Intentional Chloralose Poisoning in a Low-Resource Setting: Epidemiology and Short-Term Outcomes from a Tunisian Emergency Department

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Abstract

Background: Intentional self-poisoning with chloralose remains an issue in low- and middle-income countries, where α-chloralose rodenticides are easily accessible. Data from frontline emergency departments are limited.

Objective: To describe the epidemiological, clinical, management, and short-term outcome profile of intentional chloralose poisoning in a polyvalent emergency department.

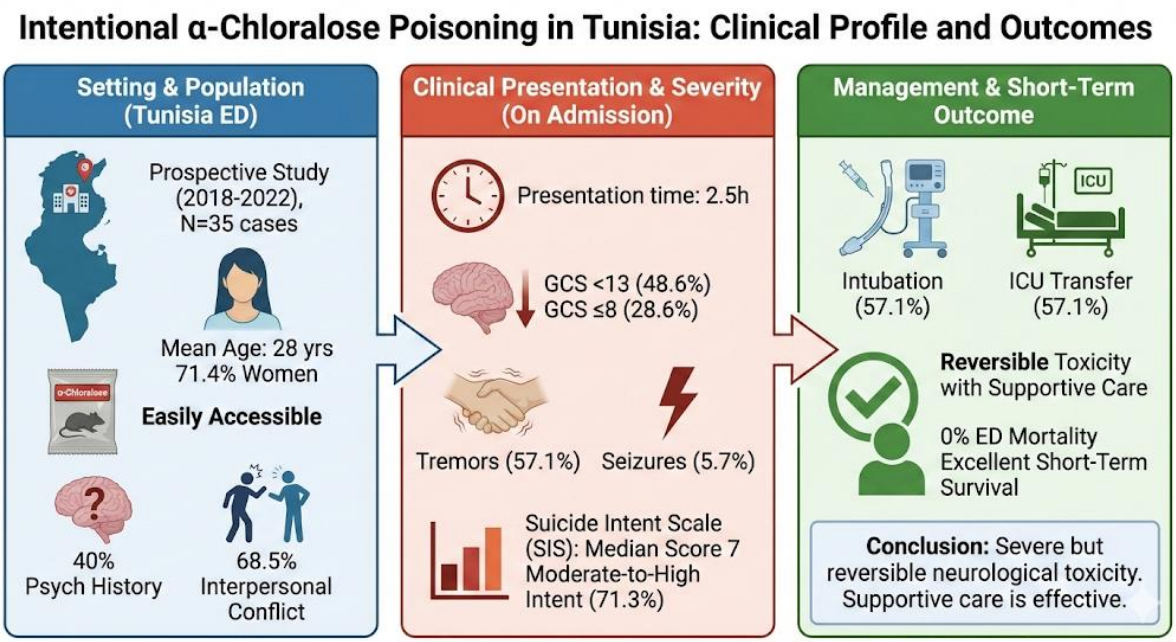
Methods: We conducted a prospective descriptive study in the emergency department of a regional hospital in Tunisia from January 2018 to December 2022. All patients aged ≥18 years with intentional ingestion of an α-chloralose, confirmed by history and/or toxicological analysis, were included. Sociodemographic data, clinical features, investigations, treatment, disposition, and outcomes were collected, and suicidal intent was assessed using the Suicide Intent Scale (SIS).

Results: Inclusion of 35 patients, among 1812 poisoning cases over the study period. The mean age was 28 ± 11 years, and 71.4% were women. Forty percent had a psychiatric history, and interpersonal conflict was the most frequent precipitating factor (68.5%). The median time to presentation was 2.5 hours. On admission, 48.6% had a Glasgow Coma Scale score <13, and 28.6% had a score ≤8; tremors and seizures occurred in 57.1% and 5.7% of patients, respectively. Orotracheal intubation was required in 57.1% of cases, 57,1% were transferred to intensive care, and no deaths occurred during emergency department stay. The median SIS score was 7 (range 0–22), with 71.3% of patients exhibiting moderate-to-high suicidal intent.

Conclusion: Intentional chloralose poisoning in this setting predominantly affects young women with psychiatric vulnerability and presents with severe but reversible neurological toxicity, frequently requiring organ support but associated with excellent short-term survival under supportive care.

Keywords: Acute poisoning, ICU admission, Clinical Predictors, Toxicological Predictors, Scoring Systems, Biomarkers, Poisoning, Outcomes

Graphical abstract



Introduction

Acute poisoning is a pathological condition of the organism resulting from exposure to a toxic substance that is exogenous to the body. It is a dynamic process that is often of short duration but can rapidly deteriorate, leading to life-threatening complications, justifying the need for a standardized and adapted emergency management approach (1).

Intentional acute poisoning has become a major public health challenge, with an increasing incidence, particularly among young females. According to statistics from the World Health Organization (WHO), more than 800,000 people die by suicide every year worldwide (1).

Currently, drugs, mainly psychotropic agents, are the most frequently used substances in intentional self-poisoning, especially among people treated with those molecules (2). The use of pesticides, and particularly chloralose, remains common in rural areas and in low and middle-income countries (3).

Chloralose is a chlorinated organic compound first described by Arthur Heffter in 1889. It was initially used in the medical field as a general anesthetic and subsequently as a hypnotic and sedative; however, these indications were later abandoned because of its adverse effects. At present, chloralose is used mainly for its rodenticidal and avicidal properties.

Although chloralose poisoning has declined in most developed countries, it remains relatively frequent in developing countries, including Tunisia. In Tunisia, particularly in the intensive care unit of the Emergency Medical Assistance Center of Tunis, which is the main toxicology reference center for the Greater Tunis area, the incidence of acute chloralose poisoning is considerable, with an estimated 100 hospitalizations per year and a mortality rate of 0.4% (4).

In literature, the incidence and prognosis of chloralose poisoning have been studied mainly in intensive care units or specialized toxicology centers. The present study aimed to describe the

epidemiological profile of chloralose poisoning in a polyvalent emergency department (ED).

Methods

We conducted a prospective, descriptive, single-center study in a polyvalent ED in a regional hospital in Tunisia over 5 years, from January 2018 to December 2022.
We included all patients aged 18 years or more admitted for acute intentional chloralose poisoning, defined as voluntary ingestion of an α-chloralose–containing preparation, confirmed by history and/or urine toxicological analysis. Patients who left the ED before completion of their management were excluded.

Data collection

Data were prospectively collected using a standardized form and included: sociodemographic characteristics, medical and psychiatric history, circumstances of poisoning, type of product, clinical presentation, and results of laboratory tests, electrocardiogram, arterial blood gases, and toxicological analyses. Suicidal intent was assessed using the 15-item Suicide Intent Scale (SIS), with scores categorized as low (0–3), moderate (4–10), or high (11–28). The SIS score was calculated by the physician upon admission or at discharge for comatose patients. Therapeutic management (including symptomatic treatment and organ support), ED course disposition, and in-hospital outcomes were also recorded.

Statistical analysis

Data were analyzed using SPSS version 25. Quantitative variables were described as means with standard deviations or medians with interquartile ranges, depending on their distribution (assessed by the Kolmogorov–Smirnov test). Qualitative variables were expressed as counts and percentages. A p-value <0.05 was considered statistically significant.

Ethical considerations

The study was approved by the Hospital ethics committee.

Results

During the study period, 35 patients were admitted to the ED for intentional chloralose poisoning. Figure 1 represents the flowchart of inclusion.

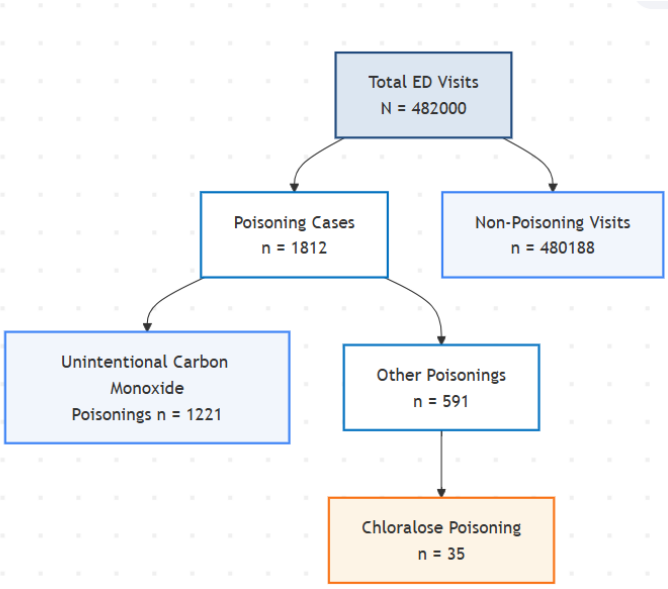


Figure 1: Flowchart of inclusion

The mean age of patients with chloralose poisoning was 28 ± 11 years (range 18–58). Women were younger than men, with a mean age of 25 ± 9 versus 34 ± 14 years. The male-to-female ratio was 0.4. Most patients were admitted from home (94.3%), with the remainder coming from the workplace or public areas. Thirty-two patients arrived by their own means three patients were transported by firefighters.

Most patients presented from their primary residence (94.3%), while the remaining 5.7% originated from an undetermined location, either an occupational setting or a public space.

For past medical history, only one patient had a history of diabetes. No other medical

comorbidities were reported. Fourteen patients had a documented psychiatric history, and seven had a prior suicide attempt.

The mean time from ingestion to ED presentation was 2.5 hours (range 1–6 hours); ten patients consulted within the first hour. The main reported precipitating factor was illustrated in Figure 2

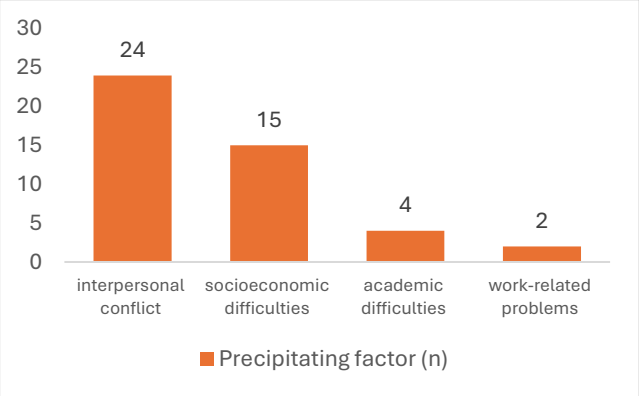


Figure 2: Precipitating factors leading to poisoning

Anamnestic data were contributory in 60% of cases, while in 40% of cases, the diagnosis was based on clinical presumption.

On admission, 18 patients (51.4%) had a Glasgow Coma Scale (GCS) score ≥13, whereas 10 patients (28.6%) had a GCS score ≤8. Tremors were observed in 20 patients (57.1%) and generalized seizures in 2 patients (5.7%). Hypersecretion was observed for 76% of patients.

The mean respiratory rate was 19 ± 3 cycles/min (range 8–28. The mean heart rate was 91 ± 20 beats/min (range 50–140). The mean systolic blood pressure was 117 ± 16 mmHg. All patients were afebrile, with a mean body temperature of 37.0 ± 0.09°C. Table 1 represents physiological abnormalities at admission.

Arterial blood gas analysis was performed in 18 patients. Hypercapnia ($PaCO_2$ >42 mmHg) was found in 7 patients, and hypocapnia ($PaCO_2$ <38 mmHg), consistent with hyperventilation, in 5 patients (14.2%). Hypoxemia (PaO_2 <60 mmHg) was documented in 2 patients (5.7%).

Routine biochemical parameters were within normal ranges for blood glucose (5.2 ± 1 mmol/L), creatinine (62.9 ± 6.7 µmol/L), and serum sodium (140 ± 2.1 mmol/L). Six patients presented with hypokalemia. Prothrombin time was reduced (<50%) in one patient without any comorbidity or co-ingestion of any other toxic. Urine screening was conducted for all patients, and it was positive for chloralose.

Table 1: Physiological abnormalities at admissions

Physiological abnormalities	N
Polypnea (≥20 cycles/min)	20
Bradypnea (≤12 cycles/min)	1
Tachycardia (>100 beats/min)	9
hypotension (systolic blood pressure <90 mmHg)	1

An electrocardiogram was obtained in 32 patients (91.4%). It was normal in 22 cases (68.7%). Sinus tachycardia was observed in 7 patients (21.8%) and sinus bradycardia in 3 patients (9.3%). No atrioventricular conduction disturbances or signs of membrane-stabilizing effects were observed.

Twenty-eight patients (80%) were initially managed in the emergency room, and seven (20%) in the short-stay unit. Orotracheal intubation with mechanical ventilation was required in 20 patients (57.1%). All patients received intravenous isotonic saline, and none required vasoactive drugs.

Gastrointestinal decontamination by gastric lavage was performed in 12 patients.

Overall, 23 patients (65.7%) were transferred to the intensive care unit, and the remaining patients were managed entirely in the ED.

All patients benefit from a psychological assessment at discharge, then referred to psychiatric consultation. Two patients were subsequently referred to psychiatric ED because of high suicidal risk. No deaths related to

chloralose poisoning occurred during ED hospitalization.

The median Suicide Intent Scale (SIS) score was 7 (range 0–22). Table 2 represents the distribution of suicidal intent according to the SIS score

Table 2: Distribution of suicidal intent according to SIS score

SIS Score	n	%	ICU admission n (%)
Low (≤3)	10	28.7	6 (17.1)
Moderate (4-10)	17	48.5	9 (25.7)
High (≥11)	8	22.8	8 (22.8)

SIS=suicidal intent scale; ICU=intensive care unit

Discussion

This study was a prospective single-center study from a Tunisian ED. Intentional chloralose poisoning represented a small proportion of all poisoning cases, predominantly affected young adults, and frequently required intensive care management. Within 5 years, 35 cases were identified, corresponding to approximately 2% of all poisonings. This pattern is in line with data from North African poison centers, where chloralose intoxication is reported far more frequently than in Western Europe, particularly France, where the annual incidence is estimated at around 10 cases per year (5). The higher burden in low- and middle-income countries is likely related to the easy, poorly regulated access to α-chloralose–containing rodenticides through hardware shops, pharmacies, and large retail stores, in contrast to Europe, where distribution is tightly controlled by biocide and pesticide regulations (6).

The demographic profile of our cohort is consistent with previously published series. The mean age was 28 years, and there was a clear female predominance with a sex ratio of 0.4. A Tunisian study conducted in the national toxicology center and including 752 cases of acute chloralose poisoning reported the same marked predominance of women, with a sex ratio of 3/7 (7). Those findings mirror the broader epidemiology of intentional self-poisoning in adults, where deliberate ingestion of toxic substances, often in a suicidal context, constitutes the most common precipitating factor (2).

In our series, most poisonings occurred at home and were triggered mainly by interpersonal conflict and socioeconomic difficulties, with a higher incidence among patients already followed in psychiatry. These circumstances are like those described in other studies from developing countries, where pesticides and rodenticides, including chloralose, are among the main agents implicated in acute intentional poisonings owing to their wide availability and the lack of strict sales regulation (8).

Clinically, our results confirm the predominant neurological toxicity of chloralose. Almost half of the patients presented with impaired consciousness (GCS <13), and nearly one-third had deep coma (GCS ≤8). Tremors were observed in more than half of the cohort, and generalized seizures were documented in only 2 cases. These findings are consistent with the known pharmacodynamic profile of chloralose, which combines sedative effects with paradoxical motor hyperexcitability, leading to a spectrum of manifestations ranging from somnolence and vertigo to coma, myoclonus, hyperreflexia, and seizures (7). Respiratory and hemodynamic involvement was generally secondary to central nervous system depression, with overall good hemodynamic tolerance and rare hypotension, in agreement with previous descriptions of chloralose intoxication (5,9). Although chloralose is known to inhibit thermoregulatory centers and can induce toxic hypothermia, no clinically significant hypothermia was observed in our cohort, possibly due to early presentation, environmental conditions, or early supportive measures.

Management in our study was predominantly supportive and non-specific, in line with current recommendations (9). Gastrointestinal decontamination by gastric lavage was performed in approximately one-third of patients who presented early after ingestion, to reduce gastrointestinal absorption of the toxicant(10). When gastric lavage was indicated, airway protection via orotracheal intubation was ensured in patients with altered consciousness to prevent aspiration. More than half of the patients required orotracheal intubation and mechanical ventilation, reflecting the severity of neurological impairment. Conversely, no patient required vasoactive drugs, which further supports the notion that chloralose toxicity in this context is mainly neurotoxic rather than cardiocirculatory (11).

The short-term outcome was favorable in all cases, with no deaths recorded during ED management. This is consistent with previous reports indicating that, in the absence of delayed consultation or major complications, chloralose-induced coma is usually rapidly reversible within 24 to 48 hours under appropriate supportive care. A Tunisian series of 752 cases reported a low mortality rate of 0.4%, primarily related to prolonged anoxic brain injury in patients managed late (7), underscoring the importance of early medical intervention.

Beyond the somatic prognosis, our data also highlight the psychiatric burden associated with intentional chloralose poisoning. The median Suicide Intent Scale score was 7, with a substantial proportion of patients classified as having moderate to high suicidal intent.

All patients in our cohort benefit from psychological assessment and are then referred to either psychiatric consultation or emergency. Among patients referred to psychiatric consultation, the adherence to the consultation was unknown. This discrepancy suggests that the psychiatric dimension of care may still be under-recognized and emphasizes the need for systematic psychiatric assessment and structured follow-up in all cases of intentional poisoning, regardless of the apparent somatic severity.

This study has several limitations, especially the loss of the long-term psychiatric trajectory of patients. The monocentric nature and relatively small sample size also limit the generalizability of the results...

From a public health perspective, intentional chloralose poisoning illustrates the broader issue of access to highly toxic substances in vulnerable populations. Even when medical prognosis is usually favorable, the impact on the health system is considerable: frequent intensive care admissions, the need for mechanical ventilation in young, otherwise healthy patients, and subsequent psychiatric care all contribute to increased costs and resource use. These findings argue in favor of stricter regulation of the distribution and sale of α-chloralose–containing products, combined with prevention strategies targeting psychosocial risk factors and improved coordination between emergency medicine, psychiatry, and community-based mental health services.

Conclusion

Intentional chloralose poisoning predominantly affects young adults, especially women, and is characterized by severe but reversible neurological impairment, often requiring airway protection and ICU admission, but with no short-term mortality. These findings highlight the importance of early supportive management combined with systematic psychiatric assessment to address underlying suicidal intent. Strict regulations of chloralose-containing products and targeted preventive strategies may help reduce the prevalence of this poison in the vulnerable population.

Competing interests: The authors declare no competing interests

Generative AI was used for the English editing.

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