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ORIGINAL ARTICLE

A retrospective analysis of pediatric poisoning patterns and clinical outcomes in Algiers, Algeria

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ABSTRACT

Objective. Acute pediatric poisoning is a leading cause of emergency department admissions, often due to accessible domestic toxins. This study examines the epidemiological characteristics, clinical presentations, and therapeutic management of poisoning cases at a referral pediatric hospital in Algiers, Algeria. **Materials and Methods**. A retrospective descriptive study was conducted on the records of 59 pediatric intoxication cases managed between January 2024 and June 2025 (18 months). Inclusion was restricted to complete medical records with comprehensive toxicological and clinical documentation. Variables analyzed included age, sex, poisoning category, intent of exposure, offending agents, endoscopic findings, length of stay, and therapeutic interventions. For analysis, household product exposures were specifically categorized into corrosive and non-corrosive agents due to their distinct clinical management requirements. **Results.** Accidental exposures predominated (94.9%), with children aged 0–3 years being the most affected group (59.3%). The leading causes were pharmaceutical agents (n=24, 40.7%) and caustic/household products (n=25, 42.4%). Within the caustic group, corrosive agents (n=10) caused direct mucosal injuries; these were managed with nil-by-mouth (NPO) status, acid suppression, and selective endoscopy. Upper gastrointestinal endoscopy was performed in 70% (7/10) of corrosive cases following departmental protocols, revealing grade IIA mucosal lesions in three patients. Non-corrosive household agents (n=15) were managed with observation and supportive care. Carbon monoxide poisoning (n=8) was observed across all pediatric age ranges. The length of hospitalization ranged from 1–4 days for pharmaceutical cases to 14 days for corrosive ingestions. **Conclusion.** Most pediatric poisonings in this clinical setting are preventable, with inadequate storage of domestic substances identified as a primary risk factor. The findings underscore the need for standardized clinical management pathways and targeted public health interventions to improve household safety.

Keywords: Poisoning, Child, Caustics, Carbon Monoxide Poisoning, Algeria.

1. INTRODUCTION

Childhood poisoning constitutes a major public health concern worldwide, ranking consistently among the primary indications for pediatric emergency department attendance, especially in children under five years [1,2]. The preponderance of these events involves accidental exposure, arising from poor storage practices for medications and domestic chemicals, insufficient parental vigilance, and the ready availability of potentially toxic agents in the home environment [3]. Clinically, the severity of presentation spans a continuum from benign, self-resolving manifestations to critical, life-threatening emergencies.

Regional variation in pediatric poisoning epidemiology is well-documented, shaped by differences in socioeconomic conditions, cultural behaviors, and healthcare system capacity [4,5]. Within the Maghreb, limited but informative comparative data are available. In Morocco, Achour et al. documented that pesticides represented the dominant pediatric toxicological agent between 1990 and 2008 [15], a pattern driven by agricultural accessibility in a predominantly rural exposure context. In Turkey, Andiran and Sarikayalar reported a pharmaceutical-predominant pattern over a twenty-year period [16], while Hemmati et al. similarly identified medications as the leading cause in an Iranian cohort [17]. These regional datasets underscore shared themes while revealing important local differences. Within Algeria, detailed hospital-based epidemiological data on pediatric intoxications remain largely absent, hampering evidence-based prevention and care planning [6].

The present study addresses this gap through a retrospective analysis of pediatric poisoning cases managed at a tertiary referral center in Algiers, with particular attention to epidemiological features, clinical presentation patterns, management approaches, and outcomes, including a formal comparative discussion against available Maghrebi and regional data.

2. MATERIALS AND METHODS

Study Design and Setting

This retrospective descriptive study was conducted in the Department of Pediatrics, Hassen Badi Hospital, Faculty of Medicine, University of Algiers, between January 2024 and June 2025 (18 months). The department serves a diverse urban population, providing emergency and inpatient pediatric care for a large catchment area encompassing Algiers and surrounding districts.

Study Population and Sample Size Justification

A total of 59 pediatric poisoning cases were identified and included. We acknowledge that this figure may appear limited for a tertiary referral center over 18 months. Two explanations are offered. First, strict inclusion criteria — requiring complete medical documentation including demographic data, agent identification, management details, and outcome — necessitated the exclusion of cases with incomplete records, a recognized constraint of retrospective design in settings where documentation quality is variable. Second, under-ascertainment is highly plausible in this context: mild poisoning cases are frequently managed at primary health centers, private clinics, or family practitioners without referral to our department, and therefore do not enter our data capture. The n=59 figure thus likely represents a conservative underestimate of the true departmental and regional incidence. It should not be interpreted as reflecting the population-level prevalence of pediatric poisoning in Algiers. These limitations are further addressed in the Discussion.

Inclusion Criteria

Children aged 0–15 years presenting to the pediatric emergency department with a confirmed diagnosis of accidental or intentional poisoning. Confirmation based on caregiver clinical history, direct observation of ingestion or exposure, and/or laboratory evidence consistent with toxic substance exposure. Availability of complete medical records including demographics, clinical presentation, management, and outcome.

Exclusion Criteria

Incomplete medical documentation. Uncertain diagnosis after clinical and laboratory evaluation. Transfer from another hospital without comprehensive clinical data. Chronic intoxication or poisoning secondary to underlying metabolic disorders.

Data Collection and Diagnostic Confirmation

Data were systematically extracted from hospital medical records and included demographic variables (age, sex), intoxication category, specific toxic agents, intent (voluntary vs. accidental), clinical findings, endoscopic evaluations where applicable, hospitalization duration, management, and outcomes. Data accuracy was ensured through cross-verification with the clinical record by the principal investigator. Diagnostic confirmation followed a tiered, agent-specific approach. For pharmaceutical and non-corrosive household product ingestions, diagnosis rested on consistent caregiver anamnesis corroborated by clinical presentation (symptoms, vital signs, and exposure timeline). Toxicological laboratory confirmation was not universally available — a recognized constraint in our setting — and cases where diagnosis could not be supported by at least consistent clinical history and examination findings were excluded per the exclusion criteria. For caustic ingestions, confirmation required identification of the specific agent (brand or container presented by caregivers) combined with oro-pharyngeal examination findings; endoscopy was performed selectively per the departmental protocol described below. For carbon monoxide intoxication, confirmation required either carboxyhaemoglobin measurement on arterial or venous blood gas, or a clinically consistent constellation — including an identified indoor combustion source, concurrent exposure of multiple household members, and compatible symptoms — in cases where

laboratory measurement was unavailable. We acknowledge that the reliance on clinical history for some cases introduces potential diagnostic misclassification, which is discussed as a limitation.

Classification of Toxic Agents

Caustic and household product exposures were formally separated into two distinct sub-groups reflecting fundamentally different pathophysiological mechanisms, clinical presentations, and management requirements: Corrosive agents (n=10): drain cleaners (n=6), hydrochloric acid/spirit of salt (n=2), formalin (n=2). These agents induce direct chemical burns to mucosal surfaces requiring nil-by-mouth status, acid suppression therapy, and endoscopic assessment. Non-corrosive household agents (n=15): rodenticides (n=6), insecticides (n=3), eau de parfum (n=4), thinner (n=2). These agents have heterogeneous systemic toxicity mechanisms but do not cause corrosive mucosal injury and are managed with observation and agent-specific supportive protocols. This distinction is maintained throughout the Results and Discussion sections.

Endoscopic Protocol

Upper gastrointestinal endoscopy (EGD) was performed selectively in patients with suspected corrosive ingestion, not universally across all caustic exposures. The departmental protocol indicated EGD when: (1) the ingested substance was confirmed as a corrosive agent (drain cleaner, strong acid, or formalin); (2) the child was symptomatic at presentation (drooling, dysphagia, vomiting, oral mucosal burns, or stridor); and/or (3) there was clinical uncertainty about the degree of mucosal injury sufficient to alter management. Of 10 corrosive ingestion cases, 7 (70.0%) underwent EGD. The three cases not endoscoped had well-documented exposures to small quantities of dilute agents in fully asymptomatic children, in whom conservative observation was supported both by clinical judgment and by published evidence indicating that endoscopy may be safely deferred in selected asymptomatic cases [18]. EGD was not performed for non-corrosive household agents, for whom the procedure is not indicated.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki. Given its retrospective design involving exclusively anonymized data and no direct patient intervention, formal ethical committee approval was not required by the institutional policy of the Faculty of Medicine, University of Algiers. Patient confidentiality was maintained throughout data collection and analysis.

Outcome Measures

Primary outcome: clinical course and recovery status at discharge, defined as resolution of acute symptoms without long-term sequelae versus adverse outcome (prolonged hospitalization, ICU admission, or death). Secondary outcomes: toxic agent type, route of exposure, occurrence of complications, and length of hospital stay.

Statistical Analysis

Descriptive statistical methods were used throughout. Continuous variables are expressed as means with ranges; categorical variables as absolute frequencies with percentages reported to one decimal place. No inferential statistics were performed.

3. RESULTS

Epidemiological Profile

The analysis encompassed 59 pediatric poisoning cases. Accidental exposures accounted for 94.9% (n=56); three cases (5.1%) were intentional, all involving pharmaceutical ingestion in adolescents. The 0–3-year age bracket was the most affected (35/59, 59.3%), followed by the 4–10-year group (14/59, 23.7%) and adolescents aged 11–15 years (10/59, 16.9%). Male patients constituted 54.2% of the cohort (n=32); females 45.8% (n=27).

Distribution by Toxic Agent

The 59 cases comprised: pharmaceutical poisonings (n=24, 40.7%); caustic/household product exposures (n=25, 42.4%), formally subdivided into corrosive agents (n=10, 16.9%) and non-corrosive household agents (n=15, 25.4%); carbon monoxide intoxication (n=8, 13.6%); electrical injury (n=1, 1.7%); and plant ingestion (n=1, 1.7%).

Pharmaceutical poisonings involved paracetamol, neuroleptics, and antihypertensives with equal sex distribution. Corrosive agents comprised drain cleaners (n=6), hydrochloric acid (n=2), and formalin (n=2). Non-corrosive household agents comprised rodenticides (n=6), insecticides (n=3), eau de parfum (n=4), and thinner (n=2). Carbon monoxide intoxication spanned the full age spectrum, from adolescents aged 14–15 years to infants as young as 10 and 19 months, confirming vulnerability across all pediatric age groups through passive indoor environmental exposure.

Clinical Management

Pharmaceutical poisonings (n=24) followed a predominantly mild course: 16 patients (66.7%) were discharged after brief clinical monitoring; 7 (29.2%) received gastric lavage (restricted to obtunded patients presenting within one hour of ingestion of non-corrosive pharmaceutical agents, in accordance with standard decontamination guidelines); and 1 patient (4.2%) required antibiotic therapy for a secondary aspiration complication. Corrosive ingestion management (n=10): Gastric lavage was not performed in any corrosive ingestion case. This procedure is recognized as contraindicated in caustic exposures due to the risk of re-exposing the esophageal mucosa to the corrosive agent during evacuation [5,6]. Standard management consisted of nil-by-mouth status, intravenous hydration, and proton pump inhibitor therapy to reduce acid-mediated mucosal progression. In 3 patients with endoscopically confirmed grade IIA mucosal lesions, selective antibiotic prophylaxis (amoxicillin-clavulanate) was administered to reduce the risk of secondary bacterial superinfection of injured mucosa, as supported by selected pediatric gastroenterology practice guidelines for moderate-to-severe caustic injury [6], and applied on a case-by-case clinical basis rather than routinely. Non-corrosive household agent cases (n=15): 11 patients (73.3%) were managed with observation and discharged; 2 (13.3%) received gastric lavage (both were rodenticide ingestion cases, for whom the procedure is not contraindicated); and 2 (13.3%) required agent-specific supportive pharmacological management.

All 8 carbon monoxide cases were treated with high-flow supplemental oxygen; all recovered without extended hospital stays or permanent sequelae. The isolated electrical injury and plant ingestion cases were managed conservatively and discharged uneventfully.

Hospitalization Outcomes

A total of 53 of 59 patients (89.8%) were discharged without complications; 6 (10.2%) required a higher level of therapeutic intervention. Pharmaceutical poisonings typically necessitated 1–4 hospital days. Corrosive ingestions required the longest stays, up to 14 days. Non-corrosive household, CO, electrical, and plant cases did not require prolonged hospitalization.

A comprehensive overview of case distribution, demographics, and outcomes is presented in Table 1. The age-group distribution stratified by toxic agent category is illustrated in Figure 1.

4. DISCUSSION

The present study describes the epidemiological and clinical profile of pediatric poisoning cases managed at a tertiary referral hospital in Algiers, Algeria. Accidental exposures overwhelmingly predominated (94.9%), and children aged 0–3 years bore the greatest burden (59.3%), consistent with international evidence establishing the toddler age group as most susceptible due to developmental exploratory behavior and limited environmental awareness [1,2].

Pharmaceutical Poisonings

Pharmaceutical agents were the most prevalent single category (40.7%), predominantly involving neuroleptics and antihypertensives — agents accessible in the domestic environment through therapeutic use by household members. This reflects a globally documented risk pattern: similar pharmaceutical predominance has been reported in India [3], South Africa [4], Turkey [16], Iran [17], and Iraq [14]. The presence of intentional ingestions exclusively within the pharmaceutical category, confined to adolescents, is consistent with international data linking deliberate self-poisoning in adolescence to accessible medication in the home [2]. These findings reinforce the imperative for secured medication storage, child-resistant packaging, and targeted education of caregivers about household pharmaceutical risks.

Caustic Substance Ingestions: Corrosive versus Non-Corrosive Agents

The formal disaggregation of the caustic/household product category into corrosive (n=10) and non-corrosive (n=15) sub-groups represents a critical methodological distinction, as these two groups differ fundamentally in pathophysiology, clinical severity, and management. Corrosive agents caused direct mucosal injury and were associated with the longest hospitalization burden (up to 14 days), the requirement for nil-by-mouth management, acid suppression, and selective endoscopic evaluation. Non-corrosive household agents were managed with observation and supportive measures, with shorter hospital stays.

Endoscopic assessment was applied selectively according to the departmental protocol: 7 of 10 corrosive ingestion cases underwent EGD, yielding grade IIA mucosal lesions in 3, consistent with moderate esophagitis. The 3 non-endoscoped corrosive cases presented with well-documented exposures to small quantities of dilute agents in fully asymptomatic children, in whom conservative observation was supported by clinical judgment and evidence that endoscopy may be safely deferred in selected asymptomatic exposures [18]. Antibiotic prophylaxis with amoxicillin-clavulanate was used selectively — specifically in the 3 patients with grade IIA lesions — to

reduce the risk of bacterial superinfection of damaged mucosa, consistent with practice in some specialized pediatric gastroenterology centers [6]. Gastric lavage was not performed in any corrosive ingestion case, as it is recognized as contraindicated due to the risk of re-exposing injured mucosal surfaces to the corrosive agent.

Table 1. Patterns and Outcomes of Pediatric Poisonings (n=59). Distribution by agent category, sex, age group, intent, and hospitalization duration.

Category	n	Female	Male	Age 0–3 y	Age 4–10 y	Age 11–15 y	Intentional (n)	Accidental (n)	Hospitalization (days)
Medication	24	12	12	14	6	4	3	21	0–4
Corrosive agents	10	4	6	7	2	1	0	10	0–14
Non-corrosive household	15	6	9	9	4	2	0	15	0–4
Carbon monoxide	8	5	3	3	2	3	0	8	0–2
Electricity	1	0	1	1	0	0	0	1	0–1
Plants	1	0	1	1	0	0	0	1	0–1
Total (n = 59)	59	27	32	35	14	10	3	56	—

Abbreviations: Hospitalization duration is expressed as range in days from admission to discharge (e.g., 0–4 days). Intentional = deliberate ingestion; Accidental = unintentional exposure. Corrosive agents include drain cleaners, hydrochloric acid, and formalin. Non-corrosive household agents include rodenticides, insecticides, perfumes, and thinner.

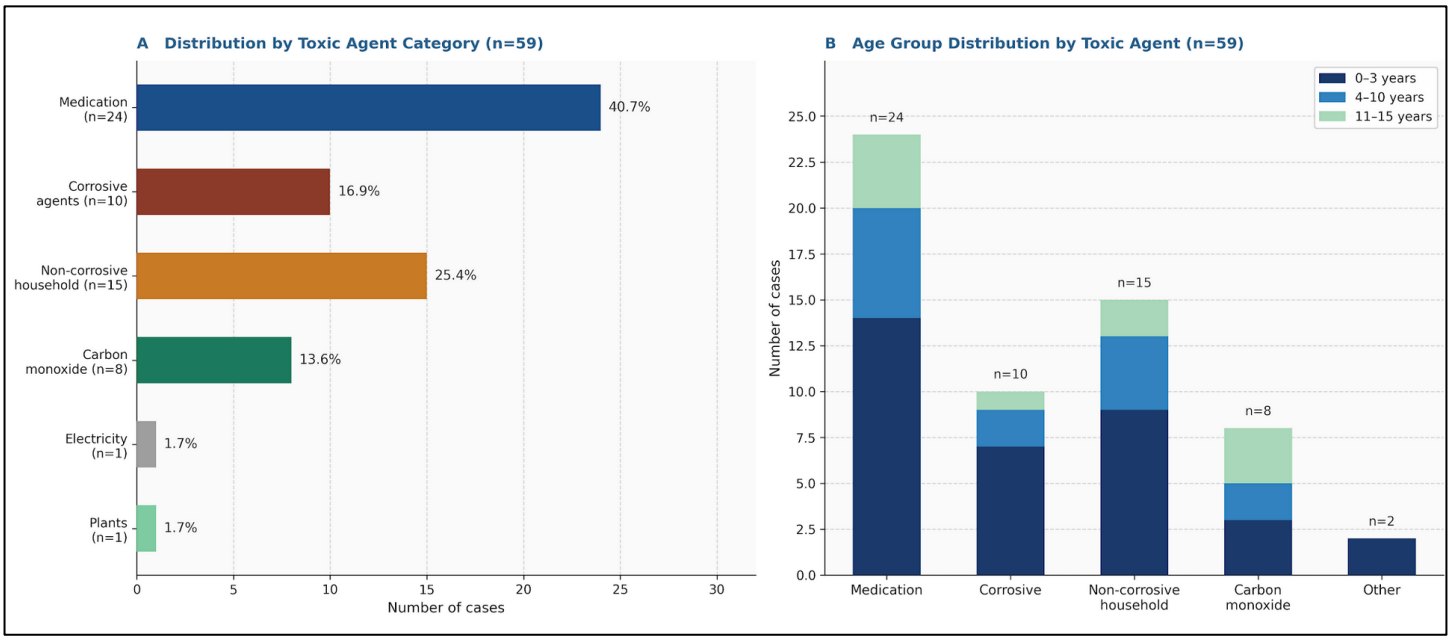

Figure 1. Epidemiological profile of pediatric poisoning cases (n=59). Panel A: distribution of cases by toxic agent category with proportions. Panel B: age group distribution (0–3, 4–10, and 11–15 years) stratified by toxic agent, presented as stacked bars. "Other" encompasses electrical injury (n=1) and plant ingestion (n=1). Corrosive agents: drain cleaners, hydrochloric acid, formalin. Non-corrosive household agents: rodenticides, insecticides, eau de parfum, thinner.

The breadth of corrosive agents identified — drain cleaners, hydrochloric acid, formalin — reflects the wide commercial availability of caustic household products in Algeria without adequate child-safety packaging or access restriction, reinforcing the need for regulatory measures and public awareness campaigns [8,9].

Carbon Monoxide Intoxication

Eight cases of carbon monoxide intoxication were identified, spanning all pediatric age groups and notably including two infants (10 and 19 months). This confirms that CO poisoning is not confined to older children and adolescents but endangers the full pediatric age range through passive exposure to polluted indoor environments, particularly in the context of inadequate ventilation and the use of gas-fueled heating and cooking appliances. All 8 patients recovered with high-flow oxygen supplementation [12]. Comparable age distribution patterns have been reported in Turkey and the United States [10,11]. Preventive strategies — enhanced indoor ventilation, CO detection device deployment, and community education on combustion fuel risks — are therefore indispensable in the Algerian context.

Comparison with Maghrebi and Regional Data

Contextualizing these findings against Maghrebi and regional comparators reveals both shared patterns and important local specificities. In Morocco, Achour et al. (1990–2008) documented pesticides as the dominant pediatric toxicological agent, with cholinergic toxidrome as the leading clinical presentation [15]. This agricultural pesticide predominance reflects a predominantly rural exposure context distinct from our urban Algiers cohort, where no agricultural pesticide cases were identified. The absence of this category in our series most plausibly reflects the urban hospital catchment area and referral pattern rather than a genuinely lower national burden; rural Algerian pediatric poisoning data may show a different profile.

In Turkey and Iran, pharmaceutical dominance was consistently reported [16,17], a pattern partially mirrored in our cohort (40.7% pharmaceutical). The prominence of caustic household product ingestions in our series (42.4%) is proportionally higher than most published comparators and may reflect the availability and storage conditions of corrosive household products in Algerian urban settings. Systematic indexed data from Tunisia, Libya, and other North African countries are not available, which itself underscores the contribution of the present dataset as an early Algerian reference for the regional literature.

Sample Size and Potential Ascertainment Bias

The total of 59 cases over 18 months at a tertiary center requires explicit discussion. The figure almost certainly represents an underestimate of the true caseload. Mild poisoning cases — which constitute the majority of pediatric intoxications in all published series — are frequently managed at primary health centers, outpatient clinics, or emergency units of non-tertiary hospitals without referral to our department, and thus escape our data capture entirely. Retrospective record review further excludes cases with incomplete documentation. This ascertainment bias is expected to over-represent moderate-to-severe presentations and under-represent mild and rapidly resolving cases in our dataset. Future prospective, multi-site surveillance studies using standardized case definitions and active case ascertainment are required to establish reliable incidence estimates for pediatric poisoning across Algeria.

Limitations

The single-center retrospective design limits external validity and generalizability. Toxicological laboratory confirmation was not universally available; some diagnoses relied on clinical history and examination alone, introducing potential diagnostic misclassification. Follow-up was confined to the inpatient period, precluding assessment of late sequelae such as esophageal stricture in caustic cases. The sample size constrains meaningful subgroup analyses. Notwithstanding these limitations, this study provides a valuable epidemiological and clinical baseline for pediatric poisoning in Algeria and offers a foundation for prospective multicenter research. These clarifications address methodological concerns regarding diagnostic reliability, case ascertainment, and management variability inherent to retrospective analyses.

5. CONCLUSIONS

Pediatric poisonings in this Algerian tertiary center are predominantly preventable, with pharmaceutical agents and caustic household products — formally disaggregated here into corrosive and non-corrosive sub-categories with distinct management pathways — constituting the most commonly implicated substances, and toddlers bearing the greatest burden. The predominance of accidental ingestions among children aged 0–3 years identifies inadequate domestic storage practices and insufficient caregiver knowledge as primary modifiable determinants. These findings advocate for comprehensive preventive action: mandatory child-resistant packaging for medications and hazardous household substances, secured storage requirements, and structured caregiver training in poisoning prevention and early recognition. From a clinical standpoint, protocolized management pathways are indispensable: corrosive caustic ingestions require a clearly defined endoscopy protocol, nil-by-mouth management, acid suppression, and selective antibiotic prophylaxis for confirmed mucosal injury; gastric lavage is contraindicated in corrosive exposures. Carbon monoxide intoxication demands community-level prevention through improved indoor ventilation and CO detection. Meaningful reductions in the pediatric

poisoning burden will require concerted collaboration among clinicians, public health agencies, regulatory bodies, and the caregiver community.

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