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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2025;14(4):1019-24

Retrospective analysis of patients admitted to the emergency department due to poisoning: Types of poisoning and treatment outcomes by age groups

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Received 14 March 2025; Accepted 21 July 2025
Available online 27 November 2025 with doi: 10.5455/medscience.2025.03.081

Abstract

Poisoning is a critical emergency requiring rapid recognition and treatment. This study retrospectively examined poisoning cases in the emergency department, identifying types, management strategies, and patient outcomes across age groups to improve care, reduce complications, and lower mortality. This retrospective, observational study included 1,000 patients admitted to the emergency department of Esenyurt Necmi Kadıoğlu State Hospital due to poisoning from January 1, 2024, to June 30, 2024. The data were collected from the hospital's information management system and included demographic data, the cause of poisoning, the treatment given, and the clinical outcome. Statistical Package for the Social Sciences (SPSS) version 26.0 was used for the statistical analyses and chi-square tests, t-tests, Analysis of Variance (ANOVA), and multivariate regression analysis were used to determine the significant associations. The study included 1,000 patients with equal gender distribution. Medication, chemical, alcohol, and carbon monoxide (CO) were the main poisoning types. Gastric lavage (35.2%) and antidotes (25.4%) were common in medication poisoning, while CO cases most often required intensive care. Complications occurred in 20% of patients, highest in chemical and CO poisoning. Mortality was 5% in CO and intensive care cases. Older age and CO poisoning were linked to longer recovery times. This study shows that age specific strategies are required for poisoning management in emergency departments. The findings also show that there is a need for early intervention in cases that need intensive care and that there is a need for tailored treatment protocols to enhance patient outcomes. The study therefore recommends standardized poisoning management protocols and improved training of healthcare professionals to address suboptimal emergency care in poisoning cases.

Keywords: Poisoning, emergency department, age groups, treatment outcomes, complications, mortality

Introduction

The management of poisoning represents a medical emergency because this condition frequently requires emergency department admissions [1]. The management of poisoning cases in emergency medicine requires immediate detection and suitable therapeutic interventions because these actions determine patient results [2].

The World Health Organization reports that poisoning remains a worldwide problem which creates substantial healthcare system strain mainly in developing countries [3]. The human body can become toxic from contact with different substances including chemicals and medications and alcohol and carbon monoxide (CO) and various toxic agents [4]. The correct identification of poisoning cases along with immediate medical intervention helps decrease dangerous consequences and fatal results.

The classification of poisoning cases depends on their origin [5]. The most prevalent types of poisoning include medication poisoning which stems from overdoses and suicide attempts and misuse as well as chemical poisoning from household and industrial exposures and alcohol intoxication and gas poisoning primarily CO [6]. The emergency department receives most of its patients due to medication poisoning among all poisoning cases [7].

CITATION
Boga E. Retrospective Analysis of Patients Admitted to the Emergency Department Due to Poisoning: Types of Poisoning and Treatment Outcomes by Age Groups. Med Science. 2025;14(4):1019-24.

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DOI: 10.5455/medscience.2025.03.081

Research about poisoning types and treatment methods and patient outcomes across different age groups remains scarce despite its widespread occurrence [8]. The available data about vulnerable groups including children and elderly people remains insufficient [9].

This research examines the different poisoning types and treatment methods and clinical results of emergency department patients who experienced poisoning while analyzing age-related differences. The research evaluates existing treatment protocols to develop age-targeted prevention and management strategies [10].

Material and Methods

This study performed a retrospective observational evaluation at the Emergency Department of Esenyurt Necmi Kadıoğlu State Hospital in Istanbul, Türkiye. The research included patients who displayed suspected poisoning or received confirmed poisoning diagnosis during January 1, 2024 through June 30, 2024. Medical data and demographic records and clinical findings along with treatment protocols and outcomes were collected from the hospital information management system (HIMS).

The study required patients to meet three conditions to be included: patients had to be aged between 18 and 85 years and admitted to the emergency department for poisoning symptoms between January 1, 2024 and June 30, 2024 and have fully documented medical records. Both intentional (e.g., suicide attempts) and unintentional (e.g., accidental ingestion, occupational exposure) poisoning cases were included in the study.

The study selected patients who received their diagnosis and treatment and ended up either going home or staying in the hospital. The study evaluated cases that involved poisoning from medications and chemicals and alcohol and CO and various toxic substances.

The patient population was divided into four age groups: young adults (18–35 years), middle-aged adults (36–50 years), older adults (51–65 years) and elderly patients (66–85 years). The age-based classification system enabled researchers to compare poisoning types alongside treatment approaches and clinical results between different age groups.

The researchers excluded patients younger than 18 or older than 85 years and those with insufficient medical records and patients without completed diagnostic processes or follow-up and those transferred to different institutions or admitted for non-poisoning reasons.

A total of 1,000 patients were included in the study. The HIMS system served as the tool for collecting data. Each patient record included data regarding demographics and admission time along with poisoning reason and clinical signs and treatment strategy and recovery duration and complications and fatality statistics. All patient records were anonymized to maintain confidentiality. The researchers removed all records with missing or incorrect information from the study.

The data cleaning process focused on resolving missing or conflicting pieces of information. The data validation process included manual as well as automated procedures to verify the accuracy of the information. The data completeness was ensured by applying multiple imputation methods to handle missing information.

Data analysis was conducted with Statistical Package for the Social Sciences (SPSS) version 26. The analysis of categorical variables including gender and poisoning types displayed frequencies with corresponding percentages but continuous variables like age and hospitalization duration showed means alongside standard deviations. The comparison of age groups and poisoning types and treatment outcomes employed both Chi-square and independent t-tests. The research established statistical significance through a p-value below 0.05. Analysis of Variance (ANOVA) served as the statistical method to evaluate the effect of different treatment protocols on recovery time.

Multivariate regression analysis assessed how independent variables (age, gender, type of poisoning and treatment protocol) influenced clinical outcomes. The regression analysis helped researchers identify which factors increased the risk of complications and death. Research results showing statistical significance were properly interpreted.

Ethical Approval Statement

The research "Retrospective Evaluation of Management Protocols and Clinical Outcomes of Poisoning Cases Admitted to the Emergency Department by Age Groups" received approval from the Non-Interventional Clinical Research Ethics Committee at Istanbul Medipol University. The committee evaluated the application through assessment of scientific foundation and research goals along with methodology and ethical standards before making their approval.

The committee approved this research unanimously through their decision number 1079 dated November 7th 2024.

This study was approved by the Non-Interventional Clinical Research Ethics Committee at Istanbul Medipol University (Protocol No: 1079, Date: November 7, 2024).

Results

The research study included 1,000 patients in its participant group. The participants had equal gender distribution since each gender made up 50% of the total participants. The patients in this study ranged from 18 to 85 years old and were divided into four age categories as follows: 18–35 years (n = 256, 25.8%), 36–50 years (n = 222, 22.8%), 51–65 years (n = 198, 20.3%), and 66–85 years (n = 304, 31.2%) (Table 1). The gender distribution showed no statistically significant differences compared to the age group distribution (Chi-square test, $p > 0.05$). Every participant finished the study with complete data without any missing information.

DOI: 10.5455/medscience.2025.03.081

Table 1. Poisoning types by age group

Poisoning Type	18-35 Age Group (%)	36-50 Age Group (%)	51-65 Age Group (%)	66-85 Age Group (%)
Medication	30.5	28.7	25.1	21.8
Chemical	25.2	26.3	27.4	28.6
Alcohol	20.8	22.4	23.1	24.7
Carbon Monoxide	23.5	22.6	24.4	24.9

The results of the analysis did not show any significant difference between gender distribution of poisoning types (Chi-square = 5.92, p = 0.116). The Chi-square test results revealed no statistically significant connection between poisoning types and age group distribution (Chi-square = 6.98, p = 0.639).

Gastric lavage (35.2%) and antidote administration (25.4%) were the main treatment methods for patients with medication poisoning according to the evaluated treatment protocols. Gastric lavage (30.1%) and antidotes (31.8%) were among the commonly used treatments for chemical poisoning cases. The majority of alcohol poisoning patients received supportive therapy as their primary treatment approach (45.7%). The requirement for intensive care was higher in CO poisoning cases compared to other types of poisoning (Table 2, Figure 1).

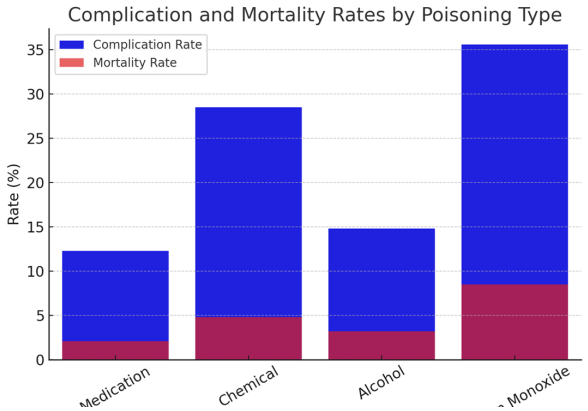

Figure 1. Distribution of complication and mortality rates according to different types of poisoning.

Table 2. Complication and mortality rates by poisoning type

Poisoning Type	Complication Rate (%)	Mortality Rate (%)
Medication	12.3	2.1
Chemical	28.5	4.8
Alcohol	14.8	3.2
Carbon Monoxide	35.6	8.5

The frequency of complications reached 20% and these complications occurred more often in chemical and CO poisonings. The patients who needed intensive care experienced more complications than other patients. Most deaths occurred among patients with CO poisoning and patients who required intensive care treatment. The mortality rate reached 5% while most deaths occurred in cases of CO poisoning and among patients who needed intensive care.

The duration of recovery depended on the age of patients. The recovery duration for patients in the 18–35 age group averaged 6.5 days while the 66–85 age group required 9.0 days for recovery. The duration of recovery differed between CO poisoning which took the longest at 9.3 days and medication poisoning which required the shortest recovery time at 6.8 days. Patients undergoing intensive care needed more time for recovery (mean = 10.1 days) compared to patients receiving supportive care who recovered in 6.9 days on average (Table 3, Figure 2).

Table 3. Recovery time by age group and treatment protocol

Category	Average Recovery Time (Days)	Supportive Treatment (Days)	ICU Treatment (Days)
18-35 Age Group	6.5	6.2	8.0
36-50 Age Group	7.4	7.0	9.2
51-65 Age Group	8.2	7.8	10.1
66-85 Age Group	9.0	8.6	11.4

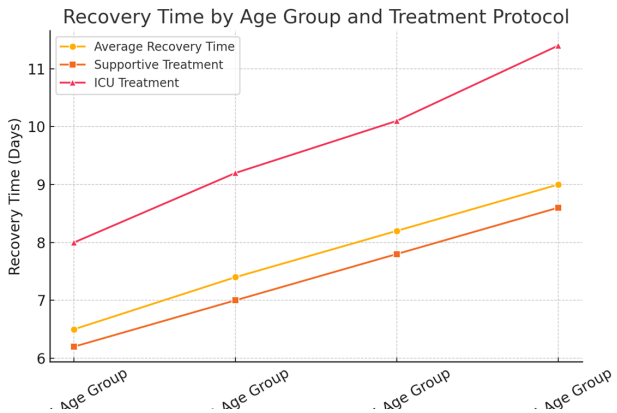

Figure 2. Average recovery time by age groups and treatment type (supportive care vs. ICU).

The ANOVA results showed that the chosen treatment protocols significantly affected recovery duration (F = 12.45, p = 0.001). Intensive care resulted in extended recovery times as compared to supportive treatment.

The multivariate regression analysis demonstrated that gender failed to show any meaningful relationship with recovery time duration (p = 0.123). The analysis revealed significant associations between recovery duration and both poisoning type (p < 0.001) and age group (p < 0.001). Recovery duration became longer when patients experienced CO poisoning and when they belonged to older age groups.

DOI: 10.5455/medscience.2025.03.081

These findings match existing literature by showing the requirement for protocols that match patient age when treating poisoning cases. The treatment strategies should take into account the increased risks associated with age due to higher complication and mortality rates among elderly patients. The study demonstrates how intensive care plays a vital role in treating severe cases especially CO poisoning.

Additional research needs to investigate how age together with comorbidities and poisoning types influence long-term outcomes. The evaluation of treatment success in larger patient groups across various healthcare facilities will enhance both the applicability and help doctors make better choices during patient care.

Several visualizations are recommended for better presentation of the study findings as follows:

1. A statistical table will present poisoning type frequencies according to patient age groups
2. A bar chart presents complication and mortality rates based on different poisoning types.
3. A line chart shows how recovery time changes based on age groups and treatment types.

The visual tools will help improve the interpretation and comprehension of study results.

Discussion

The main objective of this research was to evaluate the effectiveness of different management strategies based on the nature of poisoning and the age of the patient [11]. Among medication poisoning cases, gastric lavage and antidote administration were the most frequently applied methods, with an average hospital stay of 6.8 days and a low complication rate. In chemical poisoning cases, supportive therapy and intensive care were more frequently required, with a mean hospital stay of 8.5 days. Alcohol poisoning was predominantly treated with supportive care, with an average stay of 7.2 days. The highest complication and intensive care admission rates were observed in CO poisoning, where the recovery period averaged 9.3 days [12].

However, the interpretation that “CO poisoning slowed down recovery” lacks clinical specificity. It is unclear whether patients with CO poisoning received standardized treatment protocols, such as hyperbaric oxygen therapy, as recommended in national poisoning management guidelines. Clarifying whether such protocols were implemented would enhance the clinical relevance of the findings.

The study found that older patients tend to have longer recovery times and more complications. These findings are consistent with the literature. For example, previous studies have also highlighted gastric lavage and antidote use as standard treatment for acute medication poisoning [13,14]. The link between CO poisoning and elevated complication and mortality rates has been well documented [12,14].

Furthermore, our results support prior observations that the clinical management of poisoning varies between countries depending on the healthcare system structure, emergency department capabilities, and treatment protocols [15]. This highlights the necessity of conducting further multicenter studies to place our findings in a broader international context and ensure their generalizability.

These results suggest that tailoring treatment strategies according to age can improve outcomes. Specifically, while younger patients may benefit from rapid stabilization and discharge planning, older patients may require longer observation and more intensive interventions. This indicates a need for age-specific modifications to emergency care protocols [15].

In addition, standardizing treatment protocols in emergency departments and training healthcare personnel accordingly could improve the overall management of poisoning cases [16]. These measures should be supported by prospective studies evaluating the long-term efficacy of poisoning treatments and their implications for patient outcomes and healthcare policy [17].

This research highlights the effectiveness of current treatment approaches in various poisoning types and age groups. It also reveals the need to re-evaluate emergency department protocols, especially for high-risk patients requiring intensive care. Developing strategies for early identification and structured observation for these patients is essential.

Limitations

This study has several limitations. First, as a retrospective study, its accuracy is inherently limited by the completeness and reliability of hospital documentation. The data obtained from the HIMS may contain missing or inaccurate records, potentially affecting the results' validity [18]. Additionally, variations in clinical practice among healthcare providers could not be controlled and may have introduced bias. Future studies should adopt prospective designs for more robust data collection [5].

Moreover, although the regression model included variables such as age, gender, and type of poisoning, it did not account for comorbidities (e.g., cardiovascular disease, diabetes), which are particularly relevant in the elderly (66–85 age group). These unmeasured confounding factors may have influenced the observed outcomes. Future research should consider including such variables in the model.

Furthermore, the severity of poisoning at presentation (e.g., Glasgow Coma Scale, vital signs, initial blood gas results, or estimated toxic dose) was not systematically classified or included in the analysis. This lack of clinical severity adjustment may have confounded the association between poisoning type and clinical outcomes, such as Intensive Care Unit (ICU)

DOI: 10.5455/medscience.2025.03.081

admission. Future studies should incorporate variables reflecting initial poisoning severity to improve risk stratification.

Additionally, although the overall mortality rate was reported as 5%, it was not possible to determine whether deaths were directly attributable to poisoning or influenced by underlying comorbidities. This distinction could affect the interpretation of mortality outcomes and represents a limitation of the study.

Further research should explore the role of age and comorbidities in patient outcomes [19,20]. In particular, understanding the long-term consequences of poisoning complications in the elderly is critical [21]. Evaluating the durability of different treatment protocols across poisoning types would also provide valuable insights for clinical decision-making [22].

In conclusion, large-scale, prospective, and multicenter studies are required to confirm these findings and support the development of comprehensive, evidence-based clinical guidelines for poisoning management.

Conclusion

The research shows that both the poisoning type and patient age determine emergency department treatment results. The medical response to medication poisonings included gastric lavage and antidote therapy yet chemical poisonings required more intensive care. The management of alcohol poisoning consisted mainly of supportive care but CO poisoning resulted in the worst complications and death rates.

Age proved to be the main factor which determined how patients would recover. The recovery duration for younger patients was shorter than for older adults who spent more time in the hospital and developed more complications especially those between 66 and 85 years old. The research demonstrates the requirement for age-based treatment approaches and emergency protocols that focus on elderly patients.

The improvement of clinical practice requires emergency departments to develop better systems for detecting dangerous cases and creating personalized treatment plans. Standardizing CO poisoning treatment protocols and improving healthcare staff training will produce better results for patients.

The research findings demonstrate that public health needs to create age-based triage systems and unified strategies for poisoning treatment. Future multicenter and prospective studies need to analyze long-term results from different poisoning types while considering both comorbidities and exposure duration.

The study provides evidence for emergency care poisoning management systems that adapt to patient age to minimize preventable complications and deaths.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
This study was approved by the Non-Interventional Clinical Research Ethics Committee at Istanbul Medipol University (Protocol No: 1079, Date: November 7, 2024).

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