

A Study of Toxication Types in Intubated Poisoned Patients in the ICUs of Taft Shahid Beheshti and Yazd Shahvali Hospitals (2015–2019)

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Abstract

Background: Although poisoning is one of the most common reasons for visits to emergency departments, the types of toxication among intubated poisoned patients in ICUs have not been well documented.

Objectives: This study aimed to identify the toxication types among intubated poisoned patients in an intensive care unit (ICU).

Methods: This retrospective cross-sectional study was conducted on poisoned patients with chemical compounds, hospitalized in ICU, and underwent endotracheal intubation. Toxicological and clinical factors, as well as outcomes, were collected and analyzed. Analysis was performed using the Chi-square test and Fisher's exact test. The p-value < 0.05 was considered significant.

Results: In this study, 307 patients with the diagnosis of poisoning were evaluated. The most common toxic agents were methadone (46.8%), opium (5.9%), organophosphorus compounds (5.9%), methanol (4.2%), and other chemical substances (2.4%). A single compound poisoned most patients (70%). Furthermore, 167 patients (54.4%) experienced accidental poisoning or drug abuse, while the remaining cases (45.6%) were due to suicidal intentions. Significant differences were observed between these two groups (suicidal and accidental poisoning groups) regarding age, gender, types of toxication, and grouping and duration of ICU hospitalization ($P < 0.05$). Significant differences were found in patient outcomes based on toxication types, toxication type grouping, or ICU hospitalization duration ($P < 0.05$).

Conclusion: Our results indicate that opioids, especially methadone, were the most frequent cause of poisoning in our study. Pesticide poisoning occurred significantly more often in patients with suicidal intent. Additionally, patient outcomes were significantly influenced by age, gender, type, grouping of toxic agents, and duration of ICU hospitalization.

Keywords: Endotracheal intubation, Intensive care unit (ICU), Mortality, Poisoning.

1. Background

Poisoning is a leading cause of emergency department (ED) visits and intensive care unit

(ICU) admissions worldwide, posing a significant public health challenge, especially in developing countries (1–7). Globally, over one million poisoning cases are reported annually, contributing substantially to morbidity and mortality (8). In Iran, poisoning represents the most common method of fatal self-harm, accounting for nearly 60% of suicide-related deaths (9) and constitutes approximately 15–20% of all ED visits (10–12). The proportion of patients with acute intoxication presenting to EDs varies widely, ranging from 3.7% to 40% (1–3). Similarly, depending on the healthcare setting and ICU type, patients with acute poisoning constitute between 3.4% and 13.8% of ICU admissions (4, 5). According to the World Health Organization, pesticide poisoning alone causes over 200,000 deaths annually, with mortality rates reaching up to 20% in certain regions (8).

Additionally, drug overdose remains a significant medical challenge, often requiring ICU admission and extensive healthcare resources (13). The rising incidence of opioid overdoses—including prescription opioids, synthetic variants, and heroin—poses an increasing challenge for critical care providers who must manage more complex cases (14). Among opioids, methadone poisoning, a synthetic opioid with a long-acting effect, has also seen a notable increase in our country (15). Clinical outcomes among poisoned patients depend on multiple factors, including the type and dose of the toxic agent, duration of exposure, and the patient's baseline health status. Early recognition and prompt supportive care are essential to improving survival rates (16). Severe cases often present with impaired consciousness or respiratory failure, necessitating endotracheal intubation to protect the airway and prevent aspiration (17–19). Other indications for intubation include seizures, severe agitation, or depressed respiratory drive resulting from toxic exposure (20–25). Despite the clinical significance, there is a paucity of data on the patterns of poisoning and outcomes among

intubated patients in Iranian hospitals. Moreover, there is no comprehensive study in this regard in our province. Therefore, this study aims to characterize the types of toxins involved in poisoned patients who required endotracheal intubation in the ICUs of Shahid Beheshti Hospital in Taft and Shah-Vali Hospital in Yazd between 2015 and 2019.

2. Objective

This retrospective cross-sectional study was conducted in the Department of Poisons at Taft Shahid Beheshti and Yazd Shahvali hospitals, the centers of Iran, from January 2015 to March 2019. The types of toxification in patients who underwent endotracheal intubation were measured. Inclusion criteria consisted of patients in all age groups referred to the poisoning Department with poisoning of the chemical compound, hospitalized in an intensive care unit (ICU), and underwent endotracheal intubation. Exclusion criteria consisted of patients with incomplete or inadequate medical records. The study flowchart is shown in [Figure 1](#).

A toxicologist confirmed the diagnosis of chemical compound poisoning.

Then, various variables including the patient's age, type of drug which led to the poisoning, post-intoxication vital status, intentions of the drug use, and etc were recorded for each patient based on medical files. It should be noted that the following conditions are the indications for intubation in cases with a diagnosis of poisoning of chemical compound: (i) respiratory failure (including airway blockage); (ii) intubation as a standalone therapy or to support a specific therapy; and (iii) airway protection in the unprotected airway.

Data Analysis

Only data from patients who completed the trial were analyzed and reported. Statistical analyses were conducted using SPSS version 22 software (SPSS Inc., Chicago, IL, USA). Results were summarized using measures such

as mean and standard deviation, or median and mode, along with the interquartile range (IQR), including minimum and maximum values, which were presented in graphs and corresponding tables. Besides the overall

scores, outcomes for each subgroup were also reported separately. The Chi-square and Fisher's exact tests were applied for analysis. A p-value of less than 0.05 was considered statistically significant.

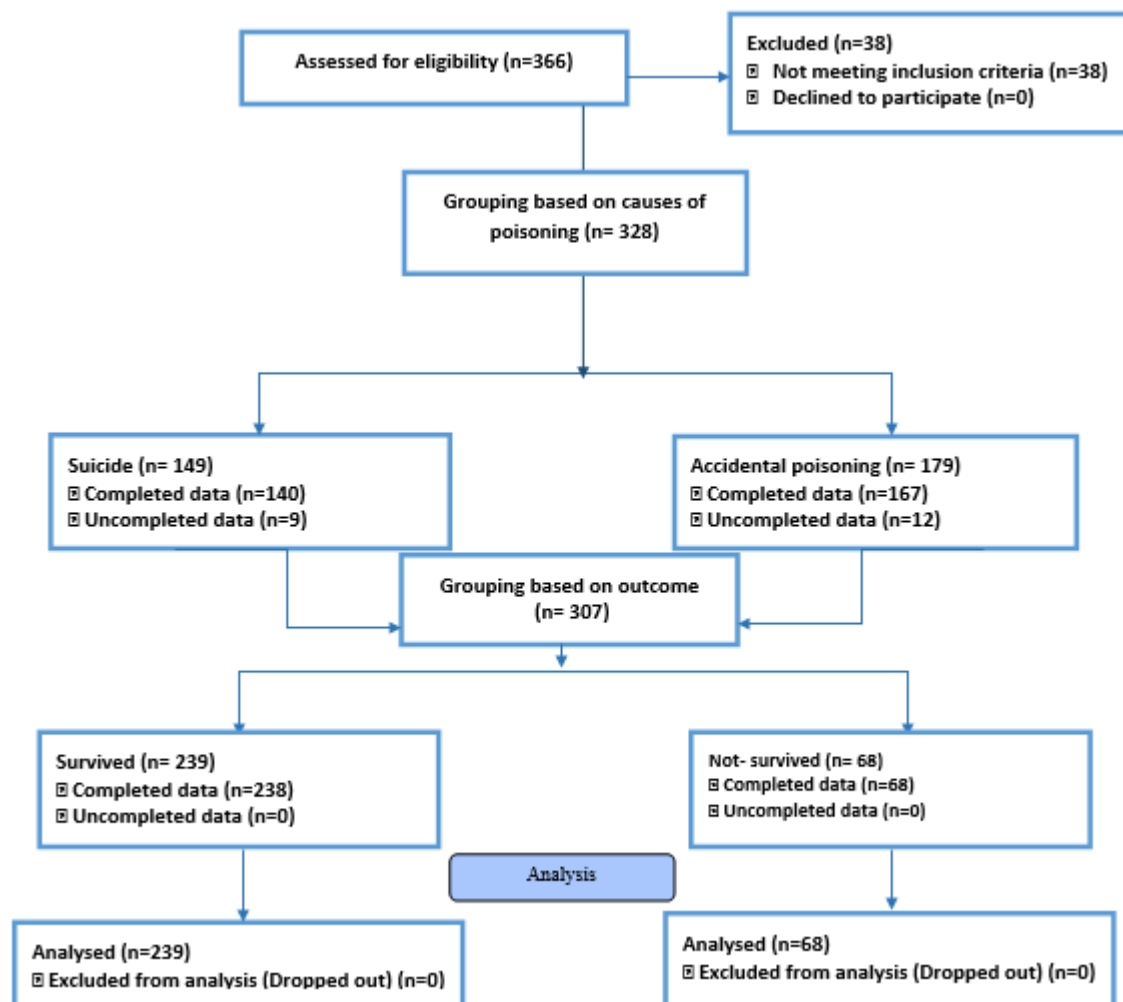


Figure 1. Study flowchart

3. Results

In this study, patients with chemical poisoning were evaluated, including 217 males (70.69%) and 89 females (29.31%). Regarding the frequency of specific toxic agents, methadone was the most common (46.8%), followed by opium (5.9%), organophosphates (5.9%), methanol (4.2%), and other chemical compounds (2.4%) (Figure 2).

When toxic agents were grouped, opioids were the most frequent cause of

poisoning (60.6%), followed by pesticides (8.5%) (Figure 3). The majority of patients (70%) were exposed to a single toxic substance. In terms of the cause of poisoning, 167 patients (54.4%) had accidental or substance abuse-related poisonings, while 140 patients (45.6%) were identified as intentional (suicidal) cases.

Of the total patients, 239 patients (77.9%) survived, while the remaining 68 (22.1%) died during hospitalization. The duration of ICU hospitalization in the two

groups (suicidal intentions groups and accidental poisoning) was 3.3571 ± 1.21 and 4.6047 ± 1.30 days, respectively ($P < 0.001$).

The mean age of patients in suicidal intentions and accidental poisoning groups were 35.67 ± 18.45 and 40.44 ± 18.91 years old, respectively ($P < 0.01$). Suicidal intent was also significantly higher among females (66.3%) than males (37.3%) ($P = 0.001$). Analysis of toxic agent types revealed that patients poisoned with opium had the lowest rate of suicidal intent (16.7%), while those exposed to other chemical

compounds had the highest rate (68.18%) ($P = 0.001$). When grouped, patients poisoned with pesticides had the highest rate of suicidal intent (80.8%), whereas those poisoned by opioids had the lowest (30.1%) ($P = 0.001$) (Table 1).

Table 2 shows sample features based on the outcomes.

A significant difference was found between the two groups (survived and non-survived groups) in terms of the type of toxic agent, toxicant group, or ICU length of stay ($P < 0.05$).

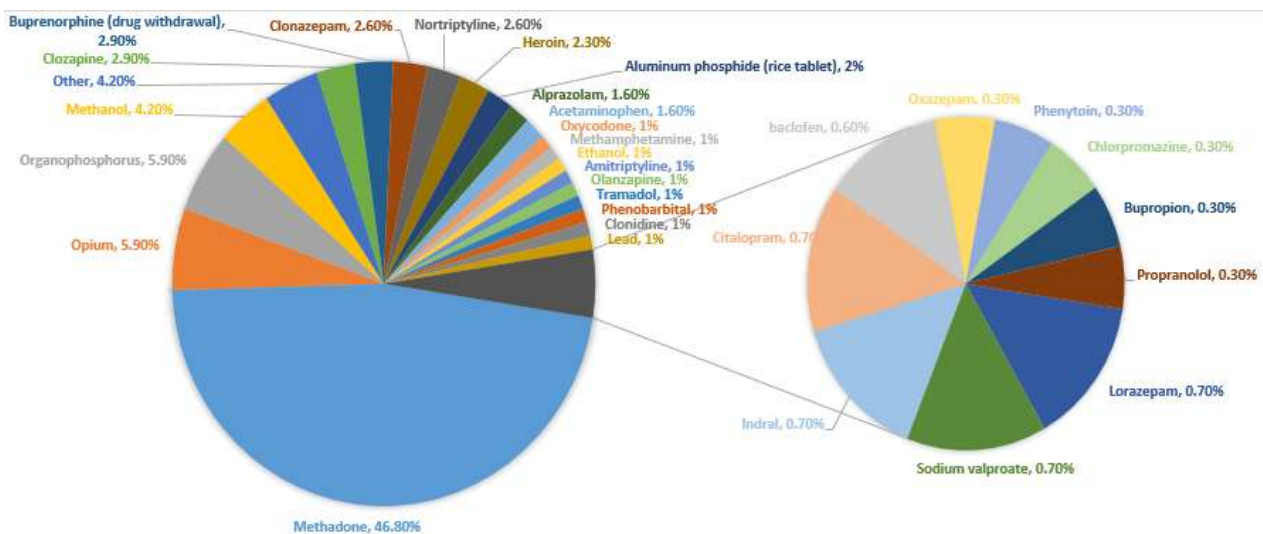


Figure 2. Frequency of toxification types in patients with a diagnosis of the poisoning of the chemical compound

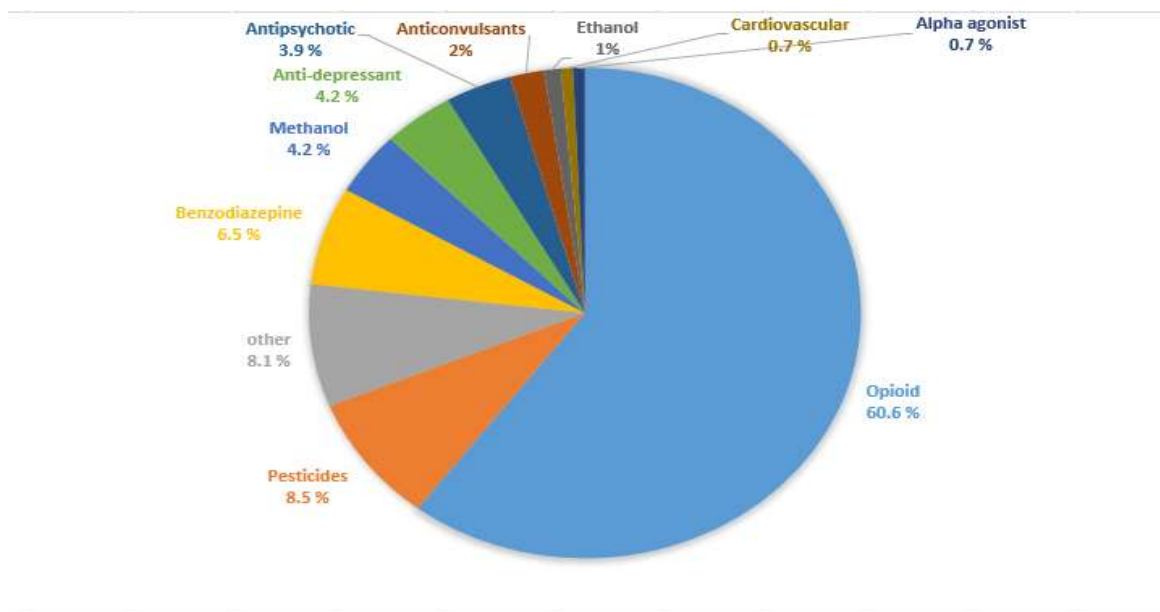


Figure 3. Frequency of groups of toxification in patients with a diagnosis of poisoning of the chemical compound

Table 1. Sample features based on the causes of poisoning

Cause Variables		Suicidal intentions N(%)	Accidental poisoning N(%)	p-value
Age group	Age (year)	35.67±18.45	40.44±18.91	0.000
	Less than 18 years old (n=60)	18 (30 %)	42 (70 %)	
	More than 18 years old (n=246)	121 (49.2 %)	125 (50.8 %)	
Sex	Male (n=217)	81 (37.3 %)	136 (62.7 %)	0.001
	Female (n=89)	59 (66.3 %)	30 (33.7 %)	
Toxification types	Methadone (n=144)	44 (30.5 %)	100 (69.5 %)	0.000
	Opium (n=18)	3 (16.7 %)	15 (83.3 %)	
	Methanol (n=13)	3 (23.1 %)	10 (76.9 %)	
	Other (n=132)	90 (68.18 %)	42 (31.8 %)	
Toxification types grouping	Opioid (n=186)	56 (30.1 %)	130 (69.9 %)	0.021
	Pesticides (n=26)	21 (80.8 %)	5 (19.2 %)	
	Other (n=95)	63 (66.3 %)	32 (33.68 %)	
ICU hospitalization duration (day)		3.3571±1.21	4.6047±1.30	0.000

Table 2. Sample features based on the outcomes

Cause Variables		Survived N(%)	Not- survived N(%)	p-value
Age group	Age (year)	37.5504±18.97	40.75±18.48	0.000
	Less than 18 years (n=60)	53 (83.33%)	7 (11.66%)	
	More than 18 years (n=246)	186 (77.83)	60 (22.17%)	
Sex	Male (n=217)	162 (65.86 %)	55 (34.14 %)	0.000
	Female (n=89)	76 (85.4 %)	13 (14.6 %)	
Toxification types	Methadone (n=144)	114 (79.1 %)	30 (20.9 %)	0.001
	Opium (n=18)	12 (66.7 %)	6 (33.3 %)	
	Methanol (n=13)	9 (69.2 %)	4 (30.8 %)	
	Other (n=132)	104 (78.8 %)	28 (21.2 %)	
Toxification types grouping	Opioid (n=186)	147 (79 %)	39 (21 %)	0.000
	Pesticides (n=26)	17 (65.4 %)	9 (34.6 %)	
	Other (n=95)	75 (78.9 %)	20 (21 %)	
ICU hospitalization duration (day)		4.0209±1.31	4.0579±1.43	0.000

4. Discussion

In this study, we reported the toxification types, characteristics, and outcomes of patients admitted to the ICU who required endotracheal intubation due to poisoning. Our findings revealed that most patients were in their fourth decade of life and predominantly male. Dadpour et al. conducted a study investigating methadone poisoning and observed that 65% of patients were male (26). The findings of this study were consistent with our study. Masoumi et al. found that 54.7% of poisoned patients were female, with a mean age of 26.5 years (27). Although the prevalence of poisoning varies across regions and cultures, no consistent gender predominance has been observed.

Additionally, we found that nearly half of the patients (45.6%) had suicidal intentions, which were significantly associated with younger age, female gender, and pesticide poisoning. Bakhsha et al., in a study

conducted in Golestan province, also reported that suicidal intention was linked to younger age and female gender, consistent with our findings (28).

In the present study, opioids were the most common category of toxic agents, with methadone being the most frequently involved. Notably, 69.5% of methadone poisonings were accidental. In Iran, methadone syrup—commonly prescribed for opioid addiction treatment—is often stored in household water bottles, leading to frequent accidental poisonings, especially among children. Moreover, methadone has increasingly become a common agent in suicide attempts. Thus, methadone poisoning is rising both in individuals attempting to quit opioids and those exposed unintentionally, accompanied by an increase in related complications and fatalities (15, 29). Other studies have also identified opioid intoxication as a leading cause of mortality in various parts of Iran. Farzaneh et al. (30) in Ardabil (northwest Iran), Afzali (31) in

Hamadan (west Iran), and Ayatollahi et al. (32) in Yazd (central Iran) all reported opioids as the most common xenobiotic causing acute poisoning. Nafei et al. (33) also reported opioids as the leading cause of acute toxicity, a trend linked to sociocultural factors and the proximity to Afghanistan, a major producer of opium.

Among the various types of toxification, pesticides were the second most frequent cause of poisoning in our study. Similar findings were reported by Kudo et al. in Japan, where pesticides were identified as the second most common cause of poisoning (n = 60) (34). Shayesteh et al. also reported that aluminum phosphide poisoning was common among ICU patients and was associated with an extremely high mortality rate (35).

The overall mortality rate observed in our study was 22.14%, with higher death rates notably associated with older patients and males. This finding aligns closely with the results of Mehrpour et al. (36), who reported a mortality rate of 19.5% among ICU poisoning patients. However, Roya et al. evaluated the mortality and long-term survival of patients with acute intoxication in the ICU and observed that this mortality in the ICU was 1.2%, and the in-hospital mortality was 2.1% (37). This substantial difference in outcome likely reflects variations in healthcare infrastructure, access to early medical intervention, and the overall severity of cases admitted to intensive care units.

One important factor contributing to the higher mortality in our study is that it was performed at a provincial poisoning referral center. Such centers typically receive patients with more severe or complicated poisonings who are referred from smaller or less specialized hospitals. Consequently, the patient population tends to have more critical presentations, which naturally leads to higher mortality rates. Additionally, differences in the types of toxins

encountered, availability of antidotes, supportive care facilities, and timely access to specialized treatment could further influence these outcomes.

This disparity highlights the need for enhanced preventive strategies, early recognition, and prompt management of poisoning cases, particularly in regions with high-risk populations. It also emphasizes the importance of strengthening healthcare resources and protocols at primary and secondary care levels to alleviate the burden on referral centers and enhance overall survival rates.

5. Conclusion

Our results indicate that opioids, especially methadone, were the most frequent cause of poisoning in our study. Pesticide poisoning occurred significantly more often in patients with suicidal intent. Additionally, patient outcomes were significantly influenced by age, gender, type and grouping of toxic agents, and duration of ICU hospitalization.

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