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Clinical severity and medico-legal evaluation in non-suicidal poisoning cases: A retrospective analysis of 2017 – 2024

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Abstract

This study aimed to evaluate the demographic, clinical, and medico-legal characteristics of non-suicidal, non-pharmaceutical poisoning cases assessed in a forensic medicine department. This retrospective cross-sectional study included 108 cases evaluated at a tertiary university hospital forensic medicine department between January 1, 2017 and December 31, 2024. Pharmaceutical exposures and cases with documented suicidal intent were excluded. Poisoning agents were classified as food-related, carbon monoxide (CO), alcohol, mushroom, and other agents. Outcomes were hospitalization, intensive care requirement, life-threatening condition, and injury not manageable by simple medical intervention (SMI), the latter two determined by forensic medicine specialists according to the national forensic guideline. Firth penalized logistic regression was used for multivariable analysis. Of the cases, 55.6% were male, and the mean age was 28.57 ± 18.94 years. The most common agents were food-related (33.3%), alcohol and other agents (21.3% each), and CO (13.0%). Hospitalization occurred in 19.4% of cases, intensive care in 4.6%, and a life-threatening condition with non-SMI status, in 17.6% of cases (19/19). No life-threatening outcome was observed in food-related poisonings, whereas CO- and alcohol-related poisonings showed significantly greater severity ($p < .001$). Respiratory distress was strongly associated with life-threatening condition (OR = 121.00; 95% CI: 13.80 – 1061.12) and hospitalization (OR = 21.00; 95% CI: 4.98 – 88.62). Consistent with the guideline's own carboxyhaemoglobin threshold for carbon monoxide poisoning (above 20%), all CO cases in our series with carboxyhaemoglobin at or above 25% were classified as life-threatening, against 12.5% below this cutoff ($p = .005$). CO exposure independently predicted life-threatening condition (aOR = 156.40; 95% CI: 1.40 – 17503.77; $p = .036$), although the interval width permits only a directional reading. Physiological severity indicators rather than exposure category alone should govern the forensic determination of life-threatening condition.

Keywords: Carbon monoxide poisoning, food poisoning, forensic medicine, life-threatening condition

Introduction

Poisonings constitute a major public health problem worldwide and in our country, representing one of the leading causes of morbidity and mortality and ranking among the most common causes of unnatural death following traffic accidents [1-3]. The epidemiological and clinical profile of toxic agent exposure varies considerably according to age, sex, geographical region, socioeconomic status, and cultural habits [1,4,5]. Although the literature emphasizes that a substantial proportion of poisoning cases presenting to emergency departments are associated with pharmacological agents and are frequently related to suicidal intent [6,7], poisonings caused by non-pharmaceutical agents such as carbon monoxide (CO), food products, alcohol, pesticides, corrosive substances, and mushrooms also constitute a considerable clinical burden in developing countries and specific regions of our country [5,8,9]. These exposures develop secondary to accident, negligence, or environmental and occupational contact without suicidal intent, and they represent a distinct patient group with high morbidity encountered in both healthcare systems and forensic medicine outpatient clinics [10].

According to the current legal regulations and the provisions of the Turkish Penal Code (TPC) in Türkiye, all poisoning cases presenting to healthcare institutions, regardless of etiology, should be considered "medico-legal cases" because they arise from unnatural causes, and they must be reported to judicial authorities with the preparation of an appropriate forensic report

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[6,11]. The medico-legal evaluation rests on two determinations defined by the TPC and operationalized by the national forensic guideline: whether the exposure produced a "life-threatening condition" (TPC Article 87/1-d) and whether the resulting injury was "of a nature that could be managed with simple medical intervention (SMI)" (TPC Article 86/2) [12]. While the criteria for life-threatening injury are relatively clear and objective in cases of physical trauma such as skull fractures or internal organ injuries, the integration of physiological parameters including the severity of the clinical presentation, intensive care requirement, and altered consciousness (e.g., Glasgow Coma Scale) into forensic reporting standards in poisoning cases represents a complex and challenging process [13].

Although numerous studies in the literature have investigated the clinical characteristics of general poisoning cases presenting to emergency departments, studies specifically examining non-suicidal poisonings evaluated in forensic medicine outpatient clinics within the scope of prosecutorial investigations remain relatively limited. In forensic reports prepared by physicians in emergency departments, a lack of standardization is frequently encountered, and considerable inconsistencies are observed in determining the presence of a "life-threatening condition" related to poisoning [10,11]. Indeed, the clinical course of non-pharmaceutical exposures such as food poisoning, alcohol intoxication, or stove gas-related CO exposure may range from relatively mild presentations, including nausea and vomiting, to altered consciousness, respiratory failure, and mortality [9,11,13]. In such cases, a clear analysis of hospitalization, intensive care requirement, and the risk of life-threatening conditions according to the type of exposure is essential for the development of evidence-based and objective criteria in medico-legal evaluations.

The aim of this study was to retrospectively evaluate the demographic characteristics, exposure types, clinical findings, and medico-legal evaluation processes of non-pharmaceutical poisoning cases with a history of non-suicidal exposure that were assessed in a forensic medicine outpatient clinic within the scope of prosecutorial investigations. In this way, it was aimed to reveal the relationship between clinical severity indicators and forensic reporting outcomes in non-pharmaceutical poisonings, to address deficiencies in forensic medicine practice, and to contribute to the literature with data regarding this specific patient group.

Material and Methods

In this retrospective cross-sectional study, non-pharmaceutical poisoning cases evaluated at the Department of Forensic Medicine of a tertiary university hospital between January 1, 2017 and December 31, 2024 were examined. All cases had been referred by the public prosecutor's office for the preparation of a forensic medical report within the scope of a judicial investigation. Throughout this article, "non-pharmaceutical" denotes agents other than medicinal products; in this series the other agent group included corrosive substances, pesticides, industrial chemicals, and rodenticides.

Case definitions and eligibility criteria

Non-suicidal poisoning was defined as an acute toxic exposure for which no suicidal or self-harm intent was documented in any available source. Suicidal intent was assessed using all available sources, including the prosecutor's investigation file, the emergency department admission record, any psychiatric consultation note, the examinee's statement, the accompanying legal guardian's statement recorded during the forensic interview in pediatric cases, and the final forensic report. A case was classified as non-suicidal when none of these sources documented or suggested suicidal intent; documented or suspected suicidal intent in any single source led to exclusion.

Within the non-suicidal group, the manner of exposure was coded as accidental or intentional use. "Accidental" denotes exposure occurring without the individual knowingly taking the agent or without awareness that the substance was toxic, such as stove gas inhalation during sleep, consumption of contaminated food, or ingestion of wild mushrooms believed to be edible. "Intentional use" denotes the deliberate consumption of a substance known to be psychoactive or potentially toxic for recreational or habitual purposes, without any intent of self-harm. In this series, this category consisted predominantly of recreational alcohol consumption. The distinction is therefore one of voluntariness of intake and not of self-destructive intent, and intentional use remains categorically separate from suicidal poisoning, which was an exclusion criterion.

Cases were included if the examinee had first been evaluated in the emergency department and was then referred for a forensic medical examination at the written request of a judicial authority. The poisoning also had to be acute and attributable to a non-pharmaceutical agent, with the exposure history documented as non-suicidal and the hospital record containing the findings needed for the medico-legal determination.

Several groups of cases were excluded. Poisoning caused wholly or partly by a pharmaceutical agent was excluded, including analgesic, antidepressant, antipsychotic, and antiepileptic overdose and mixed drug ingestion. Documented or suspected suicidal or self-harm intent was likewise an exclusion criterion, as was an exposure history that could not be established with sufficient certainty, including cases in which the agent remained unidentified. Incomplete medical records were excluded. Drug and substance-use presentations were excluded as well, since these follow a separate reporting pathway under Article 191 of the TPC. Finally, chronic or occupational cumulative exposure without an identifiable acute episode, and duplicate records of the same incident, were excluded.

Data sources and variables

Data were obtained from standardized forensic reports and the hospital electronic medical record system. Demographic characteristics, incident-related features, poisoning agent, route of exposure, clinical findings, laboratory parameters, and clinical outcomes were recorded using a structured data collection form. Poisoning agents were classified as food-related, CO, alcohol,

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mushroom, and other agents. Clinical outcomes were evaluated in terms of hospitalization, intensive care requirement, presence of a life-threatening condition, and whether the injury was of a nature that could or could not be managed with SMI. Because several categories contained few cases, the incident location was collapsed into four groups (home; restaurant or café; open area; other) and infrequent agents were combined into a single “other” category.

Medico-legal assessment

All forensic reports were prepared by forensic medicine specialists of the department. The determination of life-threatening condition and of SMI status followed the Guideline for the Forensic Medical Evaluation of Injury Crimes Defined in the Turkish Penal Code [12]. This guideline treats poisoning cases as absolute medico-legal cases, and it requires the determination to rest on the documented clinical and laboratory findings at presentation rather than on the identity of the agent alone.

A life-threatening condition was recorded when at least one guideline-defined indicator was documented in the source records. Neurological indicators were a Glasgow Coma Scale score of 8 or below or another documented impairment of consciousness. Respiratory indicators were respiratory distress, hypoxaemia requiring oxygen therapy, or the need for intubation or mechanical ventilation. Cardiovascular indicators were hypotension or shock requiring vasopressor support, or a haemodynamically significant arrhythmia. Metabolic and laboratory indicators were severe metabolic acidosis, acute kidney injury, or transaminase and coagulation abnormality. For the two agents with a validated biomarker, the relevant indicator was the carboxyhaemoglobin concentration in CO exposure or the blood ethanol concentration in alcohol exposure.

Whether the injury was of a nature manageable by SMI was determined according to the same guideline. Under the guideline, a life-threatening condition is by definition also classified as not manageable by SMI. The converse does not hold as a rule: whether a case not manageable by SMI also met the criteria for a life-threatening condition was assessed independently against the indicators above, rather than assumed.

Statistical analysis

Continuous variables were presented as mean ± standard deviation or median (IQR), whereas categorical variables were expressed as number and percentage. Pearson’s chi-square test or Fisher’s exact test was used for comparisons of categorical variables, and the Mann-Whitney U test for continuous variables. Effect size was evaluated using odds ratios (ORs) and 95% confidence intervals (CIs), and Cramér’s V was calculated for multi-categorical analyses.

Multivariable analysis was performed with Firth penalized logistic regression, selected in view of the low number of outcome events and separation in the reference group. A separate model was fitted for each of the three binary outcomes using the same prespecified covariates without stepwise selection: age, sex, manner of exposure, route of exposure, residence, and poisoning agent group, with food-related poisoning as the reference category. Model fit was assessed by the likelihood ratio test comparing each model with the corresponding intercept-only model. All analyses were performed using IBM SPSS Statistics, Version 22.0 (IBM Corp., Armonk, NY, USA), except for the Firth penalized models, which were fitted in R, version 4.3 (R Foundation for Statistical Computing, Vienna, Austria). p value of < .05 was considered statistically significant.

Ethics

This study was approved by Ordu University Non-Interventional Clinical Research Ethics Committee (Decision No: 2026/110; Date: 29.04.2026). The study was conducted in accordance with the principles of the Declaration of Helsinki. Because the design was retrospective and based on records generated in routine judicial and clinical practice, the requirement for individual informed consent was waived by the committee. All data were extracted in de-identified form, and no identifiable personal data are reported.

Results

A total of 108 non-suicidal poisoning cases were evaluated within the scope of this study. The selection process is shown in Figure 1.

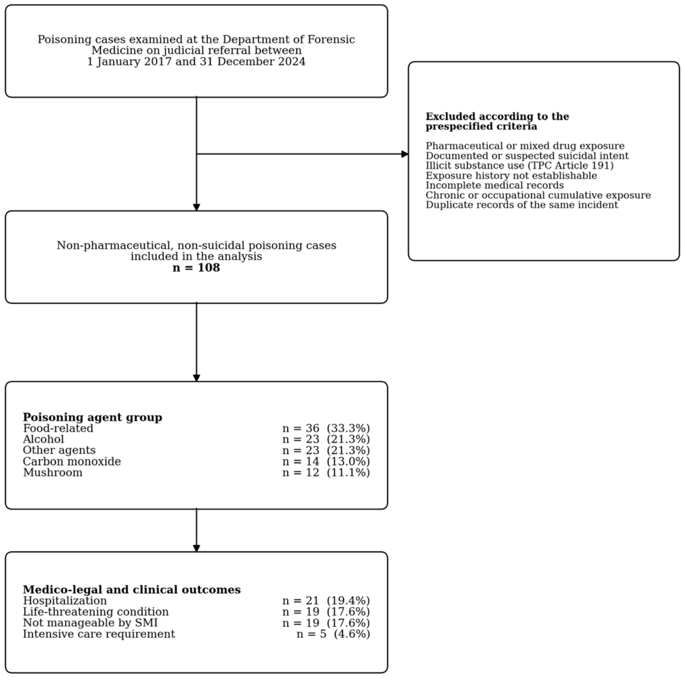

Figure 1. Flow diagram of case selection; SMI, simple medical intervention; TPC, Turkish Penal Code

Of the cases, 55.6% were male (n = 60) and 44.4% were female (n = 48). The mean age at the time of the incident was 28.57 ± 18.94 years, with a median age of 23.5 years (IQR: 15.0 – 38.2; range: 1 – 81). The incidents occurred between 08.07.2017 and 08.10.2024, whereas forensic medical examinations were performed between 13.07.2017 and 09.10.2024. The mean interval between the incident and forensic medical examination was 15.47 ± 33.13

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days, with a median of 4 days (IQR: 2 – 13; range: 0 – 264). The majority of incidents occurred in urban areas (73.1%; n = 79). Seasonal distribution showed peaks during spring (29.6%; n = 32) and autumn (27.8%; n = 30). The manner of exposure was predominantly accidental (74.1%; n = 80), whereas intentional use accounted for 25.9% of cases (n = 28). Among the main poisoning agent groups, food-related agents (33.3%; n = 36), alcohol (21.3%; n = 23), and other agents (21.3%; n = 23) were the most common. The most frequent route of exposure was oral ingestion (82.4%; n = 89). Clinically, nausea and vomiting were the most common symptoms (85.2%; n = 92), whereas altered consciousness (8.3%; n = 9) and respiratory distress (11.1%; n = 12) were observed less frequently. Hospitalization was required in 19.4% of cases (n = 21), and intensive care admission was required in 4.6% (n = 5). A life-threatening condition was reported in forensic reports in 17.6% of cases (n = 19), coinciding with non-SMI status in the same 19 cases. The descriptive characteristics of the cases are presented in Table 1.

Table 1. Descriptive characteristics of non-suicidal poisoning cases (n = 108)

Variable		Value
Age (years)		28.57 ± 18.94; 23.5 (15.0 – 38.2); 1 – 81
Interval between incident and forensic examination (days)		15.47 ± 33.13; 4 (2 – 13); 0 – 264
Sex, n (%)	**Male**	60 (55.6)
	Female	48 (44.4)
Residence, n (%)	**Urban**	79 (73.1)
	Rural	29 (26.9)
Season, n (%)	**Spring**	32 (29.6)
	Summer	23 (21.3)
	Autumn	30 (27.8)
	Winter	23 (21.3)
Manner of exposure, n (%)	**Accidental**	80 (74.1)
	Intentional use	28 (25.9)
Route of exposure, n (%)	**Oral**	89 (82.4)
	Inhalational	19 (17.6)
Poisoning agent (main group), n (%)	**Food-related**	36 (33.3)
	Alcohol	23 (21.3)
	Other	23 (21.3)
	Carbon monoxide	14 (13.0)
	Mushroom	12 (11.1)
Incident location, n (%)	**Home**	44 (40.7)
	Restaurant or café	22 (20.4)
	Open area	19 (17.6)
	Other	23 (21.3)
Most common specific agents (Top 3), n (%)	**Chicken döner**	13 (12.0)
	Mushroom	13 (12.0)
	Stove gas	10 (9.3)
Clinical findings (present), n (%)	**Nausea-vomiting**	92 (85.2)
	Respiratory distress	12 (11.1)
	Altered consciousness	9 (8.3)
Clinical outcomes, n (%)	**Hospitalization**	21 (19.4)
	Life-threatening condition	19 (17.6)
	Not manageable with simple medical intervention (SMI)	19 (17.6)
	Intensive care requirement	5 (4.6)
Laboratory findings (among measured cases)	**Ethanol (mg/dL), n = 25**	184.56 ± 98.80; 162 (112 – 271); 25 – 385
	COHb (%), n = 14	18.39 ± 15.12; 17.9 (2.88 – 30.53); 0.9 – 43.6

Categorical variables are presented as n (%), whereas continuous variables are presented as mean ± SD; median (IQR); and range (min – max); The "Other" agent group represents a combined category of infrequently encountered agents; COHb: carboxyhaemoglobin, measured in all 14 carbon monoxide cases

Factors Associated with Clinical Severity

The rate of life-threatening conditions was significantly higher in males than in females (25.0% vs 8.3%; OR = 3.67; 95% CI: 1.13 – 11.92; p = .040). A significant difference was observed among poisoning agent groups in terms of life-threatening conditions; the rate of life-threatening conditions was higher in CO- and alcohol-related cases, whereas no life-threatening condition was observed in food-related poisonings (CO 50.0% vs alcohol 34.8% vs other 13.0% vs mushroom 8.3% vs food-related 0.0%; χ^2 p < .001; Cramér's v = 0.467). Hospitalization rates also differed significantly according to poisoning agent groups (χ^2 p = .002; Cramér's v = 0.393). The main variables significantly associated with clinical outcomes are summarized in Table 2.

Table 2. Main variables significantly associated with clinical outcomes

Variable	Clinical outcome	OR / effect measure (95% CI)	p
Male sex	Life-threatening condition	3.67 (1.13 – 11.92)	.040
Intentional use	Life-threatening condition	4.38 (1.55 – 12.38)	.007
Inhalational exposure	Life-threatening condition	3.74 (1.23 – 11.39)	.040
Poisoning agent group	Life-threatening condition	Cramér's v = 0.467	< .001
Poisoning agent group	Hospitalization	Cramér's v = 0.393	.002
Incident location	Life-threatening condition	Cramér's v = 0.295	.024
Altered consciousness	Life-threatening condition / hospitalization	Fisher p < .001	< .001
Altered consciousness	Intensive care requirement	24.25 (3.38 – 173.90)	.004
Respiratory distress	Life-threatening condition	121.00 (13.80 – 1061.12)	< .001
Respiratory distress	Hospitalization	21.00 (4.98 – 88.62)	< .001
Respiratory distress	Intensive care requirement	15.67 (2.31 – 106.38)	.009
Not manageable by SMI	Hospitalization	21.94 (6.54 – 73.54)	< .001
Not manageable by SMI	Intensive care requirement	23.47 (2.45 – 224.58)	.003
Presence of suspected food exposure	Life-threatening condition	0.05 (0.01 – 0.38)	< .001
Stove gas exposure	Life-threatening condition	6.00 (1.54 – 23.44)	.014

CI: confidence interval, OR: odds ratio, SMI: simple medical intervention; Confidence intervals are wide because several exposed categories contain fewer than fifteen observations, so the estimates indicate direction rather than magnitude

When evaluated according to the location of the incident, life-threatening conditions were observed most frequently in cases occurring in the home environment (29.5% (13/44)), whereas no life-threatening condition was identified in restaurant/café-related cases (χ^2 p = .024; Cramér's v = 0.295). Similarly, hospitalization rates also differed significantly according to the location of the incident (χ^2 p = .038; Cramér's v = 0.279).

The rate of life-threatening conditions was significantly higher in intentional use cases compared with accidental exposures (35.7% vs 11.3%; OR = 4.38; 95% CI: 1.55 – 12.38; p = .007). Inhalational exposure was associated with a higher rate of life-threatening conditions compared with oral exposure (36.8% vs 13.5%; OR = 3.74; 95% CI: 1.23 – 11.39; p = .040).

Among clinical findings, altered consciousness and respiratory distress were the variables most strongly associated with severe clinical outcomes. In cases with altered consciousness, the rates of both life-threatening conditions and hospitalization were 100% (both p < .001). In the presence of respiratory distress, the rates of life-threatening conditions (OR = 121.00; 95% CI: 13.80 – 1061.12; p < .001), hospitalization (OR = 21.00; 95% CI: 4.98 – 88.62; p < .001), and intensive care requirement (OR = 15.67; 95% CI: 2.31 – 106.38; p = .009) were significantly higher. Because the exposed categories contain very few observations, these confidence intervals are wide and the estimates indicate the direction rather than the magnitude of the association. Cases evaluated as not manageable with SMI were strongly associated with hospitalization and intensive care requirement (both p ≤ .003) (OR = 21.94; 95% CI: 6.54 – 73.54 and OR = 23.47; 95% CI: 2.45 – 224.58, respectively).

Cases involving suspected food exposure showed significantly lower rates of life-threatening conditions and hospitalization (life-threatening condition 2.1% vs 30.5%; OR = 0.05; 95% CI: 0.01 – 0.38; p < .001). Among specific agents, stove gas exposure was associated with a higher rate of life-threatening conditions (OR = 6.00; 95% CI: 1.54 – 23.44; p = .014).

Multivariable Firth penalized logistic regression analyses are presented in detail in Table 3. All three models were significant compared with the corresponding intercept-only model (life-threatening condition $\chi^2(9)$ = 43.78, p < .001; hospitalization $\chi^2(9)$ = 41.20, p < .001; intensive care requirement $\chi^2(9)$ = 17.73, p = .038). In the life-threatening condition model, only CO exposure was identified as an independent risk factor compared with food-related poisonings (aOR = 156.40; 95% CI: 1.40 – 17503.77; p = .036). In the hospitalization model, CO exposure (aOR = 544.80; p = .008), mushroom exposure (aOR = 111.97; p = .004), and other agent groups (aOR = 30.15; p = .030) were independently associated with an increased risk of hospitalization, again with very wide intervals; rural residence was associated with lower odds of hospitalization (aOR = 0.22; 95% CI: 0.05 – 0.98; p = .046). Although the intensive care requirement model was overall statistically significant, no independently significant variable was identified because of the low number of cases, and this model is reported for completeness rather than interpreted.

Table 3. Multivariable firth penalized logistic regression analyses

Covariate	Reference	aOR	95% CI	p
Life-threatening condition (n = 108; events = 19; $\chi^2(9) = 43.78$; p < .001)				
Age (per 1 year)	–	1.03	0.99 – 1.06	.12
Female sex	**Male**	0.38	0.11 – 1.36	.14
Intentional use	**Accidental**	6.93	0.31 – 155.67	.22
Inhalational exposure	**Oral**	0.30	0.01 – 10.22	.51
Rural residence	**Urban**	0.80	0.17 – 3.82	.78
Carbon monoxide	**Food-related**	156.40	1.40 – 17503.77	.036
Alcohol	**Food-related**	5.86	0.09 – 402.97	.41
Mushroom	**Food-related**	7.76	0.26 – 235.16	.24
Other agents	**Food-related**	8.90	0.36 – 222.18	.18
Hospitalization (n = 108; events = 21; $\chi^2(9) = 41.20$; p < .001)				
Age (per 1 year)	–	1.01	0.98 – 1.05	.38
Female sex	**Male**	0.47	0.14 – 1.57	.22
Intentional use	**Accidental**	3.78	0.16 – 90.02	.41
Inhalational exposure	**Oral**	0.12	0.00 – 3.60	.22
Rural residence	**Urban**	0.22	0.05 – 0.98	.046
Carbon monoxide	**Food-related**	544.80	5.35 – 55486.49	.008
Alcohol	**Food-related**	6.87	0.09 – 505.07	.38
Mushroom	**Food-related**	111.97	4.61 – 2722.53	.004
Other agents	**Food-related**	30.15	1.40 – 648.74	.030
Intensive care requirement (n = 108; events = 5; $\chi^2(9) = 17.73$; p = .038)				
Age (per 1 year)	–	1.04	0.99 – 1.09	.11
Female sex	**Male**	0.36	0.05 – 2.86	.34
Intentional use	**Accidental**	5.76	0.16 – 202.64	.34
Inhalational exposure	**Oral**	0.14	0.00 – 4.35	.26
Rural residence	**Urban**	0.24	0.02 – 2.98	.27
Carbon monoxide	**Food-related**	13.49	0.08 – 2372.50	.32
Alcohol	**Food-related**	1.17	0.01 – 118.56	.95
Mushroom	**Food-related**	4.35	0.08 – 223.36	.46
Other agents	**Food-related**	18.47	0.87 – 393.21	.062

aOR: adjusted odds ratio, CI: confidence interval; All models were fitted with the same prespecified covariates and no variable selection procedure; The number of estimated parameters was large relative to the number of outcome events in each model, so the point estimates indicate the direction of association rather than its magnitude, and the intensive care model is not interpreted; Route of exposure and agent group are collinear, since most inhalational exposures were carbon monoxide exposures

Biomarker Findings in the CO and Alcohol Subgroups

Carboxyhaemoglobin was measured in every case classified as CO poisoning (14/14), and blood ethanol in 25 cases. The guideline defines a carboxyhaemoglobin level above 20% as one of several criteria that by itself establishes a life-threatening condition in CO poisoning [12]. Consistent with this rule, all six CO cases in our series with carboxyhaemoglobin at or above 25% were classified as life-threatening, compared with one of eight cases below this cutoff (100.0% vs 12.5%; p = .005), and hospitalization followed the same pattern (83.3% vs 0.0%; p = .003). The CO source was a stove in 10 cases (71.4%) and a fire in 4 cases (28.6%), with no difference in outcome between the two sources (p = 1.00). For

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alcohol, the guideline requires a blood ethanol concentration of 250 mg/dL or above, together with supportive clinical findings, for an automatic life-threatening determination; using the 200 mg/dL cutoff available in our data, a blood ethanol concentration at or above this level was likewise associated with a higher rate of life-threatening condition (80.0% vs 6.7%; OR = 56.00; 95% CI: 4.36 – 719.24; p < .001) but not with hospitalization (50.0% vs 13.3%; p = .075). These findings are presented in Table 4.

Table 4. Biomarker findings in the carbon monoxide and alcohol subgroups

Subgroup	Threshold	Outcome	At or above threshold	Below threshold	OR (95% CI)	p
Carbon monoxide (n = 14)	COHb ≥ 25%	Life-threatening condition	6/6 (100.0)	1/8 (12.5)	Not estimable	.005
Carbon monoxide (n = 14)	COHb ≥ 25%	Hospitalization	5/6 (83.3)	0/8 (0.0)	Not estimable	.003
Alcohol (n = 25 measured)	Ethanol ≥ 200 mg/dL	Life-threatening condition	8/10 (80.0)	1/15 (6.7)	56.00 (4.36 – 719.24)	< .001
Alcohol (n = 25 measured)	Ethanol ≥ 200 mg/dL	Hospitalization	5/10 (50.0)	2/15 (13.3)	6.50 (0.94 – 45.11)	.075

CI; confidence interval, COHb: carboxyhaemoglobin, OR: odds ratio; Values are n/N (%); p values are from Fisher's exact test; Carboxyhaemoglobin was measured in all 14 carbon monoxide cases; The guideline's own criteria for an automatic life-threatening determination are COHb above 20% for CO poisoning and blood ethanol at or above 250 mg/dL, together with supportive clinical findings, for alcohol poisoning; the cutoffs shown here reflect the values available in our data; Both carbon monoxide comparisons include a category with no observations, so a finite odds ratio does not exist and only the exact p value is reported

Discussion

In forensic medicine practice, accurate evaluation of the clinical severity and life-threatening potential of non-suicidal poisonings is of critical importance for the proper functioning of legal processes. The mean age of the 108 cases was 28.57 ± 18.94 years and 55.6% were male. These findings were consistent with Yürürdurmaz et al. [10], who reported a male proportion of 56.5% among accidental forensic poisoning cases in Muğla, and with Usluoğulları et al. [6], who reported 54.6% male patients and a mean age of 28.16 years in İstanbul. Sungur et al. [7] and a Qatari series [3] likewise confirmed male predominance among adult poisoning admissions, a pattern generally attributed to greater occupational and environmental exposure among men.

When the seasonal distribution and manner of exposure were evaluated, distinct peaks were observed during spring (29.6%) and autumn (27.8%) in our study. The rate of life-threatening conditions was higher in cases with a history of intentional use compared with accidental exposures (35.7% vs 11.3%). A recent study conducted in Sivas demonstrated that mushroom poisonings were most frequently observed during the summer months (52.4%) [14]. Our seasonal pattern differs from that report but is compatible with the wild mushroom season in our region. On the other hand, in their comprehensive analysis of 1344 acute poisoning cases, Efeoglu Sacak et al. [15] demonstrated that both agent and clinical course varied according to the intent of exposure, and Pedersen et al. [16] attributed the higher morbidity of intentional exposure to the larger absorbed dose; in our series, however, the association is more plausibly explained by the composition of the intentional use category, which consisted largely of recreational alcohol consumption.

In this study, CO was identified as the most important factor associated with clinical severity; CO exposure remained independently associated with both life-threatening condition and hospitalization after adjustment, although the confidence intervals were too wide for the magnitude of these associations to be estimated. Birincioglu et al. [17] attributed 63.2% of poisoning-related deaths in Trabzon to CO, and Can et al. [18] linked 78.6% of CO-related deaths in Türkiye to stove use, consistent with our finding that stove gas exposure was associated with a higher rate of life-threatening conditions (OR = 6.00). Vural and Dolanbay [19] emphasized that inhalational CO exposure may lead to multiorgan dysfunction through hypoxia and myocardial injury; inhalational exposure in our study was likewise associated with a higher rate of life-threatening conditions (OR = 3.74). This dose-dependent severity gradient reflects carboxyhaemoglobin's affinity for haemoglobin, roughly two hundred times that of oxygen, which progressively displaces oxygen from the erythrocyte and impairs tissue oxygen delivery before overt hypoxaemia becomes apparent; at higher concentrations this hypoxic insult extends to myocardium and brain, the mechanistic counterpart of the multiorgan dysfunction described by Vural and Dolanbay [19]. This physiology is also the rationale for the guideline's own carboxyhaemoglobin threshold, above 20%, as an automatic criterion for a life-threatening determination in CO poisoning: every CO case in our series with a level at or above 25% was reported as life-threatening, against one of eight below that threshold, consistent with this mechanism and with uniform application of the criterion in this group.

Alcohol poisonings constituted 21.3% of our cases and formed the second group in which life-threatening conditions were concentrated. Karacabey et al. [9] reported 88.4% male patients in alcohol intoxication and identified acidosis as a predictor of survival. Nigussie et al. [20] and Zemedie et al. [2] reported that nearly all patients presenting comatose after alcohol or chemical intoxication required intensive care, supporting the association we observed between male sex and severe outcomes (OR = 3.67). Ethanol is a central nervous system depressant acting principally through potentiation of gamma-aminobutyric acid and inhibition of N-methyl-D-aspartate receptor signalling, with a dose-

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dependent clinical effect that progresses from disinhibition to loss of protective airway reflexes and respiratory depression, the pharmacological basis for treating blood ethanol concentration as a graded severity marker rather than a binary exposure label, consistent with the acidosis-driven mortality risk identified by Karacabey et al. [9]. The guideline sets a concentration of 250 mg/dL or above [12], together with supportive clinical findings, as its own criterion for a life-threatening determination in alcohol poisoning. Using the 200 mg/dL cutoff available in our data, our series showed a graded relationship consistent with this dose-response mechanism, with a life-threatening condition reported in 80.0% of cases at or above this lower cutoff against 6.7% below it.

The most directly applicable finding for forensic practice concerns food poisoning. None of the suspected food poisoning cases, which constituted 33.3% of all cases, involved a life-threatening condition or was classified as unmanageable by simple medical intervention, and food exposure significantly reduced the risk of a life-threatening determination (OR = 0.05). Bütün et al. [21] evaluated all 98 forensic food poisoning cases in Sivas as manageable by simple medical intervention. Urazel et al. [11] found that a forensic report had been prepared in the emergency department for 140 of 215 food poisoning cases, yet only three of those reports were judged to have been completed correctly, while a life-threatening condition was recorded in just three cases overall, pointing to substantial error in routine emergency reporting rather than to the frequency of genuinely severe presentations. Terzi et al. [22] similarly reported that a Bacillus cereus outbreak in a hospital cafeteria remained limited to diarrhea and abdominal cramps. Except for rare extreme presentations, food intoxications should therefore be evaluated within the scope of injuries manageable with simple medical intervention.

Mushroom poisonings, on the other hand, constituted 11.1% of the cases and imposed a substantial morbidity burden, being independently associated with hospitalization relative to food-related poisoning (aOR = 111.97). The guideline's own criteria for this agent, namely elevated serum transaminases, jaundice, reduction in liver dullness, hepatic encephalopathy, deranged renal function, and anuria or oliguria, directly track the hepatotoxic and nephrotoxic course described in the literature [12]: Akkuzu et al. [23] observed up to 20-fold elevations in liver enzymes and prolonged prothrombin time in 21% of wild mushroom poisoning patients, Ecevit et al. [24] reported that 81% of cases occurred in autumn and frequently required hospitalization, Vişneci et al. [25] reported prolonged hospital stays, and La Rosa et al. [26] showed that mushroom toxicity may progress insidiously after a latent period. These data support the clinical rationale underlying the high hospitalization rates in our study, and indicate that hospitalization in this group should not by itself be read as evidence of a life-threatening condition.

When the integration of clinical symptoms into medico-legal evaluation was examined, all cases with altered consciousness were found to require hospitalization, and all were determined to involve a life-threatening condition. In addition, respiratory distress was the single strongest correlate of both life-threatening condition and intensive care requirement in our study. The Guideline for the Forensic Medical Evaluation of Injury Crimes Defined in the Turkish Penal Code [12] defines a Glasgow Coma Scale score of 8 or below and the presence of intubation/respiratory distress as definitive and objective indicators of life-threatening injury. Kır et al. [27], who demonstrated that central nervous system and respiratory depression constitute the primary causes of fatal outcomes in toxicology, argued that these two parameters should form the backbone of forensic reporting, particularly in chemical exposures.

Finally, incidents occurring in the home carried the highest rate of life-threatening conditions (29.5%), which underlines the preventability of domestic exposure. Çıtlak and Aslan [28] reported that 94% of paediatric corrosive ingestions occurred accidentally at home, Aydın et al. [29] attributed a mean age of 3.92 years in accidental intoxication to unsupervised storage of chemicals, Çelikkaya et al. [30] emphasized the risk of unpackaged and openly sold substances, and Karaman et al. [31] documented deficient storage and labeling practices among mothers. That severe domestic exposures were also frequent among adults in our series suggests a systemic public health problem extending beyond childhood.

Limitations

This study has several limitations. First, its retrospective single-center design may limit the generalizability of the findings. Second, the relatively small number of severe outcomes, particularly cases requiring intensive care, resulted in wide confidence intervals in the multivariable analyses; the events-per-variable ratio fell well below conventional recommendations for several models, so the adjusted estimates should be interpreted as indicating the direction rather than the precise magnitude of an association, and the intensive care model in particular is not interpreted. These analyses are hypothesis-generating and require confirmation in a larger, ideally multicentre series.

Third, children and adults were analysed together. The age range was wide and included a substantial paediatric fraction, and agent profile, exposure circumstances, and outcome are known to differ between children and adults. Stratified paediatric and adult models could not be fitted, because the number of severe outcome events was too small to divide across two age strata for any stable estimate. Age was therefore retained as a continuous covariate in all models, which adjusts for but does not characterise age-dependent effects, and the reported associations should not be assumed to apply equally to children and to adults.

Fourth, toxicological confirmation tests were not available for all cases, and some evaluations were based primarily on clinical and forensic medical records. Quantitative confirmation was available for the two agents with a validated routine biomarker, namely carboxyhaemoglobin in all CO cases and blood ethanol in the alcohol cases, whereas food-related, mushroom, and miscellaneous exposures were classified on clinical, anamnestic, and investigative grounds. Any resulting misclassification would more plausibly understate than overstate the true contrasts between agent groups. Finally, long-term clinical outcomes could not be assessed because of the retrospective nature of the study, and comparisons across agent groups and locations were exploratory in nature.

Conclusion

This study demonstrates that the clinical severity of non-suicidal poisoning varies markedly by agent, ranging from an essentially benign course in food-related exposures to a substantial risk of life-threatening deterioration in carbon monoxide and alcohol poisoning. Our findings are consistent with, and lend empirical support to, the national guideline's existing agent-specific biomarker thresholds for these two agents, while also identifying altered consciousness and respiratory distress as the clinical findings most consistently associated with a life-threatening course across the whole spectrum of exposures. Taken together, these results argue for a forensic evaluation model anchored explicitly to the guideline's agent-specific clinical and laboratory criteria rather than to broad exposure categories, an approach that would help reduce the inter-examiner variability in reporting practice noted throughout this study. Furthermore, the high frequency of preventable domestic and environmental exposures supports the necessity of preventive public health approaches. Prospective, multicentre studies with sufficient events to support stable multivariable estimation, and studies focused specifically on the paediatric population, are needed to confirm and extend these findings.

Ethical Approval

This retrospective study was approved by Ordu University Non-Interventional Clinical Research Ethics Committee (Decision No: 2026/110; Date: 29 April 2026). The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was waived due to the retrospective design of the study and the use of anonymized data.

Patient Consent

Informed consent was waived due to the retrospective design of the study and the use of anonymized data.

Conflict of Interest

The authors confirm the absence of any conflicts associated with this work.

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