Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Clinical Outcomes and Mortality-Associated Factors in Opioid-Poisoned Patients Treated with Naloxone: A Cross-Sectional Study

Saeid Ghobadi
Islamic Azad University Ardabil
Ghasem Abotalebi dariasari
Islamic Azad University Ardabil
Atabak Sedigh-Namin
Ardabil University of Medical Sciences
Jafar Ghobadi Samian
Jafarghobadisamian58@gmail.com

Ardabil University of Medical Sciences

Research Article

Keywords: Opioid, Naloxone, Overdose, Mortality, Complications, Emergency Department

Posted Date: November 23rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11659347/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

Opioid poisoning is a major cause of emergency department (ED) visits, often leading to respiratory depression, impaired consciousness, and mortality. Naloxone is the primary antidote; however, post-treatment clinical outcomes vary based on patient and clinical factors. This study aimed to determine the prevalence of mortality and complications following naloxone administration and to identify associated factors in patients with opioid poisoning.

Methods

This descriptive-analytical cross-sectional study was conducted on 150 patients with opioid poisoning who presented to hospitals affiliated with Ardabil University of Medical Sciences in 2025 and received naloxone. Data on demographics, underlying diseases, type of opioid, initial respiratory status, Glasgow Coma Scale (GCS), naloxone dose, need for intubation, ICU admission, length of stay (LOS), and complications were extracted from medical records. Statistical analysis was performed using SPSS version 26, with a significance level of $P < 0.05$.

Results

The mean age was 41.51 ± 17.91 years, and 74.67% were male. Methadone (45.33%) and opium (20.67%) were the most common substances. Before naloxone administration, 46% had respiratory depression and 11.33% had apnea. Overall, 14.67% required intubation, 12% required ICU admission, and the mortality rate was 2%. Aspiration pneumonia was the most common complication (6.67%), and 18% experienced at least one complication. Older age, presence of underlying disease, poorer initial respiratory status, and lower GCS were significantly associated with ICU admission and intubation ($P < 0.001$). Patients with underlying diseases and those who developed complications had significantly longer hospital stays ($P < 0.001$ and $P = 0.01$, respectively). Naloxone dose was not significantly associated with the need for ICU admission or intubation.

Conclusion

Although mortality was low, respiratory complications, aspiration pneumonia, and agitation were notable. Older age, underlying comorbidities, respiratory distress, and decreased consciousness were predictors of unfavorable clinical outcomes. These findings can guide risk stratification and monitoring strategies in opioid-poisoned patients.

Introduction

Opioid misuse and overdose represent a significant global public health challenge, contributing to substantial morbidity, mortality, and healthcare costs [1, 2]. The opioid crisis has imposed a massive economic burden, estimated at over $1 trillion in the United States alone between 2001 and 2017 [2]. According to the World Health Organization, approximately 296 million people used drugs globally in 2021, with 60 million using opioids. Opioid overdose accounted for nearly 80% of the 600,000 drug-related deaths in 2019 [3–5]. The pathophysiological mechanism of opioid toxicity primarily involves the activation of mu-opioid receptors in the brainstem, leading to central nervous system and respiratory depression, hypoxia, hypercapnia, and subsequent reduced consciousness [4, 5]. This respiratory depression is the primary cause of death in severe opioid poisonings. Furthermore, individuals with opioid use disorders face a significantly higher risk of all-cause and overdose-related mortality compared to the general population [6].

Naloxone, a pure opioid receptor antagonist developed in the 1960s, is the first-line treatment for reversing opioid-induced respiratory depression [7, 9]. It effectively antagonizes the effects of opioids, including respiratory depression, decreased consciousness, miosis, and constipation. However, the clinical response to naloxone is not uniform, and some patients may experience adverse outcomes [8]. The most common side effects are related to acute withdrawal syndrome, characterized by agitation, anxiety, aggression, nausea, vomiting, diarrhea, abdominal pain, and rhinorrhea [10–12]. Rare but severe complications include non-cardiogenic pulmonary edema, seizures, and cardiac arrhythmias [13, 14]. These complications usually occur shortly after naloxone administration and can lead to the need for mechanical ventilation, ICU admission, and even death.

While the efficacy of naloxone in reversing respiratory depression is well-documented [12], the prevalence of post-treatment complications and mortality varies widely across different populations and healthcare settings. Most existing evidence originates from Western countries, where the illicit opioid supply is dominated by fentanyl and heroin [13, 14]. In contrast, in Iran, prescription opioids such as methadone and opium are more prevalent, which may alter the clinical presentation and outcomes [15]. Furthermore, limited studies have simultaneously evaluated mortality, clinical complications, and their associated factors following naloxone treatment in the Iranian context. To the best of our knowledge, no study has specifically investigated the mortality and post-naloxone complications in patients presenting to medical centers in Ardabil province.

Therefore, this study aimed to determine the prevalence of mortality and post-naloxone complications and to identify the associated demographic and clinical factors in patients with opioid poisoning presenting to hospitals in Ardabil, Iran. Identifying high-risk patients can improve clinical decision-making and the quality of care for opioid-poisoned patients.

Materials and Methods

Study Design and Population

This descriptive-analytical cross-sectional study was conducted on all patients diagnosed with opioid poisoning who presented to the Emergency Department of Imam Khomeini Hospital, Ardabil, Iran, between March 2025 and March 2026. The study population was selected using a convenience sampling method.

Inclusion criteria were: (1) documented diagnosis of opioid poisoning in the medical record, and (2) receipt of naloxone. Exclusion criteria were: (1) no naloxone administration despite the diagnosis, (2) concurrent non-opioid poisoning that confounded the diagnosis, (3) incomplete key data (consciousness level, respiratory status, or naloxone dose), and (4) patients with cardiac arrest upon arrival.

The sample size was calculated using the Cochrane formula for cross-sectional studies (n=Z2pq/d2*n*=*Z*2*pq*/*d*2). Assuming a 95% confidence level (Z = 1.96*Z* = 1.96), an expected proportion of p = 0.5*p* = 0.5 (due to the lack of reliable prior estimates), and a margin of error of d = 0.08*d* = 0.08, the required sample size was estimated at 150 patients.

Data Collection and Operational Definitions

Data were extracted from patients' medical records using a standardized researcher-developed checklist. The checklist included:

- **Demographics**: Age, sex, and presence of underlying diseases.
- **Poisoning Characteristics**: Type of opioid consumed (based on patient history, family report, or physician diagnosis).
- **Initial Clinical Status**: Respiratory status before naloxone (normal, respiratory depression, or apnea) and initial Glasgow Coma Scale (GCS) score (ranging from 3 to 15).
- **Treatment and Outcomes**: Initial cumulative naloxone dose administered in the emergency department, need for endotracheal intubation, ICU admission, length of hospital stay (LOS), and ICU LOS.
- **Complications**: Occurrence of pulmonary edema, aspiration pneumonia, seizures, cardiac arrhythmias, agitation, and allergic reactions post-naloxone administration.

Operational Definitions: Complications were defined based on documented clinical and paraclinical findings. **Aspiration pneumonia** was defined as the presence of new pulmonary infiltrates on chest radiography, accompanied by clinical signs of aspiration (e.g., witnessed vomiting or dysphagia) and at least two of the following: fever, leukocytosis, or purulent sputum. **Pulmonary edema** was diagnosed based on the presence of bilateral alveolar opacities on chest imaging and clinical signs of respiratory distress (e.g., crackles, hypoxemia) without evidence of volume overload. **Seizures** and **cardiac arrhythmias** were confirmed by documented physician notes and electrocardiographic findings, respectively.

Ethical Considerations

The study was approved by the Ethics Committee of Ardabil University of Medical Sciences (Ethics Code: IR.IAU.ARDABIL.REC.1405.233). Patient confidentiality was maintained, and data were analyzed anonymously.

Statistical Analysis

Data were analyzed using SPSS software version 26. The normality of quantitative variables was assessed using the Kolmogorov-Smirnov test. Normally distributed quantitative data were reported as mean ± standard deviation (SD), while non-normally distributed data were reported as median and interquartile range (IQR). Qualitative data were presented as frequencies and percentages.

Comparisons between groups were performed using the independent t-test for normally distributed variables, the Mann-Whitney U test for non-normally distributed variables, and the Chi-square test for categorical variables. The Kruskal-Wallis test was used to compare non-normally distributed variables across more than two groups. Spearman's rank correlation coefficient was used to assess the relationship between quantitative variables. A P-value of < 0.05 was considered statistically significant.

Results

A total of 150 patients were included in the study. The mean age was 41.51 ± 17.91 years (range: 14–88 years). The majority of patients were male (74.67%, n = 112), while 25.33% (n = 38) were female. Underlying diseases were present in 34% (n = 51) of patients.

Regarding the type of substance, methadone was the most commonly consumed opioid (45.33%, n = 68), followed by opium (20.67%, n = 31), tramadol (17.33%, n = 26), buprenorphine (6.67%, n = 10), heroin (6.00%, n = 9), and concurrent use of multiple opioids (4.00%, n = 6).

Before naloxone administration, 42.67% (n = 64) of patients had normal respiratory status, 46.00% (n = 69) had respiratory depression, and 11.33% (n = 17) presented with apnea. The mean initial GCS was 14.07 ± 1.20 (range: 11–15). The median naloxone dose administered was 0.8 mg (IQR: 0.4–0.8 mg).

Table 1 summarizes the demographic and baseline clinical characteristics of the study population.

Table 1
Demographic and baseline clinical characteristics of patients with opioid poisoning (N = 150)

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	112	74.67
	Female	38	25.33
Underlying Disease	Yes	51	34.00
	No	99	66.00
Type of Opioid	Methadone	68	45.33
	Opium	31	20.67
	Tramadol	26	17.33
	Buprenorphine	10	6.67
	Heroin	9	6.00
	Multiple	6	4.00
Initial Respiratory Status	Normal	64	42.67
	Respiratory Depression	69	46.00
	Apnea	17	11.33

Following naloxone administration, 14.67% (n = 22) of patients required endotracheal intubation, and 12.00% (n = 18) were admitted to the ICU. The overall in-hospital mortality rate was 2.00% (n = 3).

At least one post-treatment complication was observed in 18% (n = 27) of patients. Aspiration pneumonia was the most frequent complication (6.67%, n = 10), followed by agitation (4.00%, n = 6), allergic reactions (2.67%, n = 4), pulmonary edema (2.00%, n = 3), cardiac arrhythmias (1.33%, n = 2), and seizures (0.67%, n = 1). Table 2 details the post-treatment clinical outcomes.

Table 2
Post-naloxone clinical outcomes and complications (N = 150)

Outcome/Complication	Frequency (n)	Percentage (%)
Intubation Required	22	14.67
ICU Admission	18	12.00
In-hospital Mortality	3	2.00
At least one complication	27	18.00
Aspiration Pneumonia	10	6.67
Agitation	6	4.00
Allergic Reaction	4	2.67
Pulmonary Edema	3	2.00
Cardiac Arrhythmia	2	1.33
Seizure	1	0.67

Univariate analysis revealed significant associations between clinical factors and adverse outcomes. Patients admitted to the ICU were significantly older (60.44 ± 24.57 vs. 38.93 ± 15.19 years; P < 0.001) and had lower initial GCS scores (13.22 ± 1.15 vs. 14.18 ± 1.16; P < 0.001). Furthermore, the presence of underlying diseases (P < 0.001) and initial respiratory depression/apnea (P < 0.001) were significantly associated with ICU admission. Type of substance also showed a significant association with ICU admission (P = 0.03), with opium users having the highest rate (29.03%).

Similarly, patients requiring intubation were significantly older (58.46 ± 23.39 vs. 38.60 ± 15.09 years; P < 0.001) and had lower GCS scores (13.00 ± 1.16 vs. 14.26 ± 1.11; P < 0.001). The need for intubation was significantly associated with underlying diseases (P < 0.001) and poorer initial respiratory status (P < 0.001). The association between the type of substance and intubation was at the borderline of significance (P = 0.05).

Interestingly, the median dose of naloxone was not significantly different between patients who required intubation or ICU admission and those who did not (P = 0.07 and P = 0.56, respectively). Table 3a and 3b present the comparison of key quantitative variables based on clinical outcomes.

Table 3
a. Comparison of variables based on ICU admission

Variable	ICU Admission (Mean ± SD / Median [IQR])	No ICU Admission	P-value
Age (years)	60.44 ± 24.57	38.93 ± 15.19	< 0.001
GCS	13.22 ± 1.15	14.18 ± 1.16	< 0.001
Naloxone Dose (mg)	0.8 [0.4–0.9]	0.8 [0.4–0.8]	0.56

Table 3
b. Comparison of variables based on need for intubation

Variable	Intubation (Mean ± SD / Median [IQR])	No Intubation	P-value
Age (years)	58.46 ± 23.39	38.60 ± 15.09	< 0.001
GCS	13.00 ± 1.16	14.26 ± 1.11	< 0.001
Naloxone Dose (mg)	0.8 [0.4–0.8]	0.8 [0.4-2.0]	0.07

The association between clinical variables and the need for ICU admission or intubation is summarized in Table 4.

Table 4
Association between clinical variables and ICU admission / Intubation (Univariate Analysis)

Variable	ICU Admission (n = 18)	No ICU Admission (n = 132)	OR (95% CI)	P-value	Intubation (n = 22)	No Intubation (n = 128)	OR (95% CI)	P-value
Underlying Disease			**4.76** (1.65–13.7)	< 0.001			**3.75** (1.44–9.77)	< 0.001
Yes	12 (23.5%)	39 (76.5%)			14 (27.4%)	37 (72.5%)		
No	6 (6.1%)	93 (93.9%)			8 (8.1%)	91 (91.9%)		
Sex			0.90 (0.30–2.70)	0.80			0.85 (0.28–2.58)	0.76
Male	13 (11.6%)	99 (88.4%)			17 (15.2%)	95 (84.8%)		
Female	5 (13.2%)	33 (86.8%)			5 (13.2%)	33 (86.8%)		

Patients who developed at least one complication were significantly older (51.71 ± 21.17 vs. 39.27 ± 16.38 years; P < 0.001) and were more likely to have underlying diseases (P < 0.001).

The median length of hospital stay was significantly longer in patients with underlying diseases (P = 0.01), those admitted to the ICU (P < 0.001), those requiring intubation (P < 0.001), and those who developed complications (P = 0.01). The initial respiratory status was also significantly associated with LOS (P = 0.01).

Spearman's correlation analysis revealed a weak positive correlation between age and LOS (r = 0.20, P = 0.01), and a weak negative correlation between GCS and LOS (r = -0.31, P < 0.001). A weak positive correlation was also found between the naloxone dose and LOS (r = 0.17, P = 0.04).

Discussion

This study aimed to evaluate the clinical outcomes and mortality-associated factors in patients with opioid poisoning treated with naloxone. Our findings demonstrated that the in-hospital mortality rate was relatively low (2%). However, a notable proportion of patients experienced complications (18%), with aspiration pneumonia being the most frequent. Furthermore, older age, presence of underlying diseases, poorer initial respiratory status, and lower GCS scores were significant predictors of ICU admission, intubation, and prolonged hospital stay.

The demographic profile of our study—predominantly male (74.67%) with a mean age of 41.51 years—is consistent with previous studies conducted in Iran [15]. A recent study in northern Iran also reported a male predominance and a mean age of 34.3 years [15]. The pattern of substance use in our study (methadone and opium being the most common) differs from Western countries, where fentanyl and heroin are the primary drivers of overdose [13, 14]. This difference reflects the distinct availability and prescribing patterns of opioids in the Iranian context [14].

Our finding that initial respiratory status and GCS are strongly associated with the need for advanced airway management and ICU admission is in line with prior literature. Studies have shown that respiratory depression and a decreased level of consciousness are the strongest predictors of severe outcomes in opioid poisoning [16, 17]. Physiologically, older age is associated with a reduced physiological reserve, a higher prevalence of undiagnosed comorbidities (e.g., chronic obstructive pulmonary disease or heart failure), and altered drug metabolism, all of which can exacerbate opioid-induced respiratory depression and delay recovery [25, 26]. An Australian study on 800 overdose patients also found that ICU-admitted patients had significantly higher ages and lower GCS scores [18].

Interestingly, while a GCS ≤ 8 has historically been a classic threshold for intubation, recent evidence suggests that a conservative approach to airway management may be safe in opioid overdose patients [19, 20]. Our study showed that patients requiring intubation had a mean GCS of 13.0, supporting the notion that intubation decisions should be individualized based on the overall clinical picture rather than a single GCS cutoff.

The dose of naloxone was not significantly associated with the need for intubation or ICU admission in our study. This aligns with the understanding that the required naloxone dose varies based on the potency of the opioid and the patient's clinical response [21, 22]. Therefore, titrating naloxone to restore adequate ventilation, rather than targeting a fixed dose, remains the most logical approach [23].

The complication rate in our study was 18%, with aspiration pneumonia being the most common [24]. The mechanism of naloxone-induced pulmonary edema is hypothesized to involve a sudden surge in catecholamines and sympathetic nervous system activity upon reversal of opioid-induced coma, leading to increased pulmonary capillary permeability and negative intrathoracic pressure from the patient's vigorous respiratory efforts [10, 11]. Furthermore, our finding that older age and underlying diseases were significantly associated with the development of complications highlights the vulnerability of these patient populations. Similar to our results, previous studies have identified age and comorbidities as risk factors for adverse outcomes in opioid poisoning [25, 26].

Strengths of the Study

This study has several strengths. First, to the best of our knowledge, this is one of the first studies in the Ardabil region to simultaneously evaluate mortality, clinical complications, and associated factors following naloxone administration. Second, we used a standardized data extraction checklist to minimize information bias. Third, the sample size (150 patients) is relatively robust for a single-center study, providing adequate statistical power for the primary outcomes.

Limitations

This study has several limitations. First, its retrospective nature and reliance on medical records may have introduced information bias due to missing or inaccurate data. Second, as a single-center study, the findings may not be generalizable to other regions with different opioid use patterns. Third, the relatively small number of mortality cases (n = 3) limited our ability to perform robust statistical analysis on mortality-associated factors. Finally, we did not assess co-ingestion of other substances, such as benzodiazepines or alcohol, which are known to exacerbate opioid toxicity.

Conclusion

The findings of this study indicate that while mortality in opioid-poisoned patients treated with naloxone is low, post-treatment complications—particularly aspiration pneumonia—are common. Older age, underlying comorbidities, respiratory distress, and decreased consciousness are significant predictors of unfavorable clinical outcomes. These results underscore the importance of comprehensive initial assessment and risk stratification in the emergency department. Patients with these risk factors may require closer monitoring and a lower threshold for ICU admission, regardless of the initial response to naloxone. Future multicenter prospective studies with larger sample sizes are recommended to validate these findings.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Ethics Committee of Ardabil University of Medical Sciences (Ethics Code: IR.IAU.ARDABIL.REC.1405.233). All methods were performed in accordance with the relevant guidelines and regulations, including the Declaration of Helsinki. The Ethics Committee waived the requirement for informed consent due to the retrospective nature of the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to patient confidentiality and institutional data protection policies but are available from the corresponding author on

reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

The authors received no specific funding for this work.

Authors' contributions

SG contributed to the study design, data collection, and drafting of the manuscript. GAD contributed to the study design and critical revision of the manuscript. ASN contributed to data collection and analysis. JGS contributed to the study conception, supervision, and final approval of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

Not applicable.

Clinical trial number

Not applicable.

References

1. British SC, Walsh SL. Treatment of opioid overdose: current approaches and recent advances. Psychopharmacology. 2022;239(7):2063–81.
2. Rhyan CN. The potential societal benefit of eliminating opioid overdoses, deaths, and substance use disorders exceeds $95 billion per year. Altarum; 2017.
3. Martins SS, Sampson L, Cerda M, Galea S. Worldwide Prevalence and Trends in Unintentional Drug Overdose: A Systematic Review of the Literature. Am J Public Health. 2015;105(11):e29–49.
4. Schiller EY, Goyal A, Mechanic OJ. Opioid overdose. 2017.
5. Wheeler E, Jones TS, Gilbert MK, Davidson PJ. Opioid overdose prevention programs providing naloxone to laypersons—United States, 2014. MMWR Morb Mortal Wkly Rep. 2015;64(23):631–5.
6. Bahji A, Cheng B, Gray S, Stuart H. Mortality Among People With Opioid Use Disorder: A Systematic Review and Meta-analysis. J Addict Med. 2020;14(4):e118–32.
7. Kolbe L, Fins JJ. The Birth of Naloxone: An Intellectual History of an Ambivalent Opioid. Camb Q Health Ethics. 2021;30(4):637–50.
8. Skolnick P. Treatment of overdose in the synthetic opioid era. Pharmacol Ther. 2022;233:108019.
9. Jordan MR, Patel P, Morrisonponce D, Naloxone. StatPearls [Internet]: StatPearls Publishing; 2024.
10. Hedberg K, Bui LT, Livingston C, Shields LM, Van Otterloo J. Integrating Public Health and Health Care Strategies to Address the Opioid Epidemic: The Oregon Health Authority's Opioid Initiative. J Public

Health Manag Pract. 2019;25(3):214–20.
11. Skolnick P. The Opioid Epidemic: Crisis and Solutions. Annu Rev Pharmacol Toxicol. 2018;58:143–59.
12. Meyers RS, Thackray J, Matson KL, McPherson C, Lubsch L, Hellinga RC, et al. Key Potentially Inappropriate Drugs in Pediatrics: The KIDs List. J Pediatr Pharmacol Ther. 2020;25(3):175–91.
13. Ghalayni R, Al Kalaji B, Malik K. From Friend to Foe: A Case of Naloxone-Induced Pulmonary Edema. Hosp Pharm. 2024;59(4):407–10.
14. Joseph M, Amin K, Siddens C, Jaime G, Seeger CM, Mercer K, et al. Pulmonary edema after naloxone administration for opioid reversal: a systematic review of case reports and causality assessment using the Naranjo scale. Clin Toxicol (Phila). 2024;62(5):334–42.
15. Ramezanzadeh H, Khosravi N, Hosseininejad SM, Mahmoodi M, Zakariaei Z, Sadeghi M. Epidemiological Aspects of Opioid Poisoning in Northern Iran: A Registry-Based Clinical Study. Health Serv Insights. 2024;17:11786329241232300.
16. Meshkini M, Hosseini SM, Erfan Talab Evini P, Rahimi M, Mostafazadeh B, Eini P, et al. Predicting the Risk of Opioid-induced Respiratory Depression Using ChatGPT-4o and Machine Learning Techniques. Arch Acad Emerg Med. 2025;13(1):e85.
17. McCabe DJ, Gibbs H, Pratt AA, Culbreth R, Sutphin AM, Abston S, et al. Risk of Delayed Intubation After Presumed Opioid Overdose in the Emergency Department. Ann Emerg Med. 2025;85(6):498–504.
18. Savage M, Kung R, Green C, Thia B, Perera D, Tiruvoipati R. Predictors of ICU admission and long-term outcomes in overdose presentations to emergency department. Australasian psychiatry. 2020;28(1):75–9.
19. Freund Y, Viglino D, Cachanado M, Cassard C, Montassier E, Douay B, et al. Effect of noninvasive airway management of comatose patients with acute poisoning: a randomized clinical trial. JAMA. 2023;330(23):2267–74.
20. Duncan R, Thakore S. Decreased Glasgow Coma Scale score does not mandate endotracheal intubation in the emergency department. J Emerg Med. 2009;37(4):451–5.
21. Merchant RC, Chapman B, Martinez PM, Krotulski A, Walton S, Carmen V-T, et al. Naloxone Administration in Relation to Fentanyl, Xylazine, CNS Depressants, and Stimulants Exposure After Suspected Opioid Overdose: A Pilot Study. Acad Emerg Med. 2026;33(4):e70280.
22. Yugar B, McManus K, Ramdin C, Nelson LS, Parris MA. Systematic Review of Naloxone Dosing and Adverse Events in the Emergency Department. J Emerg Med. 2023;65(3):e188–98.
23. Isoardi KZ, Harris K, Currey E, Buckley NA, Isbister GK. Effectiveness of intramuscular naloxone 1,600 µg in addition to titrated intravenous naloxone 100 µg for opioid poisoning: a randomised controlled trial. Clin Toxicol (Phila). 2024;62(10):643–50.
24. Isbister GK, Downes F, Sibbritt D, Dawson AH, Whyte IM. Aspiration pneumonitis in an overdose population: frequency, predictors, and outcomes. Crit Care Med. 2004;32(1):88–93.
25. Eizadi-Mood N, Abdi E, Feizi A, Meamar R. Sociodemographic and Toxicoclinical Characteristics of Patients with Opioid/Stimulant Poisoning. Addict Health. 2025;17:1565.
26. Nemati A, Etemad L, Dadpour B, Wong A, Gholami M, Mousavi SR, et al. Characteristics and risk factors of opioid poisoning in opioid-dependent individuals using their primary opioid of dependence: a registry-

based study. Int J Emerg Med. 2025;18(1):221.