the children at the time of incidence was noted.
- Exact date and time of incidence was asked.
- Delay in time to reach the medical center in hours and cause of delay in time was obtained from the attendant. (whether delay due to travel, nonavailability of male attendants at the time of poisoning, or whether incidence was not considered significant by attendant)
- If any first aid measure given at the home or treatment given to the child prior to admission to our hospital.
- Detailed account of ingestion of alcohol or mood altering drugs by victim or by perpetrator at or before time of poisoning was noted.
- History of requirement of any medical help at time of birth was noted along with overall developmental assessment of the child.
- Past history of injury or poisoning or any chronic illness or long-term medication
- Family history in the form of injury or poisoning in siblings, any family member with long-term medication or chronic illness.
- Family type was noted in the form of nuclear family or joint family
- Number of children in the family were noted in the 2 groups, fewer than or equal to 3 and more than 3.
- Mother’s education was noted in 4 groups- illiterate, primary schooling, high school, and graduate.
- Mother’s occupation was noted – either housewife or else.

Detailed clinical examination of the child was done:

- Vital parameters: Heart rate, Respiratory rate, temperature, and blood pressure
- General examination: pallor, odour, skin colour, sweating, salivation, and hydration status
- CNS examination:

- Higher mental status- irritability, drowsiness, lethargy, stupor, and coma
- Pupillary size and reaction to light- mydriasis, miosis
- Cranial Nerve examination
- Motor system examination- tone, bulk, power, deep tendon reflexes, and superficial reflexes
- Sensory system examination- touch, pain, temperature, and pressure
- Autonomic system evaluation- flushing, Heart rate, and secretions of body fluids
- GIT examination:-
 - Oral mucosa- mucosal injuries, ulceration, and excessive secretions,
 - Guarding or rigidity of the abdominal wall
 - Shifting dullness,
 - Liver- size, texture, surface, margin, span, and tenderness
 - Spleen- size, margin, tenderness, and surface
 - Bowel sounds- sluggish, absent, present, and hyperactive
- Respiratory system examination:-
 - Respiratory rate- tachypnea, respiratory depression
 - Signs of respiratory distress- subcostal and intercostal recession and nasal flaring
 - Adventitious sounds on auscultation- crepitations, rhonchi, stridor etc.
 - Signs of pleural effusion, mediastinitis.
- CVS examination:-
 - Heart rate- bradycardia, tachycardia,
 - Rhythm
 - Blood pressure
 - Cardiomegaly- evidence of cardiomyopathy
- Haematological examination:-
 - Pallor
 - Bleeding manifestations
 - Hemoglobinuria
 - Disseminated intravascular coagulation
- Musculoskeletal system examination:-
 - Compartment syndrome- swelling and tenderness of limbs, in case of animal envenomation

Identification of poison was done on the basis of history, availability of the container from which the poison was taken, clinical findings etc.

Results

Table 1 shows age and sex distribution of children. Majority of the 119 patients (77.8%) belonged to 1–5 years, while 12 belonged to 0-1 year. Majority, i.e. 100 were males (65.4%) while 53 patients (34.6%) were females. In the age group of 0–1-year, the male to female ratio was 1:1, but in age group of 1–5 years and >5 years, males predominated.

Table 2 shows the type of poisons commonly encountered. Of the 153, household chemicals were ingested in 83 (54.25%) followed by the pesticides and insecticides in 28 (18.3%) followed by medicines and drugs, i.e. 17 (11%) followed by unknown

Table 1: Age and sex distribution of the children

Age Group	Sex		Total	Ratio
	Male	Female		
0-1 year	6	6	12	1:1
1-5 year	80	39	119	2.05:1
more than 5 year	14	8	22	1.75:1
Total	100	53	153	1.88:1

Table 2: Types of poison commonly encountered in the present study

	Number of Patients	Percentage
HOUSEHOLD CHEMICALS	83	54.24
Toilet cleaner (acidic and diluted corrosives)	50	32.7
Kerosene	20	13.1
Naphthalene balls	6	3.9
Nail paint remover	3	2.0
Holi colour	1	0.7
Soap solution	1	0.7
Baking soda	1	0.7
Thermometer mercury	1	0.7
PESTICIDES AND INSECTICIDES	28	18.3
Mosquito repellent liquid	16	10.5
Rat kill powder	7	4.6
Cypermethrine	3	2.0
Mosquito repellent coil	1	0.7
Insect killer liquid	1	0.7
UNKNOWN	13	8.5
WORKPLACE PRODUCTS	10	6.5
Turpentine oil	4	2.6
Paint thinner	2	1.3
Stain remover	2	1.3
Battery acid	1	0.7
Machine oil	1	0.7
MEDICINES	17	11
Herbal joint pain medicine	3	2.0
Ayurvedic medicine	2	1.3
Gamma BHC	1	0.7
Nitazoxanide+ ofloxacin	1	0.7
Loperamide+diclophenac	1	0.7
Fexofenadine	1	0.7
Thyroxin	2	1.3
Carbamazepine	1	0.7
Amitriptyline	1	0.7
Iron	1	0.7
Olanzapine	1	0.7
Clenbuterol	1	0.7
Phenytoin	1	0.7
POISONOUS PLANTS	2	1.3
TOTAL	153	100

substances, i.e. 13 (8.5%), followed by workplace products, i.e. 10 (6.5%). The ingestion of poisonous plants (i.e. castor seeds) was least common group. Among individual poisons, toilet cleaner was most common in 50 cases (32.7%) followed by kerosene in 20 (13.1%), followed by mosquito repellent liquid (10.5%), rat kill powder (4.6%), naphthalene balls (3.9%)

amongst others. By litmus paper test, the content of the toilet cleaner was acidic in every case.

Table 3 shows the accessibility of poisonous substances to children. In 147 cases, (96.1%), poisonous substance was easily accessible to victim. While in 6 (3.9%), the poisonous substance was not accessible, in these cases, poisonous substance was mistakenly administered to child by relatives, these substances were medicines or in one case soap solution mixed in cough syrup bottle by elder son and accidentally given by the mother to younger child for cough.

Table 4 shows the circumstances of poisoning in children. In 144 cases (94.1%), poisonous substance was accidentally ingested by the child itself, while in 7 (4.6%), the poison was accidentally given to child by others (mother, grandmother, elder sibling etc). In 1 case, intentional intake of poison was noted.

Table 5 shows the place where poisoning occurred in children. 131 cases (85.6%) occurred at home, 18 (11.8%) cases occurred in home surroundings, while 2 (1.3%) cases occurred at workplace of parents (either child was taken to place where mother worked) and remaining 1.3% cases occurred in farm, where 2 siblings ingested castor seeds while playing.

Table 6 shows the complaints at the time of presentation. 2 patients (1.3%) presented with the history of diarrhoea, 12 (7.8%) in altered sensorium, 6 (3.9%) had fever, 16 (10.5%) had cough, 37 (24.2%) had excessive secretions from mouth. 31 (20.3%) had vomiting without blood staining, and 12 patients (7.8%) had blood stained vomiting as their chief complaint.

Table 7 shows the common examinations findings in children. Upon examination, mucosal injury was noted in 41 (26.8%), while 18 (11.8%) had respiratory system involvement in the form of either crept, rhonchi, consolidation etc., 9 (6%) had pain in abdomen while 5 had dysphagia and difficulty feeding. Of the 13 patients with CNS involvement, 2 (1.3%) were irritable, 6 (3.9%) were drowsy, and 2 (1.3%) were having signs of encephalopathy, while 1 (0.7%) was stuporous, 1 (0.7%) in coma while 1 patient (0.7%) had signs of sympathetic activation.

Discussion

Poisoning is found to be more common in children among the age group 1–5 years, as it was reported by Indian workers like Brata Ghosh *et al.*, NK Bhat *et al.*, U Kohli *et al.*^[7,8,10] and similarly by KP Dawson *et al.*, N Andiran *et al.*, S Budhathoki *et al.*^[11-13] Similar results were obtained in our study where this age group had 77% of poisoning incidences. This appears to be due to rapid neurocognitive development, increased activity, curiosity of surrounding, tendency for mouthing of objects, and the inability to differentiate harmful from harmless substances.^[8,14]

Males were most commonly involved in incidence of poisoning as reported by S Rathore *et al.*, NK Bhat *et al.*, K Basu *et al.*^[8,15,16]

Table 3: Accessibility of poisonous substances to children

Accessibility of the poisonous substance	Number	Percentage to the children
No	6	3.9
Yes	147	96.1

Table 4: Circumstance of poisoning in children

Circumstances	Frequency	Percent
Accidental by Self	144	94.1
Adulteration with Food or Drink	1	0.7
Accidentally Given by Other	7	4.6
Intentionally Taken by Self	1	0.7
Total	153	100.0

Table 5: Place where poisoning occurred in children

	Frequency	Percent
Home	131	85.6
Home Surrounding	18	11.8
Work Place	2	1.3
Farm	2	1.3
Total	153	100.0

Table 6: Complaints at the time of presentation

Presenting complaints	Number of cases	Percentage
Diarrhea	2	1.3
Altered Sensorium	12	7.8%
Fever	6	3.9%
Cough	16	10.5%
Excessive Secretions from Mouth	37	24.2%
Asymptomatic	75	49%
Vomiting with Blood Tinge	12	7.8%
Vomiting Without Blood Stain	31	20.3%

Table 7: Common examinations findings in children

Examination findings	Number	Percentage
Mucosal Injury	41	26.8%
Respiratory System	18	11.8%
GIT Involvement	23	15%
Abdominal pain	8	5.2%
Dysphagia	15	9.8%
CNS involvement	13	8.5%
Irritable	2	1.3%
Drowsy	6	3.9%
Stupor	3	2%
Coma	1	0.7%
Sympathetic Activation	1	0.7%

Our study also provided similar reports with males predominating in the age more than 1 year, with a male to female ratio of around 1.8:1 while in the infantile age group the males and females were equally involved probably due to the dependence of this age group on the attendants for majority of their activities. Overall male preponderance appears to be due to the differences in socialization practices applied for male and females in community.

While males are allowed and encouraged to engage in outdoor and risk-taking activities, females are not allowed similar freedom and are even provided with a supervision to follow the customs.^[1]

Many studies from developed nations, like by KP Dawson *et al.*, T Rajka *et al.* have reported medicines and drugs to be the most common agents.^[11,14] Indian researchers like S Rathore *et al.*, Brata Ghosh *et al.* and U Kohli *et al.* have reported kerosene to be the most commonly encountered agent in urban areas and overall incidence too.^[7,10,16] Although studies from the rural part of India done by NK Bhat *et al.* reported insecticides to be the most common agent causing acute childhood poisonings.^[8] In our study, we found a different trend, toilet cleaner was the most commonly encountered agent followed by kerosene and mosquito repellent liquids. Among groups of poisons, household chemicals followed by pesticides and insecticides which are commonly used in household (e.g. cypermethrine and other pyrethroids) were involved. This changing trend may be due to reduced availability of certain chemicals like kerosene and organophosphates in the population catered by our hospital.^[9]

In our study, we tried to identify the association between the specific characteristics of poisons based on the frequency and severity of poisonings. We found that poisonous substances were liquid in 3/4th of the cases. To the best of our knowledge, no other study had reported the consistency of the poisonous substances, but considering the most commonly involved poisons in studies by S Rathore *et al.*, U Kohli *et al.* and Brata Ghosh *et al.*^[7,10,16] it could be assumed that most of the poisonous agents encountered in childhood are liquid in nature. This observation can be explained by the fact that liquids are easily ingested and in larger doses as compared to solids or powders. Powders and solids may stick to the mucosa, and cause irritation to the mucosa, less doses are generally consumed.^[1] Despite these different physical properties, we found no significant association between the consistency of the substance and severity of poisoning. This may be explained by the differential chemical properties of these substances which may act as confounding factors.

Half of our cases were asymptomatic at presentation, and majority of the remaining patients presented with excessive secretion from mouth as the commonest poison found was mild diluted corrosive acids, and the other common complaints at presentation had altered sensorium, fever, cough, and vomiting with or without blood staining. On examination, local mucosal injury was the most common finding followed by the involvement of gastrointestinal tract with abdominal pain and dysphagia, while neurological involvement was recorded in 13 patients out of which only one patient had signs of increased sympathetic system activation. NK Bhat *et al.* have reported that 30% of their subjects were asymptomatic at the time of presentation.^[8] U Kohli *et al.* reported altered sensorium, respiratory distress, seizures etc., to be most common presentations.^[10] Reduced frequency of highly toxic substances like organophosphates, kerosene etc., and increased incidence of poisoning with mild or nontoxic household substances with increased literacy and

understanding of parents may explain the high incidence of mild poisoning and asymptomatic patients in our study as compared with previous studies.

In our study, 73% did not require any form of treatment, they were admitted for observation and were discharged in one or two days. Supportive care like antiemetics, oxygen supplementation, chelating agents and PPI/H₂ blockers etc., was given in 22% patients, only 2 patients needed ventilator care. Gastric lavage was given only in 5 patients who were either critically sick or presented within one hour of poisoning and in whom lavage was not contraindicated. (e.g. corrosive poisoning, kerosene poisoning) Only one patient was given specific antidote (Penicillamine in case of iron poisoning).

Lee J *et al.*^[17] found that boys were more than girls which is similar to the present study findings. They noted that home was the place in 94.7% of poisoning supporting our findings of 85.6% of poisoning which took place at home. The authors reported that in 41.4% cases, pharmaceutical ingestion was present but we found that it was only 11% while household chemicals were most common in 54.2% children.

Azab SMS *et al.*^[18] studied 38,470 children over five years. Majority (52%) were <6 years. We also had similar age structure. 68.5% of their poisoning cases were unintentional which is >94.1% in the present study. In their study, also pharmaceutical drugs were the most common poisoning agents but in the present study, it was household chemicals in 54.2% of cases. 75.8% of their cases had no/minor effects whereas in our case 49% were asymptomatic.

Disfani HF *et al.*^[19] observed that in 87.7% cases gastrointestinal poisoning was present but, in our study, only 15% cases had gastrointestinal involvement. 49.8% of their cases had poisoning related to medications which was only 11% in the present study. The authors found that the odds of poisoning were 10.44 with a previous history of poisoning and odds was 8.88 with availability.

Conclusion

Most commonly affected age group was 1–5 years and males were commonly affected which increased with increasing age. Toilet cleaner was the most commonly involved agent. Most of the poisonous substances were easily accessible to children. Most common mode of ingestion was unintentional and accidental. Most children were asymptomatic at the time of presentation till discharge. Most patients admitted with poisoning were having mild poisoning and required only observation without any specific treatment.

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Conflicts of interest

There are no conflicts of interest.

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