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Clinical Characteristics and Outcomes of Acute Drug Exposure in Children: A Retrospective Study

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Abstract

Background: Acute drug exposure in children is a common and preventable cause of pediatric morbidity, particularly in low- and middle-income countries. Children are especially vulnerable due to exploratory behavior, unsafe medication storage, and delayed access to healthcare. Data focusing specifically on drug-related exposures and outcomes in Bangladeshi children remain limited. ***Aim of the study:*** To evaluate the clinical characteristics, exposure patterns, management strategies, and short-term outcomes of acute drug exposure in children admitted to a tertiary care hospital. ***Methods:*** This retrospective observational study was conducted in the Department of Pediatrics of a tertiary care teaching hospital. Medical records of 80 children aged <18 years admitted with acute drug exposure were reviewed. Data on demographics, type and route of exposure, drug categories, clinical presentation, severity, interventions, and outcomes were collected and analyzed using SPSS version 26. Descriptive statistics were used to summarize findings. ***Result:*** Most patients were aged 1–5 years (52.5%), with a male predominance (56.25%). Accidental exposure accounted for 87.5% of cases, predominantly via oral ingestion (95%) and occurring at home (93.75%). Analgesics/antipyretics (22.5%) and antibiotics (20.0%) were the most common drugs involved. The majority had mild toxicity (70%) and presented within two hours. Complete recovery was observed in 87.5% of cases, while mortality was 5%. ***Conclusion:*** Acute drug exposure in children is largely accidental, home-based, and associated with favorable outcomes when managed promptly. Strengthening preventive strategies, caregiver education, and early medical intervention is essential to reduce adverse outcomes.

Keywords: Acute drug exposure; Pediatric poisoning; Accidental ingestion; Clinical outcomes; Bangladesh.

INTRODUCTION

Acute drug exposure in children is defined as the ingestion, inhalation, injection, or dermal absorption of a pharmaceutical or chemical substance in a quantity capable of producing toxic effects, whether intentional or unintentional [1,2]. Due to exploratory behavior, dependence on caregivers, immature metabolic pathways, and lower body mass, children are particularly susceptible to adverse clinical outcomes following toxic exposure [3]. As a result, acute drug exposure represents an important and largely preventable pediatric health problem. Globally, unintentional poisoning including drug-related exposures remains a major contributor to childhood injury, with the World Health Organization estimating over 45,000 deaths annually among children, predominantly in low- and middle-income countries [4,5]. In South Asia, pediatric drug and chemical exposure continues to impose a substantial burden due to widespread availability of medications and toxic substances, limited regulatory enforcement, and delayed access to emergency care [6]. In Bangladesh, acute poisoning accounts for approximately 2–5% of pediatric admissions, with medications ranking among the common causes alongside kerosene and pesticides [7,8,9]. The etiology of acute drug exposure in children is multifactorial. In younger children, most cases are unintentional and occur within the household, often resulting from unsafe storage of medications, absence of child-resistant packaging, parental self-medication practices, and inadequate supervision [3,10]. In adolescents, intentional exposures frequently associated with self-harm, experimentation, or misuse of prescription drugs are increasingly recognized [11]. Analgesics, antipyretics, sedatives, antidepressants, and antiepileptic drugs are commonly implicated

pharmaceutical agents worldwide [12]. Clinical manifestations of acute drug exposure vary widely depending on the type of drug, dose, route of exposure, and timeliness of medical intervention. Mild cases may present with gastrointestinal symptoms, dizziness, or drowsiness, whereas severe exposures can lead to respiratory depression, seizures, hepatotoxicity, cardiovascular instability, coma, or death [13,14]. Although many children recover with appropriate supportive care, delayed presentation and lack of specialized toxicology services significantly increase the risk of complications and mortality, particularly in resource-limited settings [5,14]. From a public health standpoint, acute drug exposure in children is largely preventable. Strategies such as caregiver education, safe medication storage, child-resistant containers, poison information centers, and standardized treatment protocols have been shown to reduce both incidence and severity of poisoning events [5,15]. However, in Bangladesh, systemic barriers including limited poison control infrastructure, inconsistent documentation, and delayed healthcare-seeking behavior continue to hinder effective prevention and timely management [9]. Despite the recognized burden, available evidence from Bangladesh is limited, with most studies being single-center, retrospective, and focused broadly on poisoning rather than specifically analyzing drug-related exposures and their clinical outcomes [8,9]. There remains a lack of comprehensive data describing exposure patterns, clinical characteristics, and short-term outcomes of acute drug exposure in children. Therefore, this study aimed to evaluate the clinical characteristics and outcomes of acute drug exposure in children to inform prevention and management strategies.

Methodology & Materials

This retrospective observational study was conducted at the Department of Paediatrics, Shaheed Monsur Ali Medical College and Hospital, Dhaka, Bangladesh from January 2021 to July 2022. Medical records of children presenting with acute drug exposure were reviewed over a defined study period of one year. A total of 80 pediatric patients (aged <18 years) admitted with a diagnosis of acute drug exposure were included in the study. Cases were identified from emergency department and inpatient admission registers.

Inclusion Criteria

- Children aged 0–18 years
- History or clinical suspicion of acute drug exposure
- Hospital admission for evaluation and management

Exclusion Criteria

- Chronic or repeated drug exposure
- Exposure to non-pharmaceutical toxins (e.g., pesticides, chemicals)
- Incomplete or missing medical records

Data Collection

Data were extracted using a structured data collection form. Variables included demographic characteristics (age, gender, residence), exposure patterns (type, route, place, and time to hospital presentation), drug categories involved, clinical manifestations, severity of poisoning, therapeutic interventions, and clinical outcomes, including duration of hospital stay.

Clinical Assessment and Management

Severity of poisoning was classified as mild, moderate, or severe based on clinical presentation and need for intensive care. Management strategies included gastric lavage, activated charcoal, antidote administration, ICU admission, and mechanical ventilation, as clinically indicated.

Statistical Analysis

Data were analyzed using SPSS software (version 26). Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation (SD). Results were summarized in tabular form.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee. Patient confidentiality was strictly maintained, and no identifiable information was recorded.

Result

Among the 80 participants, over half (52.50%) were aged 1–5 years, with smaller proportions in the 6–10 years (22.50%), 11–18 years (20.00%), and <1 years (5.00%) groups, and a mean age of 4.7 ± 3.0 years. Males comprised 56.25%, while females were 43.75%. Most children resided in urban areas (62.5%), with the remainder from rural settings (37.50%). (Table 1). Most exposures were accidental (87.50%), with intentional cases accounting for 10% and unknown exposures 2.5%. The predominant route was oral (95.00%), while inhalation and dermal routes were rare (2.50% each). The majority occurred at home (93.75%) versus outside (6.25%). Regarding healthcare-seeking, 60.00% of children presented within 2 hours, 31.25% between 2–6 hours, and 8.75% after more than 6 hours. (Table 2). Analgesics and antipyretics were the most commonly involved drugs (22.50%), followed by antibiotics (20.00%) and other prescription medications (15.00%). Benzodiazepines or sedatives accounted for 12.50%, antiepileptics 10.00%, antihistamines 7.50%, and cardiovascular drugs 5.00%. In 7.50% of cases, the specific drug was unknown. (Table 3). Vomiting was the most frequent clinical feature (45.00%), followed by drowsiness (35.00%) and altered sensorium (17.50%). Seizures and respiratory distress occurred in 10.00% and 12.50% of cases, respectively, while cardiovascular signs were noted in 5%. Most cases were classified as mild (70.00%), with moderate and severe presentations

accounting for 22.50% and 7.50%, respectively. (Table 4). Gastric lavage was performed in 65.00% of cases, and 55.00% received activated charcoal, while antidotes were administered to 12.50%. ICU admission occurred in 10.00%, with mechanical ventilation required in 5.00%. Most children recovered completely (87.50%), 7.50% recovered with complications, and 5.00% died. The mean hospital stay was 2.4 ± 1.3 days. (Table 5).

Table 1: Demographic & Baseline Characteristics (N = 80)

Characteristic	Frequency (n)	Percentage (%)
Age group (years)		
<1	4	5.00
1–5	42	52.50
6–10	18	22.50
11–18	16	20.00
Mean age ± SD (years)	4.7 ± 3.0	
Gender		
Male	45	56.25
Female	35	43.75
Residence		
Urban	50	62.50
Rural	30	37.50

Table 2: Exposure Pattern (N = 80)

Variable	Frequency (n)	Percentage (%)
Type of exposure		
Accidental	70	87.50
Intentional	8	10.00
Unknown	2	2.50
Route of exposure		
Oral	76	95.00
Inhalation	2	2.50
Dermal	2	2.50
Place of exposure		
Home	75	93.75
Outside home	5	6.25
Time to Hospital Presentation		
<2 hrs	48	60.00
2–6 hrs	25	31.25
>6 hrs	7	8.75

Table 3: Drug Categories Involved in Acute Drug Exposure (N = 80)

Drug category	Frequency (n)	Percentage (%)
Analgesics / Antipyretics	18	22.50
Antibiotics	16	20.00
Benzodiazepines / Sedatives	10	12.50
Antiepileptics	8	10.00
Antihistamines	6	7.50
Cardiovascular drugs	4	5.00
Other prescription meds	12	15.00
Unknown drug	6	7.50

Table 4: Clinical Presentations (N = 80)

Feature	Frequency (n)	Percentage (%)
Vomiting	36	45.00
Drowsiness	28	35.00
Altered sensorium	14	17.50
Seizure	8	10.00
Respiratory distress	10	12.50
Cardiovascular sign	4	5.00
Severity		
Mild	56	70.00
Moderate	18	22.50
Severe	6	7.50

Table 5: Interventions and Outcomes (N = 80)

Intervention / Outcome	Frequency (n)	Percentage (%)
Gastric lavage	52	65.00
Activated charcoal	44	55.00
Antidotes given	10	12.50
ICU admission	8	10.00
Mechanical ventilation	4	5.00
Final outcome		
Complete recovery	70	87.50
Recovery with complication	6	7.50
Death	4	5.00
Mean hospital stay (days) ± SD	2.4 ± 1.3	

DISCUSSION

Acute drug exposure in children represents a frequent and clinically significant pediatric emergency, reflecting evolving patterns of medication availability, supervision practices, and healthcare access [16]. The present study describes the clinical profile, exposure patterns, and outcomes of acute drug exposure among children, revealing several findings that are consistent with reports from both regional and global literature. The predominance of children aged 1–5 years (52.5%) reflects the well-documented vulnerability of toddlers and preschool-aged children to accidental poisoning, largely attributable to exploratory behavior, inadequate supervision, and unsafe storage of medications. Similar age distributions have been reported in studies from South Asia and other low- and middle-income countries, where children under five account for more than half of poisoning cases [17]. A slight male predominance (56.25%) was observed, aligning with multiple pediatric drug exposure studies that suggest higher exposure risk among boys, possibly due to greater mobility and risk-taking behavior [18]. The higher proportion of urban cases (62.5%) may reflect increased availability of pharmaceutical products, higher health-seeking behavior, and better access to tertiary care facilities, a trend also noted in urban-based hospital studies from Bangladesh and neighboring countries [19]. Accidental exposure was the most common mode (87.5%), with oral ingestion accounting for 95% of cases and the home being the primary site of exposure (93.75%). These findings closely mirror global pediatric toxicology data, which consistently identify accidental, home-based, oral exposures as the dominant pattern in young children [20]. Early hospital presentation within two hours in 60% of cases is encouraging and likely contributed to favorable outcomes, as timely medical intervention is known to reduce morbidity and mortality [21]. Analgesics and antipyretics were the most frequently implicated drug category (22.5%), followed by antibiotics and sedatives. This distribution is comparable to studies from developing countries, where over-the-counter availability and widespread household use of these medications increase exposure risk [22]. In contrast, studies from high-income countries often report higher involvement of antidepressants and cardiovascular drugs, reflecting differences in prescribing patterns and household medication profiles [23]. Clinically, vomiting and drowsiness were the most common presenting features, while the majority of cases were classified as mild (70%). This pattern is consistent with prior studies indicating that most pediatric drug exposures result in mild, self-limiting symptoms when managed promptly [24]. Severe manifestations, including seizures and respiratory distress, were relatively infrequent but clinically significant, emphasizing the need for careful monitoring. Management strategies such as gastric lavage and activated charcoal were frequently employed, reflecting common practices in acute pediatric poisoning in resource-limited settings. Although current international guidelines advocate more selective use of gastric decontamination, early presentation and substance type may justify its use in certain contexts [19]. The overall outcome was favorable, with complete recovery in 87.5% of children; however, a mortality rate of 5% underscores that acute drug exposure remains a potentially fatal condition, particularly in severe cases or

delayed presentations. Comparable mortality rates have been reported in hospital-based studies from similar settings [25].

Limitations of the study

This study has several limitations. Its retrospective design relied on the accuracy and completeness of medical records, which may have resulted in missing or misclassified data. Being a single-center study with a relatively small sample size, the findings may not be generalizable to other settings or populations. Information on exact drug doses and long-term outcomes was limited. Additionally, cases managed at home or not requiring hospital admission were not captured, potentially underestimating the true burden.

CONCLUSION

This retrospective study demonstrates that acute drug exposure in children remains a significant yet largely preventable pediatric health problem. The majority of cases occurred in young children aged 1–5 years, were accidental in nature, involved oral ingestion, and took place within the home environment. Analgesics, antipyretics, and antibiotics were the most frequently implicated drug categories. Although most children presented early and experienced mild toxicity with favorable outcomes following supportive management, a notable proportion required intensive care, and mortality was not negligible. These findings underscore the need for caregiver education, safe medication storage practices, child-resistant packaging, and strengthened poison control and early referral systems to reduce morbidity and mortality associated with pediatric drug exposure.

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