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Retrospective analysis of patients monitored for acute intoxication in the intensive care unit: A 5-year single-center experience

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Abstract

This study aimed to evaluate the demographic characteristics, clinical parameters, and outcomes of acute poisoning in adult patients hospitalized and treated in our hospital's intensive care unit (ICU). In this single-center observational retrospective study, 283 patients over the age of 16 who presented to the emergency department with acute drug poisoning and were admitted to the ICU over a 5-year period were included, and data were collected from the patients' medical records. The demographic characteristics of the patients, causes of poisoning, clinical parameters, length of stay in the ICU, treatment methods, and prognoses were recorded. Our study included a higher proportion of female patients, and the majority of cases were suicidal and involved younger patients. The most frequent cause of acute poisoning was medications, primarily antidepressants and antipsychotics. The second most frequent cause was alcohol and addictive substances. While most patients were successfully treated and discharged within 48 hours, those requiring further intervention had a significantly higher mortality rate. These findings highlight the importance of various preventive and clinical management strategies. Acute poisoning remains an important cause of ICU admission, particularly among younger patients and females with suicidal intent. Early recognition, appropriate intervention, and preventive strategies may contribute to improved clinical outcomes and reduced mortality.

Keywords: Suicide, intensive care unit, prognosis

Introduction

Poisoning is the disruption of the body's normal functions as a result of the suicidal or accidental intake of toxic or non-toxic (high-dose) substances that can harm the body. It can lead to damage, dysfunction, or death in the body [1]. The most common causes of poisoning are drugs, alcohol and addictive substances, and toxic substances of industrial or agricultural origin [2]. Poisoning can be suicidal, accidental, or occur during treatment, but in adults, it is predominantly suicidal. A significant increase in suicide rates has occurred in Turkiye over the past decade, particularly observed in the female gender and the 20-24 age group [3]. Serious clinical outcomes associated with acute poisoning and multisystem organ failure may occur, and many of these patients need to be hospitalized in the ICU [4]. Between 3.4% and 13.8% of patients hospitalized in the emergency department due to poisoning are followed in ICUs, and this rate has risen to 37% in Turkiye [5].

The aim of the study is to investigate the demographic characteristics, causes of poisoning, clinical parameters, length of stay in intensive care, treatment modalities, and prognoses in adult patients monitored and treated for acute poisoning in the ICU of our hospital. Knowing the general poisoning profiles in a region is a critical factor to help identify and prevent potential poisonings.

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Material and Methods

The study was designed with the approval of the Malatya Clinical Research Ethics Committee (No: 2019/208, Date: 04 December 2019). A total of 283 patients aged 16 years and older who presented to the emergency department of Malatya Training and Research Hospital with acute drug poisoning and were hospitalized in the ICU between January 1, 2013, and January 1, 2018, were included in the study. The age threshold of 16 years was selected because patients younger than 16 years are typically managed in pediatric ICUs and follow different clinical protocols, making them inappropriate for inclusion in an adult ICU study. Exclusion criteria were the absence of available data in the hospital system, not having been hospitalized for 24 hours yet, and being followed up in the wards. In our single-center observational retrospective study, data were collected from patients' medical records. Patients' demographic characteristics, causes of poisoning, clinical parameters, length of stay in ICU, treatment modalities, and prognoses were recorded.

Statistics

Statistical evaluation of the data was performed using IBM SPSS Statistics version 25.0 program. The conformity of variables to normal distribution was examined with the Kolmogorov-Smirnov test. Continuous variables were expressed as mean ± standard deviation or median (minimum-maximum), categorical variables as number and percentage. Independent sample t-test, Mann-Whitney U test, and Kruskal-Wallis test were used for comparisons between groups; Pearson chi-square test was used for categorical variables. Mortality risk factors were determined by univariate and multivariate logistic regression analysis. Relationships between variables were evaluated by Pearson/ Spearman correlation analysis. Statistical significance level was accepted as $p<0.05$.

Results

Between January 2013 and December 2018, a total of 283 patients were admitted to and monitored in our ICU for acute intoxication. Females constituted a slight majority (52.3%), while males accounted for 47.7% of cases. The mean age of the cohort was 29.7 ± 14.0 years. The highest incidence was observed in the 16–25-year age group (50.2%), followed by the 26–35-year group (26.9%), whereas patients older than 50 years represented the smallest proportion (8.5%) (Table 1).

Table 1. Demographic data of patients

Demographics		n	%
Male		135	47.7
Female		148	52.3
Age groups	**16-25 years**	142	50.2
	26-35 years	76	26.9
	36-50 years	41	14.5
	>50 years	24	8.5
Total		283	100

Data are presented as number (n) and percentage (%)

Intentional self-poisoning predominated, accounting for 84.1% of admissions, while accidental exposures comprised 15.9% of cases (Figure 1).

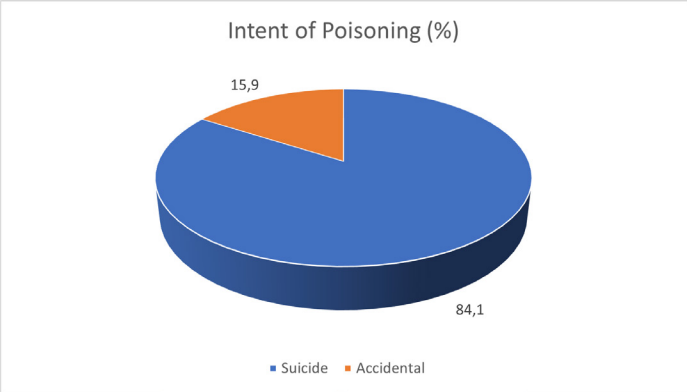

Figure 1. Distribution of cases according to intent of poisoning

Pharmaceutical agents were the leading cause of intoxication. Antidepressants and antipsychotics were the most frequently implicated agents (33.6%), followed by Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) and paracetamol (20.5%). Substance-related intoxications, including synthetic cannabinoids and other addictive agents, accounted for 11.7% of cases. Cardiometabolic medications (antidiabetic and antihypertensive drugs) comprised 11%, while organophosphates and agricultural chemicals were responsible for 8.1%. Alcohol intoxication accounted for 7.8% of admissions. carbon monoxide (CO) and mushroom poisoning were each identified in 4.2% of patients (Table 2).

Table 2. Agents causing poisoning in cases

Agents	n	%
Antidepressants-antipsychotics	95	33.6
Nonsteroidal anti-inflammatory drugs (NSAID)-paracetamol	58	20.5
Synthetic cannabinoids, other addictive substances	33	11.7
Diabetes drugs, antihypertensive drugs	31	11
Organophosphates, agricultural drugs	23	8.1
Antiepileptics	21	7.4
Alcohol	22	7.8
CO poisoning	12	4.2
Foods (mushroom poisoning)	12	4.2

Data are presented as number (n) and percentage (%)

Eleven patients (3.9%) required endotracheal intubation at ICU admission. Of these, 90.9% were male. The overall mortality rate was 1.8%. Mortality occurred predominantly among intubated patients. Gender-based comparison demonstrated that males had significantly lower Glasgow Coma Scale (GCS) scores and higher intubation rates compared to females ($p<0.05$). Median GCS was 13 in males and 15 in females. Intubation was required in 7.4% of males versus 0.7% of females (Table 3). No statistically significant gender differences were observed in terms of suicide attempt frequency or multiple drug ingestion.

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Table 3. Comparison by gender

Variable	Male (n=135)	Female (n=148)
Age	30.4 ± 14.8	29.1 ± 13.3
Multiple drug use	56 (41.5%)	71 (48.0%)
Suicide attempt	113 (83.7%)	125 (84.5%)
GCS	13 (3-15) ± 2.9	15 (8-15)
Intubation	10 (7.4%)	1 (0.7%)

Data are presented as mean ± standard deviation for age, number (n) and percentage (%). Data are presented as number (n) and percentage (%) for multiple drug use, suicide attempt and intubation. Data are presented as median (min-max) for GCS

Comparative analysis between suicide and accidental intoxication groups revealed that patients in the suicide group were significantly younger (28.0 ± 12.2 vs. 39.0 ± 19.0 years, p<0.05). Multiple drug ingestion was also significantly more prevalent in suicide attempts (49.6% vs. 20.0%, p<0.05). Although psychiatric history and female gender were more frequent in the suicide group, these associations did not reach statistical significance (Table 4).

Table 4. Comparison of suicide and accident groups

Variable	Suicide (n=238)	Accident (n=45)
Age	28.0 ± 12.2	39.0 ± 19.0
Female gender	125 (52.5%)	23 (51.1%)
Male gender	113 (47.5%)	22 (48.9%)
Psychiatric history	101 (42.4%)	16 (35.6%)
Multiple drugs	118 (49.6%)	9 (20.0%)

Data are presented as mean ± standard deviation for age, number (n) and percentage (%). Data are presented as percentage (%) for other variables

Risk factor analysis for mortality demonstrated that GCS <12 and intubation were strongly associated with fatal outcomes (p<0.05). Due to the small number of mortality cases, odds ratios approached infinity, reflecting the strength of association despite wide confidence intervals. Psychiatric history was present in 80% of non-survivors; however, this variable did not independently predict mortality (p=0.089) (Table 5).

Table 5. Mortality risk factors

Risk factor	OR	95% CI	p value
GCS <12	∞	1.46-54.82	0.018*
Intubation	∞	2.35-98.76	0.004*
Psychiatric history	5.84	0.88-33.12	0.089 (NS)

Data are presented as odds ratio (OR) with 95% confidence interval (CI). *p<0.05, statistically significant; NS, not significant; GCS: Glasgow Coma Scale

Correlation analysis further supported these findings. A strong inverse correlation was observed between GCS and mortality (r =0.521, p<0.001), indicating that lower GCS scores were associated with increased mortality risk. A very strong negative correlation was found between GCS and intubation requirement (r=0.730, p<0.001). Additionally, weak but statistically significant negative correlations were observed between GCS and ICU length of stay (r=-0.246, p<0.001), and between GCS and age (r =0.117, p=0.049) (Table 6).

Table 6. Correlation analyses

Variable Pair	Correlation (r)	p value
GCS ↔ Mortality	-0.521	0.000*
Intubation ↔ GCS	-0.730	0.000*
GCS ↔ Length of stay	-0.246	0.000*
Age ↔ GCS	-0.117	0.049*

Pearson/Spearman correlation analysis. *p<0.05, statistically significant. Correlation strength: r=0.00-0.30, weak; r=0.30-0.50, moderate; r=0.50-0.70, strong; r=0.70-1.00, very strong. GCS: Glasgow Coma Scale

Following psychiatric evaluation, 75.3% of patients were discharged or transferred to a general ward within the first 48 hours of ICU admission (Figure 2).

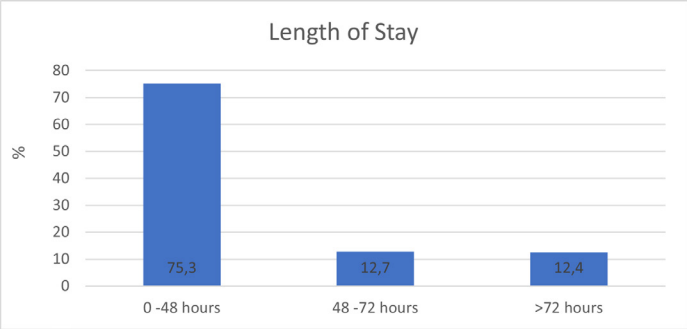

Figure 2. Distribution of patients according to length of ICU stay

Discussion

In our country, people hospitalized in the emergency department due to poisoning or other reasons and who require intensive care are followed in both medical ICUs and anesthesia and reanimation ICUs. The results of studies reporting data from both ICU types vary. In our hospital, similar to some centers, poisoning patients are followed in anesthesia and reanimation ICUs.

In general, studies conducted in our country report that poisoning cases followed in ICUs are predominantly young adults and the female gender is more common. In a study conducted in the Mediterranean region by Bilge, the mean age of cases was 28.6 ± 11 years, 59.1% of the patients were female, and 93.1% of poisonings were suicidal [5]. In another study conducted in the Central Anatolia region with 162 patients by Yilmaz et al., the mean age of patients was 27.7 ± 9.9 years, the female gender was 59%, and the rate of suicide cases was 82% [6]. Similar to our study's data, there are also studies from different regions of our country that show very close results [7,8].

While data from other countries are generally consistent with our country regarding gender and age group, the rate of suicide cases

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in ICUs is much lower. For example, in a study conducted in India by Singh et al., 85.3% of 102 patients followed for poisoning were young adults, 51.9% were male, 25.4% were suicidal, and the rest were accidental, and this was explained by the easier accessibility of drugs in rural areas [9]. In a study conducted in Jamaica with 91 patients by Williams et al., 30 patients (33%) were suicidal [10]. The increasing ease of access to drugs and the rise in suicides in the general population are factors that increase the number of patients in ICUs.

In our study, when we examined the agents causing acute poisoning, we found that antidepressants and antipsychotics were in the first place, consistent with data from studies conducted in our country. This occurs mostly in the form of overdose intake with suicidal intent. In a comprehensive study with 195 patients conducted in our country by Arikan et al., the most frequently taken agents were also detected as antidepressants (31.3%) and antipsychotics (24.6%), and the rate of multiple drug intake was 81%, the intentional poisoning rate was 92.8%, and the rate of patients with psychiatric disorders was 61% [11]. In a study from the Netherlands conducted by Sut et al., antidepressants were again the most common poisoning cause, accounting for 26% of 70 patients [12]. In a comprehensive study conducted by Gummin et al. in the United States, analgesics, antidepressants, and sedatives were detected among the most common agents causing poisoning [13].

After drugs, the second most frequent cause was alcohol and addictive substance-related poisoning. Recently, synthetic cannabinoids have become popular among young people due to their low cost and easy accessibility, and in this group, serious clinical outcomes and deaths have been observed. In our study, in the suicidal group, along with alcohol and synthetic cannabinoids, drugs were taken in excess doses, and all the deaths in our study were in this group. It should be noted that our mortality data only reflect the ICU. Synthetic cannabinoid poisonings are generally mild in young patients and are monitored and discharged from the emergency department after symptomatic treatment. While our rate was determined as 11.7%, the rate of synthetic cannabinoid and other addictive substance-related poisonings in the emergency department was found to be around 31.5% in studies conducted in our country in recent years, and rates between 4.6%-10.2% were reported for these patients being transferred to the ICU. The mortality rate of patients transferred to the ICU has been determined as approximately 1-2.6% [2,14,15].

Studies show that intentional alcohol intake (16.2%) is the most important risk factor for suicide [16,17]. In our study, the rate of alcohol intake was 7.8%. However, toxic alcohol varieties (methyl alcohol, ethylene glycol, etc.) were much less common. The rate of toxic alcohol intake was around 1.4%. In our study, one of the five deceased patients had ingested methyl alcohol along with other substances. In a comprehensive study conducted by Bilge, while the intentional alcohol poisoning rate was 8.4%, it was determined that no toxic alcohol intake occurred [5]. In a study by Ayan et al. conducted in the emergency department, while the rate of accidental alcohol poisoning was 11.1%, the rate of intentional alcohol poisoning was 3.1%, and rates for toxic alcohols of 3.7-3.9% have been observed [18].

CO poisoning from coal and gas heaters is one of the most common accidental poisoning causes in winter months in both developed and developing countries. In our study, this rate was 4.2%, while in a comprehensive study conducted in our country, it was slightly higher at 8.4% [19]. Our patients benefited from oxygen therapy and all were discharged within the first 48 hours.

Poisonings due to mushrooms consumed as food were observed in 12 patients (4.2%) in our study in May and June, and all were discharged following their treatment in the ICU. In a study conducted in our country, it was detected in 11 cases (5.9%), and one patient was referred [2].

The prognosis of poisoning cases varies depending on the agent taken and the dose, and this also affects the length of stay in ICU. The ICU stay duration of these cases ranges from 0.7 to 3.56 days, and the number of patients staying more than two days has been determined as 12% in some studies conducted domestically and abroad [20,21]. In our study, the rate of patients monitored for more than two days was slightly higher at 24.7%, and we attribute this to multiple drug intake in this patient group or the intake of substances such as alcohol and synthetic cannabinoids with drugs.

In their study, Totoz et al. reported that eight of 66 patients (12.1%) required mechanical ventilation and 2 (3%) underwent hemofiltration and mortality rates were 1% [22]. In a study conducted by Bilge on 203 patients, only one patient received hemofiltration treatment, one patient required mechanical ventilation, and all patients recovered [5]. In our study, 4% of our patients required mechanical ventilation, 1.4% underwent hemofiltration and our mortality rate was 1.8%, which was due to poor prognosis of patients upon hospital admission, but our rates were consistent with mortality rates in our country. Rates in global studies were higher.

Brandenburg et al. evaluated 7331 patients in 81 intensive care units in the Netherlands and found a mechanical ventilation rate of 18.9% [23]. Sorge et al. reported rates of 27% for mechanical ventilation and 13.6% for hemodialysis [24]. In the quite comprehensive INTOXICATE study conducted by Zwaag et al. in 2024 involving 78 intensive care units, hospital mortality was around 4.5% (n=103/2273) [25].

Conclusion

Although our study was one of the comprehensive studies conducted in our region, it had limitations, primarily due to being a single-center study and involving a relatively small number of patients. Consequently, drug poisoning cases in the intensive care unit were predominantly in the younger age group and involved suicidal intent. They occurred with toxic doses of readily available medications, multiple drug use

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was common, and most patients had a history of psychiatric illness. Clinical outcomes varied significantly depending on the severity of acute poisoning. While the majority of patients were successfully treated and discharged within 48 hours, those requiring further intervention faced a significantly higher mortality rate. These findings highlight the importance of various preventive and clinical management strategies. Limiting access to potentially lethal medications, particularly antidepressants and antipsychotics, especially for individuals with psychiatric illness, can reduce suicide attempts. Early diagnosis of severe poisoning, prompt initiation of supportive care when needed, and evaluation of further treatments can improve outcomes.

Further multicenter prospective studies with larger sample sizes are needed to characterize poisoning patterns in more detail, confirm our findings regarding risk factors, and develop evidence-based management protocols specific to the poisoning epidemiology of our region.

Ethical Approval
Approved by the Malatya Clinical Research Ethics Committee (No: 2019/208, Date: 04 December 2019).

Patient Consent
Informed consent was waived due to the retrospective design.

Conflict of Interest
The authors declare no conflict of interest.

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