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Research Paper

Evaluation of factors associated with intentional non-pharmaceutical poisoning in Iran

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ABSTRACT

Background: Intentional poisoning is frequently observed in low and middle-income countries contributing to the global burden of injuries. However, there is limited comprehensive analysis of factors specifically associated with intentional non-pharmaceutical poisoning. This study provides one of the first analytical comparisons distinguishing intentional from accidental non-pharmaceutical poisoning in Iran, offering a practical risk profile to support early psychiatric triage, targeted intervention, and public health planning.

Methods: This retrospective cross-sectional study was conducted at a referral poisoning center in Iran. Medical records of patients admitted between January 2015 and December 2019 with nonpharmaceutical poisoning were reviewed. Binary logistic regression was used to assess factors associated with intentional poisoning.

Results: A total of 1547 patients were included. Among the participants, 1041 patients (67.3%) experienced intentional poisoning. Males accounted for 65.3% of intentional cases. The most common age group for intentional poisoning was 20-40 years old (62.1%). The strongest predictors of intentional poisoning were previous suicide attempts (OR: 14.48, 95% CI 6.73-31.17), and self-harm history (OR: 7.81, 95% CI 3.12-19.57). Other significant risk factors included psychiatric disease (OR: 3.60, 95% CI 2.39-5.42), addiction(OR: 1.97, 95% CI 1.56-2.48), and smoking habits(OR: 2.50, 95% CI 1.27-4.91). Having five or more children was found to be protective (OR: 0.45, 95% CI 0.23-0.89) in intentional poisoning compared to accidental poisoning.

Conclusion: With the high prevalence of intentional poisoning, targeted preventive strategies are crucial. These strategies should include early psychiatric evaluation for individuals with prior suicide attempts or self-harm, addiction-focused support services, smoking cessation interventions, and community-based education on the toxicity of non-pharmaceutical substances. Reinforcing family-centered support and screening high-risk young adults may further reduce intentional poisoning.

1. Introduction

Poisoning is a significant global health issue, leading to numerous emergency visits, hospital admissions, and an economic burden on healthcare systems. It is a common cause of morbidity and mortality worldwide, with the majority of poisoning deaths occurring in lower- and middle-income countries.[1–4] The pattern of poisoning varies widely among countries and regions depending on socioeconomic conditions, cultural differences, and the availability of poisonous agents.[3,5] While pesticide poisoning is the primary cause of poisoning in developing countries, poisoning with drugs and household substances is more frequent in developed countries.[6–8]

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Globally, there has been a significant rise in self-poisoning behavior, particularly among adolescents and young adults (Alrasheed et al., 2022). According to the World Health Organization, over 700,000 people die by suicide each year, with pesticides self-poisoning responsible for about 20% of the global suicide rate, mostly occurring in rural agricultural areas in low and middle-income countries (WHO).[9] Iran, as a middle-income country in the Middle East, exemplifies these global patterns while presenting unique regional characteristics that warrant specific investigation. Iran's position as a transitional economy places it at the intersection of these patterns, with both agricultural pesticide exposure in rural areas, where agriculture remains a significant economic sector and increasing urban substance abuse, reflecting the complex poisoning epidemiology seen in rapidly developing nations.[10–14]

While pharmaceutical agents remain the primary substances involved in poisoning suicides, fatal self-poisonings with non-pharmaceutical substances such as pesticides, household chemicals or environmental agents occur with some regularity.[6,15] However, unlike many Western countries where pharmaceutical overdoses predominate, Iran's poisoning pattern reflects the global developing country trend, with significant non-pharmaceutical agent involvement.[11,16,17]

Approximately 74.7% of patients in Isfahan, the central part of Iran, experience pesticide poisoning as a result of suicidal attempts.[11]

The pattern of nonpharmaceutical self-poisoning is different in various parts of Iran, mirroring the geographic variation in poisoning patterns observed globally between rural and urban areas.[10] Iran's unique geographic position as a transit route for illegal substances from Afghanistan and Pakistan to Europe creates additional poisoning risks not commonly seen in other middle-income countries, making it a critical case study for understanding how global drug trafficking patterns influence local poisoning epidemiology.[18]Studies have indicated that various factors are associated with suicide attempts. Factors such as gender, academic level, residence, depression, family history of substance abuse, and criminal convictions within the family may also contribute to attempted suicide.[19,20] The applicability of these findings to Iranian populations remains unclear due to cultural, religious, and socioeconomic differences. Furthermore a study conducted in South Korea identified important predictors of intentional self-intoxication including alcohol consumption, old age, psychiatric disease, smoking, and male sex.[21] Whether these Western and East Asian predictors apply to Middle Eastern populations like Iran requires specific investigation.

Although previous studies have evaluated intentional poisoning in general populations, the majority have focused on pharmaceutical agents, or assessed risk factors for suicide without distinguishing substance type. No study has yet identified predictors that differentiate intentional from accidental non-pharmaceutical poisoning in Iran, despite the country's high burden of pesticide, stimulant, and household-chemical exposures. This gap limits the development of targeted prevention strategies. We have a hypothesis that unique positioning patterns of Iran result in specific predictor patterns where structural and cultural factors exhibit greater predictive validity compared to individual psychological factors. This study aimed to identify and quantify the key sociodemographic and clinical factors that distinguish intentional from accidental non-pharmaceutical poisoning among patients admitted to a referral poisoning center in Iran.

2. Method

2.1. Study design and setting

This cross-sectional study was conducted at the referral poisoning center of Khorshid educational hospital, located in Isfahan, the largest city in the central part of Iran. The study was approved by the ethics committee of Isfahan University of Medical Sciences under the code IR.MUI.MED.REC.1397.316. All patients or their authorized representatives were required to provide signed informed consent in order to participate in the study.

2.2. Participants

The available medical documents in the archive of the hospital were utilized to obtain patients information. Any patient who was exposed to non-pharmaceutical substances and was admitted to the poisoning department from January 2015 to December 2017 with the discharge diagnosis code T51–T65 (toxic effects of substances chiefly non-pharmaceutical) based on the International Classification of Disease, Tenth Revision (ICD-10) were included in this study.[22]

Those who were discharged with personal consent were excluded from this study. The diagnosis of non-pharmaceutical poisoning was determined by the patient's or their companion's reported history, clinical manifestations, serum/blood toxicological tests, and toxicology urine analysis, if necessary.

2.3. Data collection

Using a data collection form, all data concerning demographic information, past medical history and toxicological findings including the type of substances (illegal opioids, stimulants, alcohols, others (household chemicals, carbon monoxide, pesticides, envenomation, heavy metals), sex, age, education level, place of residence, marital status, child number, type of exposure (intentional, unintentional), route of exposure (inhalation, ingestion, skin, intravenous, combination of two routes), history of underlying diseases (diabetes, cardiac, renal, pulmonary, others), addiction (opioids, stimulants, alcohol, cigarettes, and others), previous history of attempted suicide, suicide in the family were collected.

Psychiatric disease was recorded either through self report or when documented in the patient's medical chart as an established clinical diagnosis by a psychiatrist or physician. Addiction was defined as a documented history of recurrent opioid, stimulant, alcohol, or cigarette use noted by treating physicians or confirmed by the patient or family self-report. Self-harm was defined as a previous episode of intentional self-injury according to self report or as recorded in the medical chart, emergency admission note, or the patient's history.

To reduce misclassification bias related to stigma or underreporting, all extracted information was cross-checked with physician assessments, toxicology reports, and family interviews when available. Cases with unclear intent or incomplete psychiatric/addiction documentation were excluded from analysis, in line with our predefined criteria. Despite these measures, the possibility of under-reporting remains, particularly in culturally sensitive variables.

To ensure the integrity of our registry data, all patient files underwent a multi-step quality control process. Trained research staff conducted range and logic checks on key demographic and clinical variables to flag missing, inconsistent, or out-of-range entries. Discrepancies were resolved by cross referencing original charts and physician notes, with consensus adjudication by two independent reviewers. Additionally, a random 10% sample of records was re-abstracted by senior investigators, achieving a concordance rate above 95%. This rigorous quality check minimized information bias and reinforced the reliability of our analyses.

These data are part of a larger database. Details of the main study and the data collected have been published previously.[17]

2.4. Statistical analysis

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software for Windows version 20 (IBM Corp., Armonk, NY, USA). The normality of the data was assessed using the Kolmogorov-Smirnov test. For categorical variables frequency and percentages were reported.Chi-square or Fisher exact tests were used for comparing categorical variables between groups.

Given the exploratory aim of identifying potential predictors of intentional poisoning from a broad set of candidates, we employed a two-stage analytical approach. First, univariate analyses (chi-square tests for categorical variables and independent t-tests for continuous variables) were conducted to screen each candidate predictor. Variables with a p-value <0.05 from this initial screen were then entered into a multivariable binary logistic regression model. This screening step was a pragmatic measure to manage initial model complexity in an exploratory context. Crucially, the primary objective of the multivariable model was to obtain stable and reliable coefficient estimates for prediction. Therefore, within the final model, all selected variables were evaluated for their clinical plausibility and statistical contribution, ensuring the robustness and interpretability of the resulting predictive model. Multicollinearity among predictors was assessed using the variance inflation factor (VIF), with all VIF values below 5 indicating no concerning collinearity. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test, and a non-significant test result indicated adequate calibration. Adjusted associations are reported as odds ratios (ORs) with corresponding 95% confidence intervals (95% CIs), and a two-sided p-value <0.05 was considered statistically significant. Missing Data Handling: A complete-case analysis was used throughout. Each statistical test (univariate or multivariable) was performed using only cases with available data for all variables involved in that specific test.

3. Results

During the study period, a total of 2253 patients with non-pharmaceutical poisoning were admitted to the referral poisoning emergency center of Khorshid Hospital, mainly consisting of illegal opioids (n = 1243), stimulants (n = 94), alcohols (n = 134) and pesticides (n = 467). Seven hundred and six cases were excluded due to overdose or undetermined intent. In total, 1547 cases were included in the study. Among the participants, 1041 patients (67.3%) experienced intentional poisoning, while 506 patients (32.7%) experienced accidental poisoning. Pesticides were the second most common causative agent group after illegal opioids in both intentional and accidental cases (n = 1095 and 513, respectively).

Table 1 presents the demographic and toxicological characteristics of patients with and without intentional intoxication in this study. The majority of patients were young adults (20-40 years old, n = 937 (62.1%)). Males comprised 65.3% of intentional cases (n = 680).

Intentional poisoning showed a male predominance and was most common in young adults (Table 1), with significant age-related differences especially in the 20-40 year group (p < 0.001). Most patients with suicidal poisoning were married and had no children. The vast majority

Table 1
Demographic and toxicologic characteristics and past history of patients according to intentional or accidental posioning

		Total	Intentional Total = 1041 N(%)	Accidental Total = 506 N(%)	P value
	Male	1010 (65.3%)	680 (65.3%%)	330 (65.2%)	0.97
	Female	537 (34,7%)	361 (34.7%)	176 (34.8%)	
Age	<20	149 (9.9%)	46 (4.5%)	103) 20.7 %)	<0.001
	20-40	937 (62.1%)	699 (69.1%)	238 (47.8%)	
	41-60	312 (20.7%)	209 (20.7%)	103 (20.7%)	
	>60	112 (7.4%)	58 (5.7%)	54 (10.8%)	
Marital status	Single	666 (43.1%)	445 (42.7%)	221 (43.7%(	0.73
	Married	881 (56.9%)	596 (57.3%)	285 (56.3%)	
Education level	Illiterate	11 (10.3%)	10 (12.0%)	1 (4.2%)	0.26
	Middle school degree	33 (30.8%)	25 (30.1%)	8 (33.3%)	
	Diploma	45 (42.1%)	36 (43.4%)	9 (37.5%)	
	College education	18 (16.8%)	12 (14.5%)	6 (25.0%)	
Child number	No child	759 (67.3%)	494 (67.6%)	265 (66.9%)	0.050
	1-4	333 (29.5%)	221 (30.2%)	112 (28.3%)	
	≥5	35 (3.1%)	16 (2.2%)	19 (4.8%)	
Natinality	Iranian	1481 (95.8%)	48 (4.6%)	17 (3.4%)	0.25
	Afghan	65 (4.2%)	992 (95.4%)	489 (96.6%)	
City of residency	Esfahan	1513 (98.1%)	1018 (98.3%)	495 (97.8%)	0.55
	Other cities of Iran	29 (1.9%)	18 (1.7%)	11 (2.2%)	
Place of poisoning	Home	967 (88.8%)	669 (92.7%)	298 (81.2%)	<0.001
	At work	122 (11.2%)	53 (7.3%)	69 (18.8%)	
Rout of exposure	Oral	1382 (92.3%)	962 (94.7%)	420 (87.3%)	<0.001
	Inhalation	63 (4.2%)	27 (2.7(%	36 (7.5%)	
	Intravenous	18 (1.2%)	13 (1.3%)	5 (1.0%)	
	Skin	16 (1.1%)	0 (0.0%)	16 (3.3%)	
	Mixed	18 (1.2%)	14 (1.4%)	4 (0.8%)	
Suicide history	Yes	183 (15.7%)	176 (22.0%)	7 (1.9%)	<0.001
	No	985 (84.3%)	625 (78.0%)	360 (98.1%)	
Criminal history	Yes	86 (6.7%)	77 (9.1%)	9 (2.1%)	<0.001
	No	1194 (93.3%)	768 (90.9%)	426 (97.9%)	
Self-mulitation history	Yes	75 (8.2%)	70 (11.5%)	5 (1.6%)	<0.001
	No	843 (91.8%)	541 (88.5%)	302 (98.4%)	
Suicide family history	Yes	46 (3.7%)	37 (4.5%)	9 (2.1%)	0.038
	No	1201 (96.3%)	789 (95.5%)	412 (97.9%)	
Addiction history	Yes	592 (39.8%)	447 (45.0%)	145 (29.4%)	<0.001
	No	896 (60.2%)	547 (55.0%)	349 (70.6%)	
Addiction type	Heroin/opium	137 (8.9%)	90 (8.6%)	47 (9.3%)	0.006
	Smoke	81 (5.2%)	67 (6.4%)	14 (2.8%)	
	Alcohol	20 (1.3%)	17 (1.6%)	3 (0.6%)	
	Other	1309 (84.6%)	867 (83.3%)	442 (87.4%)	
Underlying diseases	Yes	342 (28.7%)	223 (28.7%)	119 (28.8%)	0.96
	No	849 (71.3%)	555 (71.3%)	294 (71.2%)	
History of psychiatric disease	Yes	203 (14.5%)	174 (18.9%)	29 (6.1%)	<0.001
	No	1195 (85.5%)	747 (81.1%)	448 (93.9%)	

Values are presented as number (%).

of intentional poisonings occurred through ingestion (94.7%). Home was the main place of exposure to non-pharmaceutical agents, comprising 92.7% of cases. The majority of patients with intentional exposures had no history of suicide(n = 625, 78.0%) and previous psychiatric disorders (n = 747, 81.1%). A significant difference was observed between groups according to addiction history with a higher frequency in the intentional group(45.0%) predominantly addiction to other drugs.

3.1. Predictors of intentional poisoning based on logistic regression analysis

The variables of age (20-40 and 41-60 years old) were significantly associated with a (OR = 2.73, 95% CI, 1.84-4.07) and (OR = 1.89, 95%, CI 1.21-2.93) times increase in the odds, of intentional poisoning compared to patients over 60 years old, respectively. Previous suicide attempts showed the strongest association (OR = 14.48, 95% CI, 6.73-31.17), followed by self-harm history (OR = 7.81, 95% CI, 3.12-19.57), involvement in criminal activities (OR = 4.75, 95% CI, 2.36-9.56), psychiatric disease history (OR = 3.60, 95% CI, 2.39-5.42), suicide family history (OR = 2.15, 95% CI, 1.03-4.49), and addiction history (OR = 1.97, 95% CI, 1.56-2.48) all demonstrating substantial effect sizes. Patients with a history of smoking addiction have a 2.5 times higher likelihood of intentional poisoning (OR = 2.50, 95% CI, 1.27-4.91) compared to those with a history of opioid addiction (Table 2).

Table 3 shows the subgroup analysis of predictors of intentional or accidental poisoning by non-pharmaceutical agent type. Subgroup analysis demonstrated that key predictors of intentional poisoning were largely consistent across opioid and pesticide exposures. In subgroups, individuals aged 20–40 years had the highest rates of intentional poisoning. A history of psychiatric illness also showed a meaningful association with intentional poisoning in opioid, and pesticide cases, suggesting a cross-agent vulnerability profile. While, addiction history varied between agent types, appearing more significant in opioid and stimulant cases than in alcohol-related poisonings based on intentional poisoning.

4. Discussion

Intentional self-poisoning, mainly with pesticides, was a prevalent method of suicide in Asia.[23] The results of this study showed that the rate of intentional poisoning was twice the rate of accidental poisoning, mostly caused by pesticides, opioids, stimulants, and alcohol. Similar findings were reported by other researchers on non-pharmaceutical agents.[24,25] Factors such as unemployment, urbanization, economic instability and lack of family support were identified as contributors to intentional poisoning rates.[26] The increased availability of opioids in Iran due to its strategic location neighboring countries like Afghanistan and Pakistan has played a significant role in smuggling these drugs into Europe.[18]

Previous study has noted, the cultural stigma surrounding suicide and mental illness in Iranian society, impacting intentional poisoning prevalence. Recent systematic reviews indicate that this stigma influences help-seeking behavior and method choice.[27]

Survivors of suicide attempts may avoid seeking formal healthcare due to the stigma associating suicidal behavior with a lack of religious belief, severe mental illness, or unethical conduct.[27] This stigma-driven avoidance may explain the high prevalence of non-pharmaceutical poisoning in our study. People may find it more acceptable to use household chemicals (non-pharmaceutical) readily available at home, as they are perceived as less intentional and therefore less stigmatized.

According to our results, there was no significant difference in the type of exposure with respect to gender. However males showed a higher frequency of poisoning incidents, with a higher frequency of intentional action. This aligns with regional data suggesting that while women globally attempt suicide more often, men in Middle Eastern societies are more likely to engage in high-lethality methods such as pesticide or chemical ingestion [28,29]. Cultural norms around masculinity, emotional suppression, and limited help-seeking behaviors may contribute to this pattern, where distress is externalized through aggressive self-harm rather than reported or treated clinically. In Iran, social stigma surrounding male mental illness may further inhibit early intervention, increasing the likelihood of poisoning as an impulsive or fatal coping mechanism rather than a cry for help.

In our study, the higher rates of intentional poisoning among males can be attributed to complex cultural gender dynamics that extend beyond economic factors. In Iran, the stifling masculine norms that discourage emotional expression and seeking help lead to male distress manifesting in destructive ways, such as non-pharmaceutical poisoning.[30]

Except for the age group under 20 years old, all other age categories had high rates of intentional intoxication. The highest rates were found among young adult patients, similar to those found in previous studies.[28,31] It appears that young and middle-aged adults were more susceptible to intentional poisoning. The odds of intentional poisoning decreased with increasing age.

Younger adults might be more vulnerable to stressful life events, such as academic pressures, relationship issues, or financial difficulties, which could lead them to resort to intentional poisoning as a coping mechanism. Additionally, middle-aged adults might face challenges related to career transitions, empty nest syndrome, or mid-life crises, potentially increasing their susceptibility to intentional poisoning. Aligning with our study, another study in Iran, reported that 69.2% of suicide incidences with self poisoning were in the age group of 20–50 years. Other studies in India, Ethiopia and New Zealand showed that younger ages were more involved in intentional self-poisoning.[32–34] Moreover in a review study the age group of 15–40 years was reported to be the main risk factor for suicide attempts by poisoning.[35]

The socioeconomic stressors resulting from economic difficulties are not similar in different populations. A recent meta-analysis of suicide studies in Iran found that issues related to employment were present in about 66 percent of the suicide cases.[36] This economic insecurity operates through various channels. Firstly, chronic unemployment and underemployment result in psychological stress and hopelessness, particularly among young adults who delay marriage and starting families due to financial constraints. Secondly, the economic strain on families can lead to intergenerational conflict and reduced social support, which may contribute to family conflicts identified as risk factors for intentional poisoning.

Previous studies have identified any type of psychiatric disorders as an increased risk of suicide.[37,38] Although 14.5% of our cases had a

Table 2
Logistic regression analysis of factors associated with intentional poisoning compared to a acidental poisoning.

		OR (CI 95%)	P-value
Age	<20	0.42 (0.25-0.69)	0.001
	20-40	2.73 (1.84-4.07)	<0.001
	41-60	1.89 (1.21-2.93)	0.005
	>60	1	-
Child number	No child	1	-
	1-4	1.06 (0.81-1.39)	0.68
	≥5	0.45 (0.23-0.89)	0.022
Place of poisoning	Home	2.92 (1.99-4.28)	<0.001
History of psychiatric disease		3.60 (2.39-5.42)	<0.001
Addiction history		1.97 (1.56-2.48)	<0.001
Addiction type	Heroin/opium	1	-
	Smoke	2.50 (1.27-4.91)	0.008
	Alcohol	2.96 (0.82-10.61)	0.096
	Other	1.02 (0.71-1.48)	0.90
Suicide history		14.48 (6.73-31.17)	<0.001
Suicide family history		2.15 (1.03-4.49)	0.043
Criminal history		4.75 (2.36-9.56)	<0.001
Self-mulitation history		7.81 (3.12-19.57)	<0.001

Table 3
Subgroup analysis of predictors of intentional poisoning by non-pharmaceutical agent type.

		Opioids			Pesticide			Stimulant			Alcohol		
Age		**Intentional**	**Accidental**	**P-value**	**Intentional**	**Accidental**	**P-value**	**Intentional**	**Accidental**	**P-value**	**Intentional**	**Accidental**	**P-value**
	<20	25(29.1%)	61(23.6%)	<0.001	22(6.3%)	20(30.8%)	<0.001	5(10.0%)	4(40.0%)	0.040	3(5.3%)	4(18.2%)	0.08
	20-40	420(72.0%)	120(46.3%)		265(75.5%)	30(46.2%)		32(64.0%)	3(30.0%)		47(82.5%)	16(72.7%)	
	41-60	112(19.2%)	50(19.3%)		45(12.8%)	11(16.9%)		12(24.0%)	2(20.0%)		7(12.3%)	1(4.5%)	
	>60	26(4.5%)	28(10.8%)		19(5.4%)	4(6.2%)		1(2.0%)	1(10.0%)		0(0.0%)	1(4.5%)	
Gender	Female	193(32.5%)	102(39.1%)	0.06	173(47.4%)	29(44.6%)	0.68	14(27.5%)	4(36.4%)	0.72	12(20.3%)	4(18.2%)	>0.99
	Male	400(67.5%)	159(60.9%)		192(52.6%)	36(55.4%)		37(72.5%)	7(63.6%)		47(79.7%)	18(81.8%)	
Marital status	Single	280(47.2%)	109(41.8%)	0.14	142(38.9%)	34(52.3%)	0.043	27(52.9%)	6(54.5%)	0.92	37(62.7%)	14(63.6%)	0.94
	Married	313(52.8%)	152(58.2%)		223(61.1%)	31(47.7%)		24(47.1%)	5(45.5%)		22(37.3%)	8(36.4%)	
Place of poisoning	Home	397(92.5%)	180(92.8%)	0.92	243(94.6%)	42(84.0%)	0.015	22(88.0%)	4(100.0%)	>0.99	31(91.2%)	11(73.3%)	0.18
	At work	32(7.5%)	14(7.2%)		14(5.4%)	8(16.0%)		3(12.0%)	0(0.0%)		3(8.8%)	4(26.7%)	
Nationality	Iranian	585(98.8%)	256(98.1%)	0.53	335(91.8%)	59(90.8%)	0.79	51(100.0%)	11(100.0%)	-	58(98.3%)	22(100.0%)	>0.99
	Afghan	7(1.2%)	5(1.9%)		30(8.2%)	6(9.2%)		-	-		1(1.7%)	0(0.0%)	
Level of education	Illiterate	2(4.4%)	0(0.0%)	0.52	5(19.2%)	0(0.0%)	0.90	-	-	>0.99	-	-	>0.99
	Middle school degree	11(24.4%)	5(41.7%)		11(42.3%)	1(50.0%)		2(50.0%)	0(0.0%)		2(40.0%)	1(100.0%)	
	Diploma	23(51.1%)	4(33.3%)		9(34.6%)	1(50.0%)		2(50.0%)	1(100.0%)		3(60.0%)	0(0.0%)	
	College education	9(20.0%)	3(25.0%)		1(3.8%)	0(0.0%)		-	-		-	-	
Child number	No child	313(72.6%)	135(65.5%)	0.07	188(67.9%)	43(78.2%)	0.32	25(80.6%)	7(70.0%)	0.66	41(93.2%)	17(77.3%)	0.12
	1-4	111(25.8%)	63(30.6%)		81(29.2%)	11(20.0%)		6(19.4%)	3(30.0%)		3(6.8%)	4(18.2%)	
	≥5	7(1.6%)	8(3.9%)		8(2.9%)	1(1.8%)					0(0.0%)	1(4.5%)	
Route of exposure	Oral	560(95.7%)	253(98.8%)	0.021	362(99.2%)	56(90.3%)	<0.001	38(84.4%)	8(72.7%)	0.40	58(98.3%)	22(100.0%)	>0.99
	Others	25(4.3%)	3(1.2%)		3(0.8%)	6(9.7%)		7(15.6%)	3(27.3%)		1(1.7%)	0(0.0%)	
Past medical history	Yes	146(31.3%)	72(33.8%)	0.52	66(24.1%)	10(19.6%)	0.49	10(28.6%)	3(33.3%)	1.000	11(23.4%)	3(15.8%)	0.74
	No	320(68.7%)	141(66.2%)		208(75.9%)	41(80.4%)		25(71.4%)	6(66.7%)		36(76.6%)	16(84.2%)	
History of psychiatric disease	Yes	96(17.6%)	19(7.8%)	<0.001	65(19.9%)	4(6.6%)	0.012	13(28.9%)	0(0.0%)	0.051	7(15.6%)	0(0.0%)	0.087
	No	449(82.4%)	226(92.2%)		262(80.1%)	57(93.4%)		32(71.1%)	11(100.0%)		38(84.4%)	21(100.0%)	
Suicide history	Yes	115(24.6%)	4(2.1%)	<0.001	60(20.7%)	0(0.0%)	<0.001	8(19.5%)	0(0.0%)	0.32	3(7.7%)	0(0.0%)	0.54
	No	353(75.4%)	183(97.9%)		230(79.3%)	49(100.0%)		33(80.5%)	8(100.0%)		36(92.3%)	18(100.0%)	
Self-harm history	Yes	48(13.3%)	3(1.8%)	<0.001	21(9.9%)	0(0.0%)	0.052	2(6.7%)	0(0.0%)	>0.99	3(8.6%)	0(0.0%)	0.55
	No	312(86.7%)	161(98.2%)		192(90.1%)	35(100.0%)		28(93.3%)	6(100.0%)		32(91.4%)	13(100.0%)	
Suicide family history	Yes	27(5.5%)	5(2.3%)	0.051	15(5.2%)	2(3.6%)	>0.99	1 (2.4%)	0 (0.0%)	>0.99	1 (2.1%)	0 (0.0%)	>0.99
	No	94.5%	217(97.7%)		273(94.8%)	53(96.4%)		40 (97.6%)	11 (100.0%)		46 (97.9%)	18 (100.0%)	
Addiction history	Yes	292(50.4%)	92(36.2%)	<0.001	75(21.7%)	9(14.1%)	0.17	29(59.2%)	2(18.2%)	0.014	20(37.7%)	4(18.2%)	0.10
	No	287(49.6%)	162(63.8%)		270(78.3%)	55(85.9%)		20(40.8%)	9(81.8%)		33(62.3%)	18(81.8%)	
Criminal record history	Yes	44(8.7%)	7(3.1%)	0.006	13(4.5%)	0(0.0%)	0.24	10(25.0%)	0(0.0%)	0.18	2(4.3%)	0(0.0%)	>0.99
	No	462(91.3%)	218(96.9%)		279(95.5%)	55(100.0%)		30(75.0%)	10(100.0%)		44(95.7%)	21(100.0%)	

history of psychiatric disorders, a higher portion was observed in intentional exposure compared to accidental exposure (85.7%), supporting previous observations of a high rate of self-poisoning attempted suicide in patients undergoing psychiatric treatment.[39,40] Our analysis revealed that the presence of a psychiatric history increases the odds of intentional poisoning by 3.60 times. A study conducted in South Korea targeting all types of poisoning reported a 1.92-fold increase.[41] This reflects fundamental differences in mental health infrastructure and cultural attitudes across populations. In Iran, there are 2.2 psychiatrists per 100,000 populations[42] compared to 8 per 100,000 in South Korea.[43]

Cultural stigma surrounding mental illness in Iranian society is more pronounced than in East Asian countries, leading to delayed diagnosis, family concealment of symptoms, and reduced treatment compliance. Religious and cultural factors also may create unique psychological stressors in populations. While suicide is considered a sin in Islam, the cognitive dissonance between religious beliefs and suicidal ideation may create an additional psychological burden not present in secular societies.[44]

One of the strongest indicators of suicidal behavior is a previous suicide attempt.[45–47] In our study 96.2% of patients who had previously attempted suicide intentionally poisoned themselves. Furthermore, a history of suicide attempts and a family history of suicide increased the odds of intentional poisoning by 14.48 and 2.15, respectively. Many studies reported a threefold risk of suicide attempt or completed suicide in first- and second-degree relatives of subjects who attempted or died from suicide. Most studies suggest that familial aggregation of suicides could be the result of shared genetic or environmental factors.

A suicide attempt is considered a clear manifestation of psychiatric disease.[41] However our results reflect that more than half of patients with intentional intoxication may not have a history of previously diagnosed psychiatric disease. This suggests that some individuals experiencing intentional poisoning may not have sought help for their mental health struggles. Stigma and confidentiality surrounding such a sensitive issue may result in the concealment of facts, by both the patient and their family.[48] This highlights the importance of implementing mental health screening programs in high-risk populations and addressing the stigma surrounding mental health.

The limited availability of mental health services also affects the quality of post-attempt care. Studies show that many poisoning survivors in Iran may not receive adequate psychiatric follow-up, missing critical opportunities for secondary prevention [49]. This gap in continuity of care may contribute to the high rates of repeat attempts and the severity of poisoning methods chosen.

The association between a history of smoking, substance and alcohol addiction with suicide-related behaviors, is demonstrated in the literature[50–52] and is also supported by the present study. Approximately more than half of the cases with a history of alcohol, drug and other types of addiction were involved in intentional poisoning. A study using logistic regression found that all smoking behaviors, including current smoking, former smoking, and initiating smoking, were associated with increased odds of suicidal attempts and ideation.[53] Notably, smoking in our result demonstrated 2.5 times higher odds with intentional poisoning than opioid addiction. This elevation suggests that smoking may reflect underlying psychological or behavioral traits such as impulsivity, stress reactivity, or chronic risk-taking, which could predispose individuals to deliberate poisoning independent of other substance dependencies [54]. This pattern appears unique within the addiction subgroup and warrants further investigation.

Given existing knowledge about the co-occurrence of substance use disorder and suicidal attempts throughout the lifespan, genetic factors are expected to be found in biological pathways that play a key role in neuroadaptation to stressors. Although biological explanations such as Brain-derived neurotrophic factor (BDNF)-related stress reactivity have been proposed in the literature,[55] the present study was not designed to evaluate neurobiological pathways. Given the sociocultural context of Iran, more immediate environmental determinants likely play a larger role in intentional non-pharmaceutical poisoning. Limited access to psychiatric services, particularly outside major cities, coupled with high treatment-seeking stigma may delay recognition of mental distress until crisis points occur. Economic instability, unemployment and financial strain have been repeatedly identified as strong triggers for self-harm in Iranian populations, and may help explain the high prevalence of intentional poisoning among young adults. Furthermore, the widespread availability of pesticides and household toxicants in domestic settings lowers the threshold for impulsive self-harm, especially when formal mental-health care is inaccessible or culturally discouraged.

Our study supports that a previous criminal record and self harm increased the odds of suicidal selfpoisoning by about five and eight fold respectively. Self-harm stems from complex interactions of personality factors, including impulsivity which is an important risk factor for suicide attempts.[56,57]

Based on our results having five or more children was associated with a 55% decrease in intentional self-poisoning rate using non-pharmaceutical agents compared to having no children. The results of previous studies were in agreement with our findings as parenthood was associated with a reduced suicide risk. A study conducted on 1.5 million adults in Sweden showed that having one, two, three or more children was associated with a 64%, 79% and 78% lower suicide rate, respectively, compared with having no children.[58] Having children can reduce the feeling of loneliness and help to reduce a person's suicidal thoughts and provide parents with a greater sense of purpose and direction in a parent's life, including feelings of obligation, responsibility, and care-taking.[58–62]

According to the literature, there are associations between lower levels of education, marital status, somatic disease and intentional poisoning.[32] However, no significant differences were observed in our study, which may be due to a small sample size.

Our results should be interpreted cautiously because the data are limited to one region of Iran. This registry-based study at our tertiary referral poisoning center includes both historical and concurrent presentations, ensuring comprehensive case capture but introducing several limitations. First, referral bias may overrepresent severe or complex cases, and selection bias arises because only patients who reached our center are included. We excluded individuals discharged by personal consent to ensure complete outcome data, though this decision may further bias the sample if those who leave early differ systematically from retained patients. Second, data were extracted from routine clinical charts of variable completeness and accuracy, raising the possibility of information bias and misclassification despite systematic quality checks. Third, determination of poisoning intent relied on patient or family self-report, which is prone to recall and reporting bias particularly in our region, where stigma surrounding psychiatric illness and suicide may influence disclosure. This is particularly relevant for non-pharmaceutical agents, which are more easily framed as unintentional exposures within domestic environments. If intentional cases were under-reported, the true burden may be even higher than observed, and the strength of associations such as psychiatric history or addiction could be underestimated. Our findings should therefore be interpreted as conservative estimates rather than absolute measurements of intentional self-harm risk.

The exploratory design necessitated a univariate screening step to identify candidate variables for the multivariable model. While this is a common practice in such contexts and our final model prioritized coefficient stability, this approach may, in theory, overlook variables that are weak univariate predictors but important confounders in a multivariate setting. Future confirmatory studies with larger samples could bypass this step by testing a more focused set of *a* priori hypotheses.

Finally, unmeasured confounders (e.g., socioeconomic status, access to care) may persist, and the observational registry design precludes causal inference. Future prospective, multicenter studies with standardized data collection and explicit protocols for assessing intent e.g. incorporating standardized psychological assessments or collateral

information from mental health professionals are warranted to validate and extend these exploratory findings.

This study sheds light on sociodemographic characteristics and factors associated with intentional poisoning in patients with non-pharmaceutical poisoning in the poisoning referral center in Isfahan, Iran. Our findings provide an evidence base for developing targeted prevention strategies and risk assessment protocols specifically tailored to other poisoning centers in Iran as well as the Middle Eastern populations.

Key predictors identified - younger age (20-40 years), psychiatric history, addiction, previous suicide attempts, family suicide history, criminal involvement, and self-harm behavior - create a clear risk profile that can guide clinical decision-making and resource allocation. The protective effect of having five or more children supports the importance of family-based interventions in Iranian cultural contexts.

5. Conclusion

These findings emphasize the importance of targeted clinical and public health interventions rather than broad, undefined preventive strategies. It is recommended that emergency departments and poisoning centers incorporate routine mental health screening protocols for young adults, especially those with a history of self-harm, suicide attempts, or substance use. Additionally, integrating addiction counseling and smoking cessation programs into acute toxicology services may further decrease risk.

The study also showed a protective effect among individuals with multiple children. Therefore, family-based support programs and community reinforcement strategies could enhance resilience and social connectedness in high-risk individuals. Policymakers should also consider regulating access to toxic non-pharmaceutical agents within households and improving referral pathways to psychiatric care to prevent the progression from ideation to intentional poisoning.

Ethics approval and consent to participate

This research has been performed in accordance with the Declaration of Helsinki and has been approved by the ethics committee of Isfahan University of Medical Sciences (Ethics code: IR.MUI.MED.REC.1397.316).

Consent for publication

All authors approved the final version of the manuscript.

Availability of data and material

The data that support the findings of this study are available on request from the corresponding author.

Clinical trial number

Not applicable.

Code availability

'Not applicable'

Author contributions

NIM: Conceptualization, Project administration, Funding acquisition, Data curation, Supervision, Writing- Reviewing and Editing.

PM: Writing- Reviewing and Editing, Data curation.

AF: Methodology, Software, Data Curation, Validation, Writing-Reviewing and Editing.

RM: Conceptualization, Project administration, Data curation, Resources, Supervision. Visualization, Writing- Reviewing and Editing.

SGH, RY, AD: Data collection, Data gathering, Investigation.

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Conflict of interest

The authors declared there is no conflict of interest.

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