



# A Cross-Sectional Study on Toxic Agents, Exposure Routes, and Healthcare Challenges on Pediatric Poisoning in the Al Jouf Region

Bandr Fakiha <sup>1\*</sup>

## Abstract

**Background:** Pediatric poisoning is a significant public health concern, particularly in regions with limited preventive measures and healthcare infrastructure. This study aimed to evaluate the distribution, causes, and outcomes of pediatric poisoning cases in the Al Jouf region of Saudi Arabia, emphasizing systemic challenges and potential interventions. **Methods:** A cross-sectional descriptive design was employed, analyzing secondary data from hospital records of children under 18 who presented with acute intoxication at a maternity and children's hospital between January 2015 and December 2021. Data included toxic agents, routes of exposure, clinical presentations, treatments, and outcomes. Descriptive statistics were used to summarize findings. **Results:** Pharmaceutical drugs (41%) and household chemicals (39.4%) were the most common toxic agents, with ingestion being the primary route of exposure (91.7%). Accidental poisoning accounted for 89.3% of cases, underscoring inadequate preventive measures. Treatment documentation was insufficient in 66.7% of cases, with antidotes used in <6%. Outcomes showed that

43% of cases resulted in full recovery, while 57% lacked adequate follow-up data. These findings reveal critical gaps in caregiver education, safe storage practices, and healthcare system efficiency. **Conclusion:** Pediatric poisoning in the Al Jouf region is primarily due to pharmaceutical drugs and chemicals, reflecting global trends. Systemic healthcare challenges, including inadequate documentation and limited interventions, hinder effective management. Evidence-based preventive measures, caregiver education, and healthcare reforms are essential to reduce poisoning incidents and improve pediatric outcomes.

**Keywords:** Pediatric poisoning, pharmaceutical drugs, household chemicals, ingestion, healthcare challenges.

## Introduction

Childhood poisoning is a significant global health concern, particularly for children under six years of age, as their limited understanding of environmental hazards places them at increased risk (Vilaça et al., 2020; Sayed et al., 2024). According to the World Health Organization (WHO), unintentional poisoning accounts for over 45,000 child fatalities annually, with millions more hospitalized worldwide due to exposure to toxic agents (Azab et al., 2016). In 2023, the National Capital Poison Center reported an incidence rate of 32.1 poison exposures per 1,000 children aged six years and below (National Capital Poison Center, 2023).

In Saudi Arabia, pediatric poisoning remains a persistent issue, exacerbated by cultural, socioeconomic, and environmental factors (Ibrahim et al., 2023). Despite advancements in pediatric

**Significance** | This study emphasizes the need for preventive measures, caregiver education, and improved healthcare systems to reduce pediatric poisoning incidents.

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healthcare, the frequency of poisoning cases among children remains troublingly high. Alharthy et al. (2021) found that 29% of pediatric poisoning cases involve children under five years old, with household chemicals and improperly stored medications identified as primary contributors. Regional disparities and insufficient documentation hinder comprehensive prevention and intervention efforts, underscoring the need for targeted research in this domain. Advancements in healthcare and poison control have not eradicated pediatric poisoning, which continues to challenge primary care practices, particularly in the Aljouf region of Saudi Arabia. Late presentation to healthcare facilities due to limited awareness or inadequate healthcare access often leads to complications or fatalities (Alghadeer et al., 2018; Althobaiti et al., 2023). The lack of detailed toxicological data on common agents affecting children, their modes of exposure, and their effects significantly limits the development of effective intervention strategies (Al-ahdal et al., 2019).

Current prevention approaches are generalized and fail to address sociocultural and environmental factors unique to the Aljouf region (Ibrahim et al., 2023). This knowledge gap underscores the urgency for comprehensive forensic toxicological studies to inform clinical practices, public health interventions, and policy-making in the region.

This study aims to explore pediatric poisoning cases in primary care settings in the Aljouf region of Saudi Arabia, identifying prevalent toxic agents, risk factors, and gaps in existing healthcare strategies. The study holds considerable public health significance by providing critical forensic toxicology insights into pediatric poisoning in the Aljouf region. The findings aim to bridge the current knowledge gap, enabling healthcare providers to devise targeted prevention measures and improve care protocols. This research also seeks to raise awareness among policymakers and stakeholders, catalyzing the development of educational campaigns and safety measures tailored to the region's unique needs.

By addressing the underreported and undocumented aspects of pediatric poisoning, this study aims to reduce morbidity and mortality rates among children, enhance their overall health status, and optimize the region's healthcare system. Additionally, the study's findings could serve as a foundation for future research and policy development in Saudi Arabia and other regions facing similar challenges.

## 2. Literature Review

Child poisoning can arise from exposure to various toxins, including medicinal, chemical, and environmental agents. Over-the-counter (OTC) medications such as acetaminophen, ibuprofen, and antihistamines are commonly involved in accidental ingestions among children below five years (Şenses et al., 2021; Abu El-Naga et al., 2022). Prescription medications, particularly opioids and

antidepressants, pose even greater risks due to their high toxicity in small doses (Hunter et al., 2022; Kapoor et al., 2023). Additionally, non-pharmaceutical agents, such as household cleaning products, pesticides, and hydrocarbons like gasoline or kerosene, contribute significantly to pediatric poisoning cases (Iov et al., 2019; Caba et al., 2022). Analgesics and cosmetics/personal care products rank among the most toxic agents for children, as reported by the American Association of Poison Control Centers' National Poison Data System (Flanagan, 2019). Seasonal variations also influence poisoning patterns, with an increased use of pesticides and carbon monoxide exposure observed during specific periods (Alharthy et al., 2024).

Understanding the unique pharmacokinetics, symptoms, and treatment protocols for each toxin is essential for effective management. The primary pathways of exposure in pediatric poisoning include ingestion, inhalation, dermal contact, and ocular exposure. Oral ingestion is the most common route, accounting for over 80% of cases, particularly among toddlers, whose exploratory behavior often involves placing objects in their mouths (Albano et al., 2022; Ibrahim et al., 2023). Inhalation, though less frequent, can lead to rapid systemic toxicity, as seen in cases involving carbon monoxide or volatile chemicals (Althobaiti et al., 2023; Alharthy et al., 2024). Dermal absorption is often associated with pesticides or industrial chemicals, where skin contact results in significant uptake (Caba et al., 2022). Ocular exposures, frequently accidental, are linked to splashes of cleaning agents or personal care products into the eyes (Flament et al., 2020; Şenses et al., 2021).

The exposure route significantly influences the onset and severity of symptoms. For instance, inhalation and injection can result in more rapid toxic effects than oral or dermal exposures (Dyballa et al., 2024). Identifying the exposure route is critical for determining appropriate decontamination and treatment strategies.

Toxic substances involved in pediatric poisoning exist in various physical and chemical states, impacting their accessibility and effects on children (Tobaiqy et al., 2020). Solid substances, such as detergents, tablets, or capsules, and liquids, including household cleaning agents, hydrocarbons, and medications, are easily accessible and often mistaken for food or drink by children (Washaya et al., 2021; Mathew et al., 2019). Pharmaceutical drugs, particularly those in tablet or capsule form, and detergent pods are especially dangerous because their bright colors and candy-like appearance appeal to children (Iov et al., 2019; Mottla et al., 2023). Inhalational agents, such as carbon monoxide or volatile organic compounds, can cause poisoning upon inhalation and exert rapid systemic effects (Pan et al., 2019; Althobaiti et al., 2023). Powders, including fertilizers and washing soap, may lead to dermal or ocular exposure, further highlighting the risks posed by physical forms of toxic agents (Karakasi et al., 2019).

The morphology of toxic agents plays a significant role in poisoning incidents among children, particularly in terms of accessibility and attractiveness. Solid and brightly colored substances are more likely to be ingested, emphasizing the importance of proper storage and childproofing (Mahmoud et al., 2021; Hunter et al., 2022). Recognizing the multifaceted risks associated with different toxicants is vital for developing targeted prevention and treatment strategies.

### **2.1 The Pattern of Pediatric Poisoning**

The pattern of pediatric poisoning is predominantly accidental, especially among children below six years old, due to their innate curiosity and playful nature (Iov et al., 2019; Abed et al., 2022). Intentional poisoning, though less common, may occur in cases of maltreatment or conditions like Munchausen syndrome by proxy (Dyballa et al., 2024; Kapoor et al., 2023). Older children may intentionally ingest toxic substances for purposes such as drug misuse or self-harm, typically involving medications or recreational drugs (Albano et al., 2022; Mathew et al., 2019). Immunocompromised children are particularly vulnerable, as inadequate storage of medicines and unsafe chemicals significantly increases the risk of poisoning in this group (Abu El-Naga et al., 2022; Alzayadneh et al., 2024). A lack of caregiver supervision and poor safety practices have also been identified as significant contributors to accidental poisoning (Şenses et al., 2021).

### **2.2 Clinical Manifestations**

The clinical presentation of poisoning varies based on the toxic agent, the dose ingested, and the time elapsed since exposure. Common symptoms include gastrointestinal disturbances (vomiting and diarrhea), neuropsychiatric issues (behavioral changes, altered consciousness, seizures, and lethargy), and respiratory distress (dyspnea and cyanosis). Severe cases may involve cardiovascular complications such as hypotension or arrhythmias, leading to multi-organ dysfunction (Caba et al., 2022; Tiwari et al., 2021). Prompt evaluation is critical, beginning with the stabilization of airway, breathing, and circulation (ABCs) (Şenses et al., 2021; Washaya et al., 2021). Diagnostic steps include laboratory tests like blood counts, electrolyte panels, renal and hepatic function tests, and drug or toxin screenings, as well as imaging scans to localize the toxin and assess tissue damage (Flanagan, 2019; Pan et al., 2019). Delayed medical care is often associated with worse outcomes and increased complications (Dyballa et al., 2024). Specialized pediatric care and poison center consultations significantly improve outcomes, emphasizing the importance of early identification and intervention (Mahmoud et al., 2021).

### **2.3 Management**

Management of pediatric poisoning involves removing toxic agents, providing supportive care, and administering specific antidotes when available. Gastric decontamination using activated charcoal is effective if administered within an hour of ingestion and

when the toxin is adsorbable (Şenses et al., 2021; Washaya et al., 2021). Whole-bowel irrigation is employed for sustained-release medications or compounds not adsorbed by charcoal (Abouhatab, 2024, cited in Flanagan, 2019). Supportive care measures include intravenous fluids, vasopressor therapy, and mechanical ventilation, depending on the child's clinical condition (Caba et al., 2022; Ibrahim et al., 2023). Antidotal therapies, such as naloxone for opioid toxicity, N-acetylcysteine for acetaminophen overdose, and atropine for organophosphate poisoning, are crucial in specific cases (Caba et al., 2022; Kapoor et al., 2023). Poison control centers play an integral role in guiding treatment decisions and preventing unnecessary interventions, contributing to improved outcomes (Mathew et al., 2019; Mottla et al., 2023). Advances in point-of-care testing and modern toxicology databases have enhanced diagnostic accuracy and management capabilities. However, implementing these advancements remains a challenge in resource-limited settings (Hunter et al., 2022).

### **2.4 Prognosis**

The prognosis of pediatric poisoning depends on the type of toxin, the quantity ingested, the timing of treatment, and the child's overall health status. Most cases, when treated promptly, result in full recovery (Abed et al., 2022; Şenses et al., 2021). However, poisoning involving neurotoxic or cardiotoxic substances may lead to long-term complications, such as learning disabilities, movement disorders, or chronic organ dysfunction (Kapoor et al., 2023; Dyballa et al., 2024). Although rare, fatalities occur with highly toxic agents like opioids, hydrocarbons, or pesticides (Hunter et al., 2022; Almutairi et al., 2023).

### **2.5 Prevention**

Preventive measures, including childproof packaging, parental education, and accessibility to poison control centers, are essential to reducing morbidity and mortality from pediatric poisoning (Mahmoud et al., 2021; Mottla et al., 2023). Socioeconomic disparities and differences in healthcare access are significant barriers, particularly in underserved populations, where delayed treatment often results in worse outcomes (Prochazka et al., 2018; Hayes & Ross, 2024). Public health initiatives and research focused on addressing these disparities aim to enhance early detection and treatment of poisoning cases (Washaya et al., 2021).

Pediatric poisoning primarily occurs due to the ingestion of medications, chemicals, or environmental toxins. The toxic effects depend on factors such as the type and dose of the toxin and the time since exposure. Symptoms range from mild gastrointestinal disturbances to severe multi-organ dysfunction. Management involves timely decontamination, supportive care, and antidotal therapies. Socioeconomic disparities and delayed evaluations remain challenges, particularly in resource-limited settings. Future research should prioritize exploring the impact of social determinants of health on treatment delays, addressing gaps in care

for underserved populations, and developing cost-effective diagnostic tools for low-resource environments. Collaborative efforts between healthcare providers, public health agencies, and policymakers are vital to mitigating the burden of pediatric poisoning.

### 3. Materials and Methods

#### Chapter 1 3.1 Research Design

This study employed a cross-sectional descriptive research design to evaluate cases of acute intoxication in children. The research was conducted at the Maternity and Children's Hospital in Aljouf, Saudi Arabia, focusing on patients under 18 years of age who visited the hospital between January 2015 and December 2021. This design was chosen to provide a snapshot of pediatric intoxication cases within the specified time frame, capturing patterns and frequencies of acute poisoning incidents during the study period.

#### Chapter 2 3.2 Inclusion and Exclusion Criteria

To ensure the validity and reliability of the study, rigorous inclusion and exclusion criteria were applied. The study included all cases of acute intoxication involving children below 18 years of age with complete medical records. Chronic intoxication cases, incomplete or insufficient medical records, and cases where data quality was compromised were excluded. These criteria were essential to eliminate inconsistencies and biases, ensuring that the analysis reflected high-quality and relevant data for acute intoxication incidents.

#### Chapter 3 3.3 Data Collection

Data collection for this study relied on secondary sources, specifically hospital records, to maintain objectivity and reduce potential confounding factors. Information was systematically extracted, focusing on several key aspects. First, details about the location and circumstances of toxic exposure were documented to understand the environment and context of each incident. The mode of intoxication, including routes such as ingestion, inhalation, or dermal contact, was carefully noted. The types of toxins involved in each case were identified to categorize the substances responsible for intoxication events.

Clinical presentations, including symptoms observed upon the child's arrival at the hospital, were recorded to assess the immediate impact of the toxins. Intervention details, such as the treatments administered, including decontamination methods and specific therapies, were documented to evaluate the medical response. Finally, patient outcomes were categorized into recovery, complications, or mortality to measure the effectiveness of the interventions and the overall impact on health. This comprehensive data collection process ensured that all relevant information was captured to support a thorough analysis of pediatric intoxication cases.

#### Chapter 4 3.4 Statistical Analysis

The data were analyzed using descriptive statistical methods to summarize trends, frequencies, and distributions of acute pediatric intoxication cases. Microsoft Excel was used to organize and visualize the data in the form of tables, graphs, and charts, enabling straightforward comparisons and the identification of patterns over the study period. Key variables were stratified to provide insights into age, gender, toxin type, and route of exposure.

This methodological approach ensured a comprehensive understanding of pediatric intoxication cases while maintaining data accuracy and reliability. By summarizing trends and patterns, the study provided valuable insights to inform clinical practice and preventive strategies.

### 4. Results

The results present an analysis of pediatric poisoning cases in the Aljouf region of Saudi Arabia. These findings highlight trends in toxic agents, routes of exposure, types of poisoning, patient conditions, therapeutic strategies, and outcomes. The study reveals gaps in record-keeping and treatment documentation, underscoring the need for improved preventive measures and healthcare interventions.

#### 4.1 Type of Toxic Agent

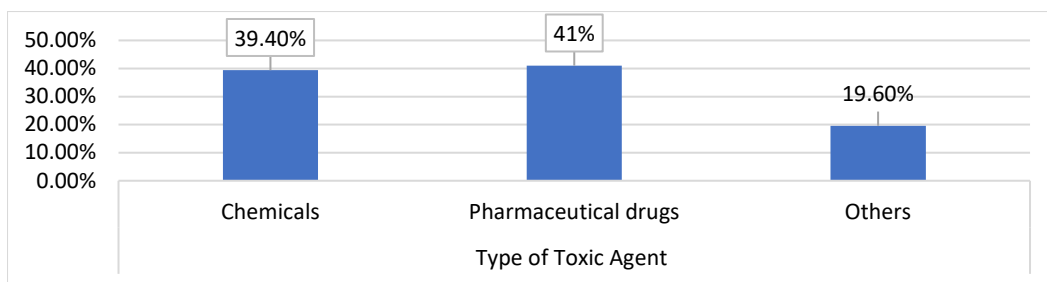
The distribution of toxic agents is detailed in **Figure 1**, showcasing three primary categories. Pharmaceutical drugs accounted for 41%, followed by chemicals at 39.4%, and others, including environmental agents, at 19.6%. The predominance of pharmaceutical drugs reflects the risks associated with improper storage and accidental consumption. Chemicals, such as household cleaning agents and insecticides, highlight the hazards of unsafe storage practices. The "others" category, though smaller, emphasizes the need for vigilance against less conventional toxicological threats. These findings stress the importance of region-specific preventive measures, particularly in safe storage and disposal of hazardous substances in the Aljouf region.

#### 4.2 Routes of Intoxication

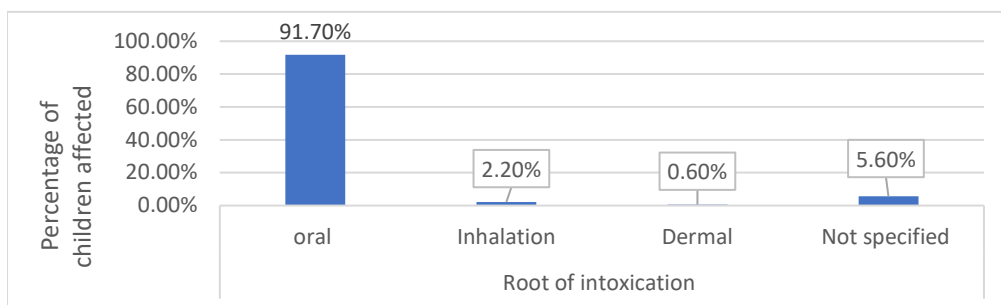
**Figure 2** illustrates the primary routes of exposure. Ingestion dominated at 91.7%, reflecting children's tendency to explore their surroundings orally and the accessibility of toxic substances. Inhalation accounted for 2.2%, often involving exposure to chemicals like carbon monoxide, while dermal absorption was rare at 0.6%. Notably, 5.6% of cases lacked specified routes of exposure. These data emphasize the critical need for preventive measures targeting oral exposure, such as childproof storage and awareness campaigns, to minimize pediatric poisoning risks in Aljouf, KSA.

#### 4.3 Types of Intoxication

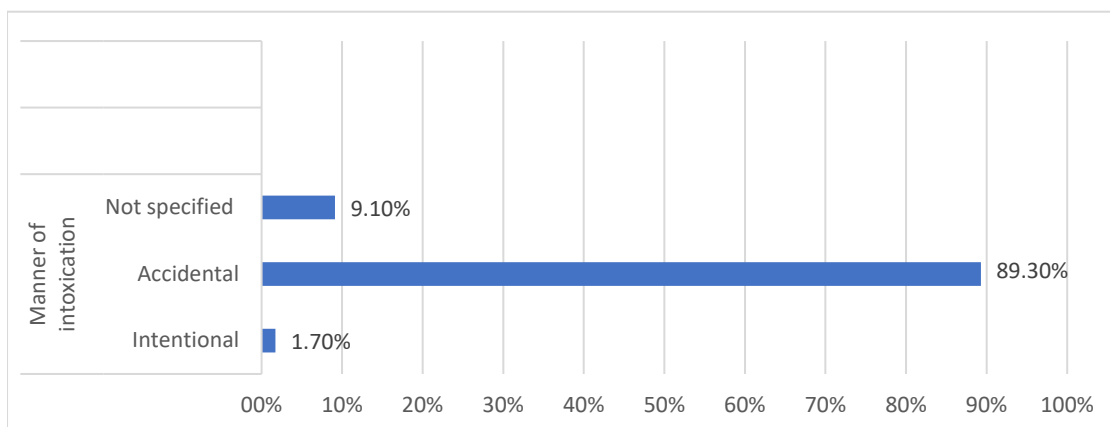
The categorization of intoxication cases is depicted in **Figure 3**. Unintentional poisoning accounted for 89.3% of cases, largely attributed to children's curiosity and improper storage of toxic agents. Intentional poisoning was rare, at 1.7%, possibly involving



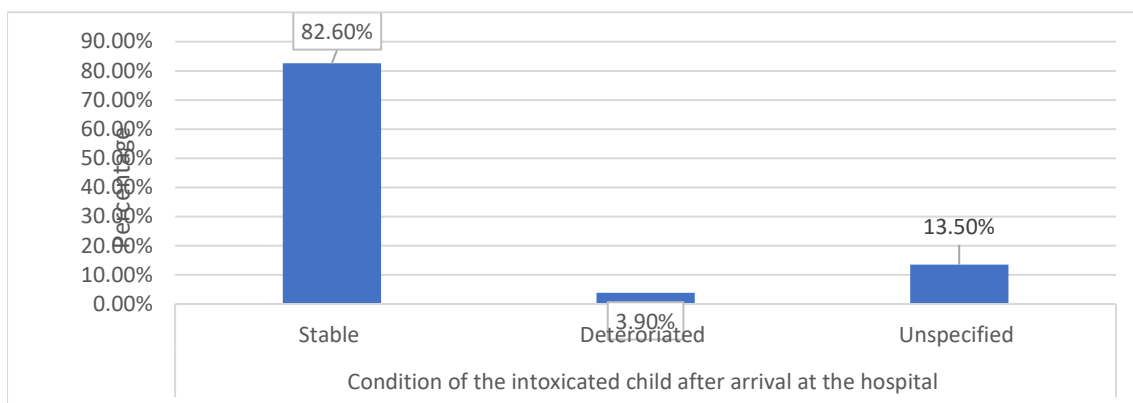
**Figure 1.** Distribution of Toxic Agents in Pediatric Poisoning Cases. Distribution of toxic agents identified in pediatric poisoning cases at the Maternity and Children’s Hospital in Aljouf, Saudi Arabia. Pharmaceutical drugs accounted for 41% of cases, chemicals for 39.4%, and environmental agents and other substances for 19.6%. These findings highlight the need for safer storage and disposal of hazardous materials.



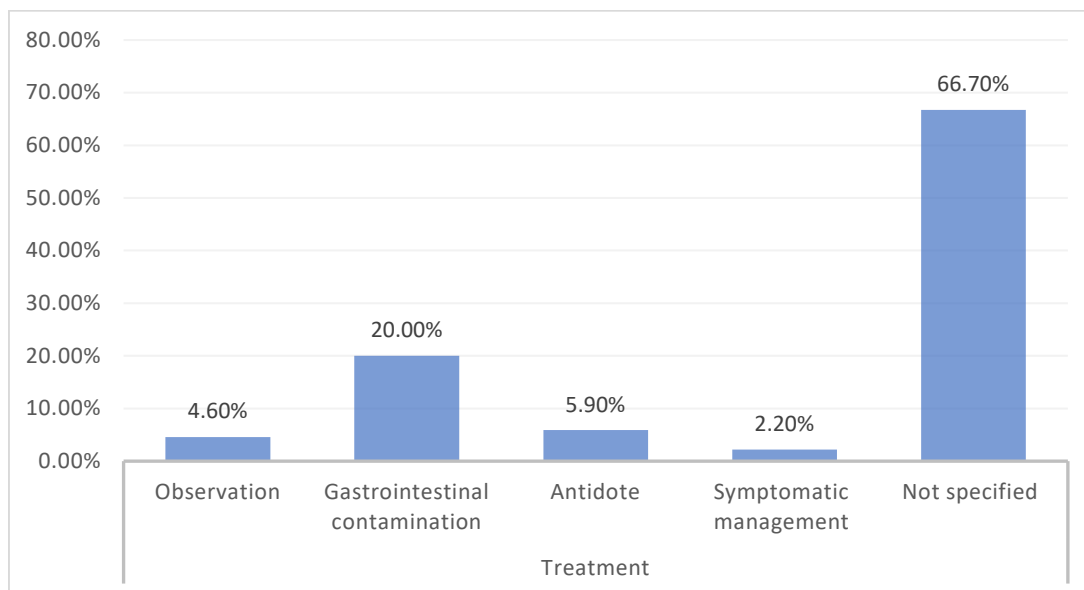
**Figure 2.** Primary Routes of Intoxication. The primary routes of exposure to toxic agents in pediatric poisoning cases. Ingestion dominated at 91.7%, followed by inhalation (2.2%) and dermal absorption (0.6%). An additional 5.6% of cases lacked specified routes. The data underline the importance of childproof storage to prevent ingestion-related poisoning incidents.



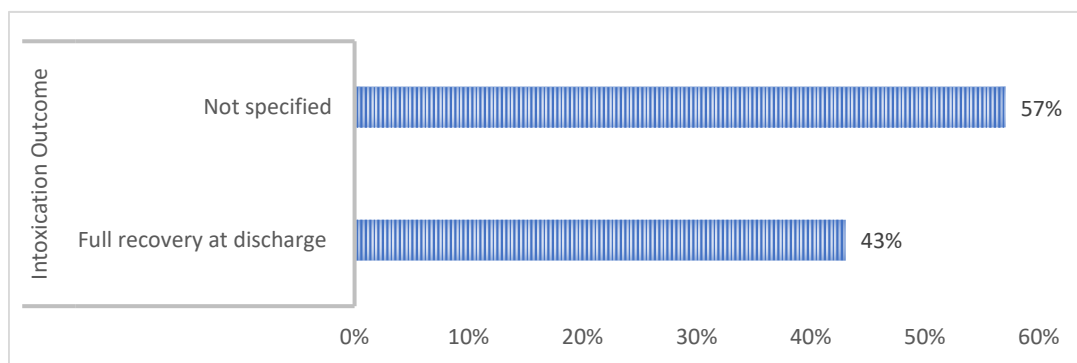
**Figure 3.** Types of Pediatric Intoxication Cases. This chart categorizes pediatric poisoning cases into unintentional poisoning (89.3%), intentional poisoning (1.7%), and unspecified cases (9.1%). The high percentage of unintentional cases emphasizes the role of caregiver vigilance and safe storage practices in preventing poison exposures.



**Figure 4.** Clinical Conditions of Intoxicated Children Upon Hospital Admission. The clinical conditions of children upon arrival at the hospital. Most cases (82.6%) were stabilized through emergency interventions, while 13.5% fell into the “others” category due to poor documentation. A small proportion (3.9%) involved worsening conditions requiring advanced toxicological analysis, emphasizing the need for improved diagnostic and treatment capabilities.



**Figure 5.** Treatment Modalities for Pediatric Poisoning Cases. This treatment approaches documented for pediatric poisoning cases. Gastrointestinal decontamination was employed in 20% of cases, while antidotal therapies were administered in less than 6%. A significant 66.7% of cases were not specified, indicating critical gaps in treatment documentation and the need for standardized treatment protocols.



**Figure 6.** Outcomes of Pediatric Poisoning Cases. The outcomes of pediatric poisoning cases, showing that 43% of cases resulted in full recovery at discharge. However, 57% of cases were classified as “not specified,” reflecting documentation gaps that hinder forensic toxicology analysis and healthcare policy development. These findings call for better reporting practices and healthcare system improvements.



adolescents or instances of maltreatment. Additionally, 9.1% of cases were unspecified, reflecting documentation gaps or insufficient investigations. These findings highlight the importance of caregiver vigilance, child safety measures, and thorough forensic toxicological assessments to mitigate avoidable poisonings in the region.

#### 4.4 Conditions of the Intoxicated Children

The condition of children upon arrival at the hospital is shown in **Figure 4**. A significant majority (82.6%) of cases were successfully stabilized and managed through emergency interventions. However, 13.5% of cases fell under the “others” category, reflecting poorly documented or undiagnosed conditions. A smaller fraction, 3.9%, involved worsening conditions, necessitating advanced forensic toxicological analysis. These results underscore the need for enhanced primary care quality, improved data tracking, and better diagnostic capabilities to address pediatric poisoning comprehensively.

#### 4.5 Treatment Options

**Figure 5** presents the treatment approaches employed. Notably, 66.7% of cases were classified as “not specified,” indicating significant gaps in treatment documentation. Gastrointestinal decontamination was employed in 20% of cases, highlighting its critical role in managing poison exposures. Antidotal therapies were rare, administered in less than 6% of cases, reflecting either limited availability or the rarity of specific poisoning cases. These findings call for better documentation, the development of evidence-based treatment guidelines, and improved management protocols at healthcare facilities in Aljouf.

#### 4.6 Results of the Intoxications

The outcomes of pediatric poisoning cases are summarized in **Figure 6**. Only 43% of cases resulted in full recovery at discharge, while 57% were classified as “not specified,” indicating poor record-keeping or inadequate follow-up. The lack of detailed records hampers forensic toxicology and policy development, while the high percentage of unspecified outcomes reflects systemic deficiencies in healthcare management. These results emphasize the need for structured reporting, comprehensive treatment protocols, and better integration of healthcare services to improve outcomes for pediatric poisoning cases in Aljouf.

The findings reveal that pharmaceutical drugs and chemicals are the primary toxic agents in pediatric poisoning cases, with ingestion as the dominant route of exposure. Most cases were accidental, highlighting the critical need for improved safety measures and caregiver awareness. Documentation gaps and inadequacies in treatment records limit the evaluation of outcomes and treatment effectiveness. Addressing these issues requires enhanced record-keeping systems, region-specific preventive strategies, and improved healthcare management. Implementing these measures

will help reduce the incidence and impact of pediatric poisoning in the Aljouf region of Saudi Arabia.

## 5. Discussion

The present study provides a comprehensive analysis of pediatric poisoning cases in the Al Jouf region, revealing trends and issues that align with findings from global studies. The identification of pharmaceutical drugs and household chemicals as the main toxic agents supports existing research by Şenses et al. (2021) and Abu El-Naga et al. (2022). Over-the-counter medications, such as acetaminophen and ibuprofen, along with prescription drugs, including opioids and antidepressants, were highlighted as common contributors to accidental poisoning. Similarly, exposure to household chemicals like detergents and pesticides corroborates findings by Iov et al. (2019) and Caba et al. (2022), who identified these substances as significant contributors to pediatric poisoning. The dominance of ingestion as the primary route of exposure (91.7%) reflects toddlers' oral exploratory behaviors and the accessibility of toxic agents. Albano et al. (2022) and Ibrahim et al. (2023) emphasized that children's natural curiosity and the availability of hazardous substances in the household environment are key factors. The study also found that accidental poisoning accounted for 89.3% of cases, underscoring the importance of caregiver supervision and preventive measures. This aligns with Şenses et al. (2021), who noted that improper storage practices and lack of awareness are major contributors to such incidents. Research by Abed et al. (2022) and Hunter et al. (2022) further supports these findings, linking unsafe storage to the prevalence of pediatric poisoning.

The study also draws attention to the role of the physical characteristics of toxic substances. Mottla et al. (2023) and Mahmoud et al. (2021) highlighted that detergent pods and colorful pills, often resembling candies, can attract children, increasing the risk of accidental ingestion. These findings underscore the need for product safety measures, such as child-resistant packaging and awareness campaigns to educate caregivers about potential risks.

Analysis of treatment methodologies revealed significant gaps in healthcare responses to pediatric poisoning. Most cases (66.7%) were categorized as “not documented/not managed,” reflecting systemic flaws in record-keeping and treatment protocols. This observation aligns with findings by Alharthy et al. (2024), who noted similar deficiencies in healthcare systems. Furthermore, the low percentage of antidote administration (<6%) raises concerns about the availability of antidotes and the accuracy of poisoning diagnoses. Zafari and Mehrabi (2021) and Flament et al. (2020) discussed the challenges posed by limited resources and diagnostic capabilities in managing poisoning cases effectively.

The study also highlights issues with outcome reporting, as 57% of cases were classified as “not specified.” This lack of follow-up and

poor documentation hinders the formulation of effective policies and limits the potential of forensic toxicology to contribute to preventive strategies. Althobaiti et al. (2023) and Washaya et al. (2021) emphasized the need for systematic improvements in healthcare management and data recording to enhance treatment outcomes and policy development.

The findings underscore the global nature of pediatric poisoning risks and the critical need for region-specific preventive measures, improved caregiver education, and robust healthcare system reforms. These include better documentation practices, enhanced diagnostic capabilities, and targeted interventions. As noted by Dyballa et al. (2024) and Albano et al. (2022), the integration of empirical evidence into healthcare policies is essential to address pediatric poisoning effectively. This study provides a foundation for further research and interventions aimed at reducing pediatric poisoning cases and improving healthcare outcomes in the Al Jouf region and beyond.

## 6. Conclusion

This study underscores the substantial burden of pediatric poisoning in the Al Jouf region, with pharmaceutical drugs and household chemicals identified as the predominant toxic agents, primarily ingested. The majority of cases were accidental, highlighting the critical need for enhanced caregiver supervision and effective preventive strategies. The study also reveals significant gaps in treatment documentation, limited

utilization of antidotes, and inadequate follow-up, reflecting systemic challenges within the healthcare framework. These findings align with global trends and emphasize the necessity of strengthened educational initiatives, improved storage practices, and comprehensive healthcare reforms. Evidence-based interventions and enhanced reporting systems are imperative to mitigate pediatric poisoning risks and improve health outcomes in the region

## Author contributions

B.F. led the study's conceptualization and design, performed the data analysis, interpreted the findings, and drafted the manuscript. B.F. also reviewed and approved the final version, ensuring accuracy and integrity in all aspects of the work.

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## Competing financial interests

The authors have no conflict of interest.

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