

# A study about clinic-epidemiological pattern of acute poisoning in pediatric age group



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Submission: 19-08-2020

Revision: 21-02-2021

Publication: 01-04-2021

## ABSTRACT

**Background:** Poisoning is one of the most common causes for emergency hospitalization and mortality in children. Mostly it is accidental in nature and can be prevented by awareness in caregivers. Recently due to increased use of many new chemicals in homes and agriculture clinic etiological profile of poisoning is also changed. **Aims and Objectives:** To study clinic-epidemiological pattern of acute poisoning in hospitalized children and To evaluate association of clinicodemographic factors to age of intoxicated children to evaluate association of clinicodemographic factors to age of intoxicated children. **Materials and Methods:** A cross sectional study was conducted from October 2019 to February 2020 in pediatric department of a tertiary care center. Child admitted with alleged history of poisoning included in study. Type and amount of poison, clinical presentation, outcome and demographic profile were recorded from medical records of patients. **Results:** Study was conducted among 50 patients of poisoning. 74% patients were under 5 year of age while 56% were boys and 44% were girls. Patients admitted due to ingestion of insecticides and pesticides (18%), hydrocarbons (14%), medicines (12%) and agricultural products (8%), plant products (16%) and others. Maximum number of patients intoxicated with household products (56%). Age was significantly associated with residence ( $p = 0.02$ ) and place of exposure ( $p = 0.01$ ) and nature of poisoning ( $p = 0.05$ ). **Conclusion:** In children below 5 year of age incidences of poisoning are more frequent, most of the cases are accidental in nature and easily preventable. Proper care in this tender age is very important in order to prevent morbidity and mortality due to poisoning.

**Key words:** Poisoning; Accidental; Pesticides; Intoxication; Poison

## INTRODUCTION

Poisoning is one of the commonest causes of morbidity and mortality in children. As reported by WHO in 2008 unintentional poisoning is an issue of global health concern in pediatric population with incidence rate 1.8/100 thousand inhabitant and approximately 45000 death/year.<sup>1</sup> Most of the cases occur in children below 5 year of age - reasons are children's curious nature, lack of knowledge about impending danger and habit of mouthing in toddlers.<sup>2</sup> Approximately 2 million children below 6 years of age visited every year with alleged history of poisoning in emergency department.<sup>3</sup> Most of the cases were accidental especially in young age while intentional poisoning is very common in adolescent age group. Among the accidental poisoning, even though there is no significant decrease in

the number, the pattern of poisoning has shown a change with new hazards constantly appearing due to introduction of newer drugs and chemicals for domestic use and farming. Common poisoning agents in high-income countries include pharmaceutical agents, household products (e.g. bleach, cleaning agents), pesticides, poisonous plants and bites from insects and animals. Common poisoning agents in low-income and middle income countries are fuels such as paraffin and kerosene, pharmaceuticals and cleaning agents.<sup>1</sup>

Maximum children exposed to these poisonous substances in home only few children exposed outside.<sup>4,5</sup> Most of the poisons are in reach of toddlers and mishap happened in a fraction of minutes. Awareness of caregivers is very important to prevent such fateful incidences because lake of knowledge and supervision were found as major

### Access this article online

**Website:**

<http://nepjol.info/index.php/AJMS>

**DOI:** 10.3126/ajms.v12i4.30701

**E-ISSN:** 2091-0576

**P-ISSN:** 2467-9100

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reasons for these accidental exposures in children.<sup>6</sup> Timely intervention and management is very important key to save such precious lives of these innocent victims.

Present study had conducted to improve knowledge about clinic-epidemiological profile of poisoning in pediatric age group and to observe changes in pattern of poisoning. Present findings hypothesized that quality care of affected children will be improved by creating awareness among public to prevent such accidents.

## MATERIAL AND METHODS

A cross sectional study was conducted in pediatrics department of a tertiary care center in Central India. It is a referral hospital with 10 bedded PICU and large drainage area; patients came from urban as well as rural areas for treatment. It was a hospital based study and data was collected from hospital's medical record section. All Children hospitalized with history of poisoning between ages of 1 month to 14 years in pediatric department from October 2019 to February 2020 were included in the study. Patients whose medical records were incomplete or relevant data was absent excluded from study.

Hospital records were reviewed about patients admitted with alleged history of poisoning. Children who were included in the study their details of relevant clinical details were recorded in predefined proforma from case records. Type of poisoning, nature of poisonous substance, route of exposure, time interval between exposure and treatment, clinical presentation, treatment, outcome and demographic details were recorded.

### Statistical analysis

Data was compiled and statistically analyzed by using SPSS 16.0 trial. Descriptive and inferential statistics had used. Results for continuous variable presented as mean  $\pm$  SD while categorical variables presented in numbers and percentage (%). Ratio and rate were calculated. Chi square test used to show association between variables. Probability value  $\leq 0.05$  was considered as statistically significant.

## RESULTS

One thousand four hundred eighty children were admitted during this period. Fifty patients admitted with history of poisoning were included in the study. Incidence rate of poisoning found to be 3.3%.

Most common age group found to be under 5 children (74%) out of them 38% had aged between 6 months to

1 year of age and 36% between 1 to 5 years. 26% children were above 5 years of age (Figure 1). Mean age of children found to be  $44.58 \pm 32.5$  months.

Fifty eighty percent children were from urban area and 42% were from rural area. Children from rural background were sicker than urban area. All children belong to low socioeconomically status. House hold products especially medicines were commoner reason for poisoning in urban area while in rural area agricultural and plant products were more common. Boys (56%) were more in numbers than girls (44%). Male: female ratio (M: F ratio) was 1.27:1 (Figure 2).

Ninty six percent children exposed accidentally to poisonous substance while 4% children had history of intentional poisoning. Homicide was not observed. Exposure route was ingestion (100%) in all children; other route exposure was not seen. Poisonous substance was available to children in their near vicinity, 60% children ingested poisonous substance at home. Forty percent children ingested it out doors. Single substance was ingested in 96% cases while in 4% cases poison was unknown. Fifty six percent children ingested poisonous house hold products. Majority of affected children observed immediately by their caregivers and received care timely. In 16% children parents gave some home treatment. Amount of poisonous substance

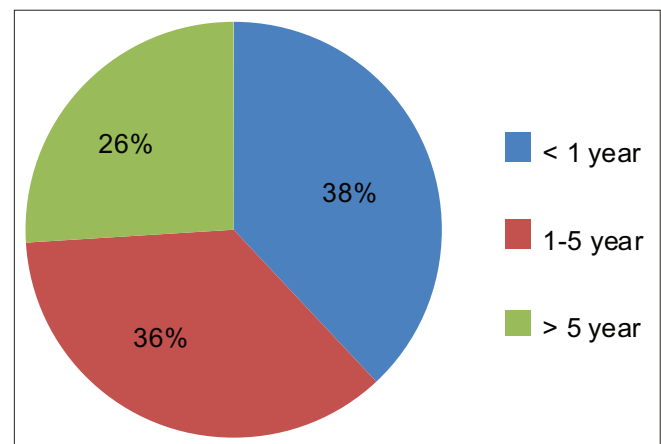


Figure 1: Distribution of poisoning cases according to age

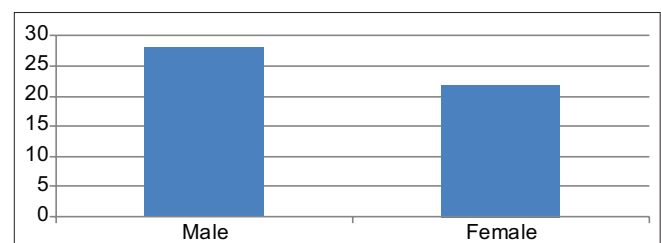


Figure 2: Distribution of poisoning cases according to gender

ingested was little in most of the cases. Gastric lavage was done in 70% patients but only in 56% children gastric lavage was done within 1 hour of exposure. Sixty percent intoxicated children reached to hospital within 2 hours of ingestion (Table 1). Seventy percent patients directly came to our hospital and 30% referred patients among which 16% patients were referred from peripheries due to serious condition after few hours, 14% patients received treatment in nearest hospital and referred to us after initial stabilization. Twenty two percent patients were in clinical stable condition out of them 18% had no complaints. Sixty-six percent were sick and 12% in very serious condition.

Most common poisonous substances were insecticides and pesticides (18%) followed by plant products (16%) and hydrocarbons (14%). 12% patients had ingested medicines, 8% agricultural products, food poisoning (12%) out of it 4% exposed at home while 8% exposed after eating outside in social gathering (8 %) and unknown poisoning (4%). Poisonous substances divided in 8 broad groups as shown in Table 2. Agricultural products were organophosphorus compound and herbicides, hydrocarbons were kerosene and paint thinner. Corrosive included acid, toilet cleaner, phenyl tablet while insecticides / pesticides included mosquito, rat and ant killers.

**Table 1: Clinical variables in intoxicated children at time of admission**

Clinical Variables		Number
Poison	House hold products	28 (56%)
	Others	22 (44%)
Route of exposure	Ingestion	50 (100%)
	Other	0
Time to reach hospital	<2 hours	32 (64%)
	>2 hours	18 (36%)
Observed by caregivers	Immediately	31 (62%)
	Delayed	19 (38%)
At home treatment given	Yes	8 (16%)
	No	42 (84%)
Gastric lavage	<1 hour	28 (56%)
	>1 hour	7 (14%)
	Not done	15 (30%)
Condition at time of admission	Stable	11 (22%)
	Sick	33 (66%)
	Critical	6 (12%)

**Table 2: Type of poisonous substances in children**

Poisonous substance	Patients number
Insecticide/ Pesticides	9 (18%)
Plant product	8 (16%)
Hydrocarbon	7 (14%)
Medicine	6 (12%)
Food poisoning	6 (12%)
Agricultural product	4 (8%)
Corrosive	4 (8%)
Others	4 (8%)
Unknown	2 (4%)

Association of age above and below 5 years to gender, residence, nature of poisoning and place of exposure was analyzed as shown in Table 3.

Table 3 highlighted that age is significantly associated with residence ( $p = 0.02$ ) and place of exposure ( $p = 0.01$ ). Seventy percent of <5 years children were exposed to poison at home while above 5 year of age only 30% exposed at home. In urban area 67% children were under 5 year of age while in rural area 30% were below 5 year of age. Nature of poisoning was significantly associated with age, intentional poisoning was more common in higher age group ( $p = 0.05$ ). Gender was not significantly associated with age, male dominance was present in both age groups.

Table 4 showed that 18% children were totally asymptomatic, rest of them presented with various clinical presentations. Most common complaint was vomiting (44%) followed by diarrhea (24%), pain abdomen (20%) and respiratory distress (12%) other complaints found to be less prevalent (< 10%).

Table 5 highlighted that asymptomatic children needed only observational care. Twelve percent patients were in critical condition required intensive care out of them 6% patients needed ventilator care. Rest of children received only symptomatic and supportive care.

Eighty percent patients improved and discharged, 2% patients died and 9 patients left against medical advice (LAMA) as shown in Table 5. Case fatality rate was 2%. Overall survival rate was 80%.

## DISCUSSION

Poisoning is 4<sup>th</sup> leading cause of unintentional injury after road traffic accidents; burn and drowning.<sup>7</sup> Under 5 age group is associated with significant number of poisoning cases. In developed countries it is a major reason for emergency visits and admission in hospitals.<sup>8</sup> In present study 74% cases were found in under 5 age group.

It is equally prevalent in developed and developing countries but types of poison are different. Most of the times, children are exposed to poison available in their near vicinity and easily approachable to them. Majority of the cases occurred at home, approximate in 9 children out of 10 with poisoning (90%)<sup>5</sup> and involved single substance. In present study 60% patients affected at home, 40% children ingested poison while playing outside. Sarika D reported home as commonest place for poisoning in children.<sup>9</sup> Most common route for

**Table 3: Association of Demographic variable to age of intoxicated patients**

Variables		Total children Numbers (n-50)	Children ≤5 years (n-37)	Children >5 years (n-13)	P value
Residence	Urban	29 (58%)	25 (67.5%)	4 (30.7%)	0.02 <sup>£</sup>
	Rural	21 (42%)	12 (32.4%)	9 (69.2%)	
Gender	Male	28 (56%)	20 (54.1%)	8 (61.5%)	0.44 <sup>£</sup>
	Female	22 (44%)	17 (45.9%)	5 (38.4%)	
Nature of poisoning	Accidental	48 (96%)	37 (100%)	11 (84.6%)	0.05 <sup>£</sup>
	Intentional	2 (4%)	0	2 (15.3%)	
Place of exposure	At home	30 (60%)	26 (70.2%)	4 (30.7%)	0.01 <sup>£</sup>
	Outdoors	20 (40%)	11 (29.7%)	9 (69.2%)	

<sup>£</sup>The association is not significant for 1 degree of freedom at the 0.05 level of significance.

<sup>£</sup>The association is highly/strongly significant for 1 degree of freedom at the 0.05 level of significance.

**Table 4: Clinical presentation on admission**

Clinical presentation	Number
Asymptomatic	9 (18%)
Vomiting	22 (44%)
Diarrhea	12 (24%)
Pain abdomen	10 (20%)
Respiratory distress	6 (12%)
Altered sensorium	3 (6%)
Cough	3 (6%)
Respiratory failure	2 (4%)
Fever	1 (2%)
Multi organ dysfunction	1 (2%)

**Table 5: Treatment and outcome in intoxicated patients**

Treatment and outcome variables	Number	Percentage
Treatment	Observation	9 18
	Gastric lavage	35 70
	Antidote	1 2
	Symptomatic and supportive care	41 82
	Ventilator care	3 6
Outcome	Survive	40 80
	Death	1 2
	Left against medical advise	9 18

exposure is ingestion.<sup>2,10</sup> Present findings revealed that route of exposure was ingestion in all cases (100%) and single substance was ingested in 96% cases, poison remained unknown in 4% cases. Male predominance (56%) was present in the study, same findings reported by Budhoathoki s et al and some other studies.<sup>11-13</sup> No specific reason mentioned in literature but may be more curious nature of boys than girls is responsible for it. Present study did not show significant gender difference in acute poisoning cases above and below 5 years age groups.

Vomiting, diarrhea, altered sensorium and respiratory difficulty were common clinical presentation in the study, similar results with vomiting and altered sensorium were common finding in studies by Dayashri et al and Sharma et al.<sup>13,14</sup> Most cases involved in the study were

below 5 years of age (74%) and poisoning was accidental in nature, similar findings were reported by others. Kohli U and Budhathoki S reported age group below <5 year of age and according to some other studies age group 1 to 3 years was most affected age.<sup>8,10,15</sup> Quazi et al reported that 13 to 18 years was commoner age for poisoning and mostly intentional.<sup>16</sup> It is already reported in literatures that below 5 year of age children are prone to accidental poisoning due to their curious nature, habit of mouthing and innocence. In all studies, below 5 years of age accidental poisoning was most common presentation as reported in this study. Above 10 years of age intentional poisoning was more prevalent as reported by Hyder, Sharma J and Manzar N.<sup>7,14,15</sup> In present study similar findings were reported, nature of poisoning was significantly associated with age.

Common poisonous substances were different in different geographical areas and pattern of poisoning changed over time as reported in various studies. In this study house hold substances were most common cause for poisoning. In urban area increased incidences of poisoning due to medicines and insecticides was found while in rural area agricultural and plant product were common poisonous substance. Medicines were reported as most common cause for poisoning in children in developed countries.<sup>2-5</sup> A study from Iran by Haghghat M et al found opium as most common substance while study by Manzar et al reported that kerosene, medicine, insecticide and bathroom cleaner were common cause for poisoning in children. In Sri Lankan study plant product especially risinus was most common cause of poisoning in children.<sup>17</sup> Results of this study were differing from some other South Asian studies from India, Pakistan and Sri Lanka where Kerosene oil was most common etiological agent.<sup>8,15,18,19</sup> Kerosene was most common poisonous substance in children in past as reported in literature but now it is not available in market and it's use is also decreased in houses due to availability of gas stoves for cooking. That's why chances of accidental exposure to Kerosene in children decreased

significantly while poisoning due to agricultural products and medicines increased due to increased availability and easy accessibility of these substances in near vicinity to children due to increased usage of pesticides, insecticides in farming and medicinal products at home.

Case fatality rate was low in current study (2%), in many other studies same findings were reported of low mortality rate in comparison to adult population.<sup>8,10</sup> Reason may be low or negligible amount taken accidentally by children, less harmful substance was ingested and timely noticed by caregivers.

The World Health Organization and the United Nations Children's Fund recommend that to decrease risk of poisoning in children potentially toxic domestic products should be replaced by similar nontoxic or less harmful products with specialized information and provision of immediate care should be included in preventive strategies.<sup>1</sup>

Present study highlighted that this young tender age need continuous supervision by caregivers because in fraction of minutes mishap can happen. For prevention caregiver's knowledge about these incidents is very important. Awareness in general public may be a good tool to prevent it. Most incidences happened due to easy availability of these toxic substances which can be prevented easily. All toxic substances should be out of reach to children (on height, in closed cupboards) and in containers with child proof caps. These toxic substances should not put into empty water bottles and elders should not keep their medicines in children's reach.

### Limitations of the Study

Limitations of present study were small sample size and single centric therefore, present findings suggested that future studies may conducted with large sample size to verify findings of current study.

## CONCLUSION

Pediatric population is prominent age group for exposure to poisonous substances accidentally and associated with high risk of morbidity and mortality. Mostly substances are common house hold products easily approachable to children. It is very important to create awareness in public to make home and surroundings safe for these curious but innocent victims of such tragedy.

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**Author's contribution:**

**PR, NJ-** Contributed the complete process of this study, Participate in concept design, review of literature, data collection, interpret results, statistical analysis and interpretation, preparing manuscript, first draft, critical revision of manuscript.

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**Source of Funding:** None, **Conflict of Interest:** None.