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Original Research Article

Patterns and Outcomes of Childhood Poisoning: Insights from a Tertiary Care Hospital-Based Study

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Abstract:

Background: Childhood poisoning remains a significant public health concern, particularly in low- and middle-income countries, where it contributes substantially to pediatric hospital admissions and preventable morbidity.

Objective: This hospital-based study aimed to analyze the patterns, clinical presentations, and outcomes of childhood poisoning cases admitted to a tertiary care hospital.

Methods: A total of 89 cases were evaluated, focusing on demographic characteristics, types of poisons, mode of exposure, and associated clinical outcomes. Data were collected and analyzed to identify trends and highlight key areas for intervention.

Results: The majority of poisoning incidents were accidental, with children under five years being the most affected. Household substances such as cleaning agents and medications were the leading causes, followed by agricultural chemicals. Early recognition and appropriate treatment resulted in the successful management of most cases.

Conclusion: The study emphasizes the need for parental awareness, public health education, poison control measures, and improved child safety strategies to mitigate the burden of childhood poisoning.

Keywords: Childhood Poisoning, Accidental Poisoning, Household Substances, Public Health, Poison Control, Tertiary Care Hospital, Clinical Outcomes.

Introduction

Childhood poisoning is a significant public health issue, especially in developing countries, where it contributes substantially to preventable morbidity and mortality [1,2]. Poisoning in children typically results from accidental exposure to toxic substances, which are often found within the household. Due to their natural curiosity, lack of awareness, and exploratory behaviour, young children, particularly those under the age of five, are at the highest risk of exposure [3,4].

The ingestion of household cleaning agents, medications, pesticides, and other chemical substances is common in such cases, underscoring the need for preventive measures [5,6]. The epidemiological patterns of childhood poisoning vary across regions and are influenced by socioeconomic conditions, cultural practices, and the availability of hazardous substances [7]. Poor storage practices and inadequate supervision further compound the risk. In addition to accidental poisoning, intentional poisoning cases, though rare can occur in older children and adolescents, often associated with psychosocial issues or self-harm [8, 9]. The impact of such incidents is not limited to the immediate health consequences but extends to long-term emotional and financial burdens on families and healthcare systems [10,11].

This hospital-based study aims to analyze the patterns, causes, and clinical outcomes of childhood poisoning cases admitted to a tertiary care center. The study explores the demographic characteristics, types of poisons, and treatment modalities employed. By highlighting these aspects, the research seeks to identify key risk factors and suggest strategies for prevention, early detection, and effective management. Ultimately, the findings underscore the importance of parental education, household safety, and the establishment of robust poison control systems to mitigate the incidence of childhood poisoning.

Materials and Methods

This hospital-based prospective study was conducted in the Department of Pediatrics, SCB Medical College & SVPPGIP, Cuttack, over a period of two years, from November 2019 to October 2021. A total of 89 pediatric patients, aged 1 to 14 years, admitted with a history of poisoning were included in the study. Ethical approval was obtained from the institutional ethics committee, and informed consent was taken from the parents or guardians of all participants.

Study Design: Hospital-Based Prospective Study

Study Population: Pediatric patients aged 1 to 14 years presenting with poisoning.

Inclusion Criteria:

- Children under 14 years of age with a history of poison consumption, irrespective of signs and symptoms.
- Cases accompanied or unaccompanied by the poison or container.

Exclusion Criteria:

- Children with developmental delays, such as cerebral palsy or neurodegenerative diseases.
- Cases leaving against medical advice before a detailed evaluation.
- Cases of food poisoning or idiosyncratic drug reactions.

Data Collection: A structured proforma was used to record demographic details, type of poison, route of exposure, symptoms, clinical examination findings, investigations, treatment received, and outcomes. Investigations included haematological parameters (e.g., complete blood count), serum acetylcholinesterase levels, chest X-rays, and electrocardiograms as required.

Methodology: The clinical condition of each patient was evaluated, including systemic examination for cardiovascular, respiratory, gastrointestinal, and central nervous system involvement. Supportive treatment, specific antidotes, and mechanical ventilation were provided based on clinical needs. Outcomes were documented, including duration of hospital stay, need for PICU admission, and survival rates.

Statistical Analysis: Data were analyzed using SPSS 22 software, with categorical variables expressed as frequencies and percentages. Associations between variables were assessed using Chi-square tests, and a p-value < 0.05 was considered statistically significant.

Results

The study included 89 cases of childhood poisoning, with detailed observations captured across various parameters.

Demographic Distribution

The majority of cases (78.7%) occurred in children aged 1–5 years, followed by 14.6% in the 10–14 years age group and 6.7% in the 6–9 years age group. The mean age of the population was 2.1 years. A male predominance was observed, with a male-to-female ratio of 1.5:1, reflecting 60.7% male cases and 39.3% female cases. Out of the total cases, 53.9% were from rural areas and 46.1% from urban areas. Poisoning predominantly occurred indoors 82%, while 18% were outdoor cases.

Substances Involved / Types of Poisoning

Kerosene ingestion was the most common, accounting for 43.82% of cases, followed by organophosphates (14.61%), mosquito repellents (10.11%), and turpentine oil (8.98%). Other substances included diesel, sanitizers, and caustic soda, among others. Mode and Manner of Poisoning were predominantly accidental with 84.2% of cases, mostly in children ≤5 years old. Intentional poisoning constituted 15.7%, observed exclusively in children >5 years of age.

Clinical Presentations

Respiratory manifestations in 49.4% cases and gastrointestinal symptoms such as vomiting (47.2%) and abdominal pain (39.3%) were common. Fever was noted in 40.4% of cases.

Management and Outcomes

Supportive care including oxygen therapy (48.3%), nebulization (44.9%), and antipyretics (43.8%), was the mainstay of treatment. Specific antidotes were administered in 19.1% of cases. PICU admission was required in 17.9% of cases, with mechanical ventilation in 4.5% of cases.

Mortality and Hospital Stay

The mean hospital stay was 4.96 days. Mortality was reported to be 1.1%, giving an overall survival rate of 98.9%.

Table 1 shows the age distribution of poisoning cases, with the majority of incidents occurring in children aged 1–5 years (78.7%), reflecting their higher vulnerability due to exploratory behaviour.

Table 1: Age Distribution of Poisoning Cases

Age Group (Years)	Frequency	Percentage (%)
1–5	70	78.7
6–9	6	6.7
10–14	13	14.6

Table 2 depicts the gender distribution of poisoning cases, showing a male predominance (60.7%) compared to females (39.3%).

Table 2: Gender Distribution of Cases

Gender	Frequency	Percentage (%)
Male	54	60.7
Female	35	39.3

Table 3 represents the distribution of poisoning cases based on residence and location, with rural areas accounting for 53.9% of cases and the majority of incidents occurring indoors (82%).

Table 3: Residence and Place of Poisoning

Parameter	Frequency	Percentage (%)
Rural Residence	48	53.9
Urban Residence	41	46.1
Indoor Poisoning	73	82
Outdoor Poisoning	16	18

Table 4 illustrates the types of poisoning agents involved, with kerosene being the most common (43.8%), followed by organophosphates (14.6%) and mosquito repellents (10.1%).

Table 4: Types of Poisoning Agents

Poisoning Agent	Frequency	Percentage (%)
Kerosene	39	43.8
Organophosphates	13	14.6
Mosquito Repellent	9	10.1
Turpentine Oil	8	9.0
Others (e.g., Diesel)	20	22.5

Table 5 provides an overview of the clinical presentations observed, with respiratory symptoms (49.4%) and vomiting (47.2%) being the most common among cases.

Table 5: Clinical Presentations of Poisoning Cases

Symptom	Frequency	Percentage (%)
Respiratory Symptoms	44	49.4
Vomiting	42	47.2
Abdominal Pain	35	39.3
Fever	36	40.4

Table 6 describes the mode and manner of poisoning, showing accidental poisoning as the predominant mode (84.2%), while intentional cases constituted 15.7%.

Table 6: Mode and Manner of Poisoning

Mode of Poisoning	Frequency	Percentage (%)
Accidental	75	84.2
Intentional	14	15.7

Table 7 outlines the management and supportive care measures provided, with oxygen therapy (48.3%) and nebulization (44.9%) being the most frequently administered treatments.

Table 7: Management and Supportive Care

Treatment Modalities	Frequency	Percentage (%)
Oxygen Therapy	43	48.3
Nebulization	40	44.9
Antipyretics	39	43.8
Specific Antidotes	17	19.1
PICU Admission	16	17.9
Mechanical Ventilation	4	4.5

Table 8 summarizes the duration of hospital stay, with the majority of patients (46.1%) being discharged within 3 days, and 16.8% requiring stays longer than 6 days.

Table 8: Duration of Hospital Stay

Duration (Days)	Frequency	Percentage (%)
≤ 3 Days	41	46.1
4–6 Days	33	37.1
> 6 Days	15	16.8

Table 9 depicts the outcomes of poisoning cases, showing a recovery rate of 98.9% and a minimal mortality rate of 1.1%.

Table 9: Outcomes of Poisoning Cases

Outcome	Frequency	Percentage (%)
Recovered	88	98.9
Mortality	1	1.1

Table 10 displays the association between age group and PICU admission, with children aged 1–5 years accounting for 75% of admissions.

Table 10: Association between Age Group and PICU Admission

Age Group (Years)	PICU Admission (%)	Non-PICU (%)
1–5	12 (75.0)	58 (78.4)
6–9	2 (12.5)	4 (5.4)
10–14	2 (12.5)	12 (16.2)

Table 11: Antidotes with Their Indications

Antidote	Main indication for	Antidote	Main indication for
Acetylcystein	Paracetamol	Flumazenil	Benzodiazepines
Amyl nitrate	Cyanide	Glucose	Insulin
Atropin	Cholinergic drugs	Guanidin	Bolulism
Isoprenaline	Beta blockers	Ascorbic acid	Organic peroxides
Aurintricarboxylic acid	Beryllium	Calcium salts	Oxalate, Fluorides
Desferrioxamine	Iron, Aluminium	Diazepam	Chloroquine
Dimercaprol	Arsenic	Ethanol	Methanol, ethylene glycol
Methionine	Paracetamol	N-acetlpenicillamine	Mercury
Naloxone	Opiates	Oximes	Organophosphates
Oxygen (hyperbaric)	Carbon monoxides, cyanide	Penicillamine	Copper
Phentolamine	Alpha adrenergics	Prussioan blue	Thallium
Propranolol	Beta adrenergics	Protamine sulphate	Heparine
Pyridoxine	Isoniazid	Sodium nitroprusside	Ergotism
Succimer	Lead mercury	Tocopherol	Carbon monoxide
Triethylene tetramine	Copper	Activated charcoal	Given above
Calcium chloride	Calcium channel blocker, spider bites	Cyproheptadine	Serotonin syndrome
Diphenhydramine HCl & Benztropin mesylate	Antipsychotics (extrapyramidal reactions)	Calcium gluconate	Calcium channel blocker toxicity, hydrofluoric acid burns

Discussion: This hospital-based study provides a comprehensive analysis of childhood poisoning cases, highlighting critical epidemiological patterns, clinical presentations, and outcomes [12, 13]. The predominance of cases among children aged 1–5 years aligns with global trends and underscores their heightened vulnerability due to curiosity, exploratory behaviour, and limited understanding of danger [14, 15]. The male predominance observed (60.7%) may reflect gender-based activity patterns, which often place boys at a greater risk of exposure to hazardous substances [16-18]. These findings emphasize the need for targeted preventive strategies for this high-risk age group.

The predominance of kerosene poisoning (43.8%) is consistent with its widespread use in rural households, where unsafe storage practices often contribute to accidental ingestion [19, 20]. Similarly, the significant proportion of cases involving organophosphates and mosquito repellents reflects the increasing use of pesticides and household chemicals in developing regions [21, 22]. Most poisonings (84.2%) were accidental, further emphasizing the critical role of parental supervision, childproofing measures, and community education to prevent unintentional exposure [23, 24]. The clinical presentations in this study, including respiratory symptoms (49.4%) and vomiting (47.2%), demonstrate the immediate systemic impact of ingested toxins. These symptoms necessitate prompt medical intervention to mitigate complications [25, 26]. The management strategies employed in the study, including oxygen therapy (48.3%) and nebulization (44.9%), were effective in stabilizing patients. However, the 17.9% PICU admission rate and 1.1% mortality indicate that certain cases can escalate to severe outcomes, particularly in younger children with delayed presentation or exposure to highly toxic agents [27, 28]. The study also highlights the association between longer hospital stays and severe poisoning cases, with 16.8% of patients requiring more than six days of hospitalization [29]. This finding underscores the burden placed on healthcare systems by such incidents and the importance of equipping rural healthcare facilities with appropriate resources for timely intervention [30].

The findings advocate for enhanced public health measures, including the establishment of poison control centres, widespread education campaigns on safe storage and usage of household chemicals, and policies ensuring the availability of antidotes in primary healthcare settings. Future studies should explore the long-term psychosocial and health impacts of childhood poisoning, as well as the effectiveness of community-level prevention programs in reducing incidence rates [31-33].

In conclusion, this study highlights the urgent need for a multifaceted approach combining parental education, policy interventions, and healthcare system strengthening to address the burden of childhood poisoning effectively.

Recommendations:

- Parents and care givers are required to keep the home environment safer for the curious toddler.
- The practice of storing toxic material in familiar containers like soft drink bottles, mineral water bottles and cough syrup bottles should be stopped.
- After consuming the medicine, container should be closed and kept in a safe place beyond the reach of the children.
- It is recommended that parents must be counselled about the rapid change in behavior of children >5 years of age and particularly during adolescence. Parents should try to behave with their children in a friendly manner and understand them to prevent intentional poisonings.
- It is essential to be familiar with specific antidotes that must be readily available in both the emergency department and ICU.

Conclusion

Childhood poisoning is one of the pediatric medical emergencies like other emergencies.□□Most of the accidental poisoning cases are seen in less than five years age group due to their curiosity, mouthing tendencies and exploratory nature. Inspite of rapid socio economic changes, still kerosene is the commonest agents involved in pediatric poisoning followed by insecticides due to surrounding rural areas and dependence on agriculture as the main modality of earning a livelihood. The usual practice of keeping poisoning substances in soft drink bottles and transparent bottles in both rural and urban areas should be prohibited. Immediate supportive management along with antidotes in case of childhood poisoning lessens hospital stay, PICU admission and improves survival rate.

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