Check for updates

Journal of Applied Toxicology

WILEY

Journal of Applied Toxicology

RESEARCH ARTICLE

Determinants of Intentional Pharmaceutical Poisoning: A Cross-Sectional Study From a Referral Poisoning Center in Iran

Nastaran Eizadi-Mood[1] | Maryam Rajaeizadeh[2] | Awat Feizi[3] | Razieh Yazdi[2] | Amin Dorostkar[2] | Parisa Mirmoghtadaee[4] | Rokhsareh Meamar[5]

[1]Department of Clinical Toxicology, Isfahan Clinical Toxicology Research Center, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran | [2]Department of Clinical Toxicology, Isfahan University of Medical Sciences, Isfahan, Iran | [3]Department of Epidemiology & Biostatistics, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran | [4]Deputy of Research and Technology, Isfahan University of Medical Sciences, Isfahan, Iran | [5]Department of Clinical Toxicology, School of Medicine, Isfahan Clinical Toxicology Research Center, Khorshid Hospital, Isfahan University of Medical Sciences, Isfahan, Iran

Correspondence: Rokhsareh Meamar (meamar@med.mui.ac.ir)

Received: 28 February 2026 | **Revised:** 7 July 2026 | **Accepted:** 22 July 2026

Keywords: acute poisoning | determinant | intentional | pharmaceutical

ABSTRACT

Pharmaceutical poisoning is a major health concern and a leading method of intentional self-poisoning. In Iran, broad medication access has increased the burden, yet factors distinguishing intentional from accidental exposures remain underexplored. This study aimed to identify the determinants of intentional pharmaceutical poisoning using both traditional statistical methods and machine learning techniques. We conducted a cross-sectional study at a referral poisoning center in Isfahan, Iran, between January 2015 and December 2019. Medical records of patients admitted with pharmaceutical poisoning were reviewed for demographics, toxicological characteristics, and past history. Univariate logistic regression assessed determinants of intentional poisoning. A multilayer perceptron (MLP) neural network evaluated variable importance and discrimination. Among 3096 eligible patients, 94.4% were intentional cases. Mean (SD) age of intentional cases was 32.14 (10.74) years, predominantly 20–40 years. Logistic regression identified female sex (OR: 2.01; 95% CI: 1.47–2.73), age 20–40 (OR: 9.85; 95% CI: 6.79–14.29), age 41–60 (OR: 4.80; 95% CI: 2.94–7.85), and history of psychiatric disease (OR: 1.54; 95% CI: 1.03–2.30) as significant determinants. The MLP showed strong discrimination (AUC: 0.859); age, number of children, education, and history of psychiatric disease were top predictors. Efforts should prioritize family and social support, mitigation of educational/occupational stressors, early psychiatric screening, timely psychological care, and community-based programs to identify and protect high-risk groups and reduce recurrence.

1 | Introduction

Acute poisoning is a significant global public health issue and continues to be a common reason for emergency department admissions (Salem et al. 2024; Getie and Belayneh 2020). Acute poisonings may occur either intentionally, often in the context of self-harm or suicide attempts, or unintentionally, due to accidental overdoses (Getie and Belayneh 2020; Zemedie et al. 2021). Each year, approximately 370,000 deaths from intentional poisoning and 193,469 deaths from unintentional poisoning are reported worldwide, with the vast majority occurring in low- and middle-income countries (LMICs) (Telayneh et al. 2024). Deliberate self-poisoning is widely recognized as a common method of attempting suicide (Finkelstein et al. 2015). The consequences of intentional poisoning extend beyond acute morbidity and mortality, contributing to repeated hospitalizations and

© 2026 John Wiley & Sons Ltd.

All rights reserved, including rights for text and data mining and training of artificial intelligence technologies or similar technologies.

increased health care costs (Finkelstein et al. 2015; Laflamme et al. 2024; Owens et al. 2005). The effects of poisonings, especially intentional ones, impact not only the individual attempting suicide but also their family and friends (Piekarska-Wijatkowska et al. 2016). Unlike highly lethal violent methods, survival following intentional self-poisoning is common, which presents an important chance to implement secondary prevention strategies (Finkelstein et al. 2015).

Pharmaceutical agents constitute one of the leading causes of acute poisoning cases (Eizadi-Mood et al. 2024; Cowans et al. 2023; Alinejad et al. 2017). According to a review study, in high-income countries (HICs), pharmaceutical agents account for over half of all poisoning cases, whereas in LMICs, they only make up around 10% of toxic exposures (Cowans et al. 2023). Despite this lower proportion, the mortality rate from drug overdoses in LMICs is estimated to be nearly four times higher than that observed in HICs (Cowans et al. 2023).

In Iran, as a developing country, the general increase in availability of medications, particularly over-the-counter drugs, has made pharmaceuticals the leading cause of poisoning (Alinejad et al. 2017). Pharmaceutical poisoning is among the common causes of acute poisoning in many provinces of Iran such as Shiraz, Isfahan, Tehran, and Razavi Khorasan (Eizadi-Mood et al. 2024; Alinejad et al. 2017; Aryaie et al. 2012; Ghazi-Khansari and Oreizi 1995). Most pharmaceutical poisonings in Iran are intentional and predominantly occur in the young population (Naseri et al. 2023). According to a review study, the most important pharmaceutical drugs ingested were antidepressants, sedative-hypnotics, antipsychotics, antiepileptics, and analgesics like acetaminophen (Alinejad et al. 2017).

Despite the high prevalence of pharmaceutical poisoning in Iran, limited studies have comprehensively examined the differences distinguishing intentional from accidental cases, particularly using advanced analytical approaches. There is a necessity to know the factors associated with intentional poisoning with medications, to take up appropriate preventive efforts and management. However, we previously reported the clinical-epidemiological features and outcomes of poisoned patients involving pharmaceutical and nonpharmaceutical substances (Eizadi-Mood et al. 2024). Additionally, recently, we reported first analytical comparisons distinguishing intentional from accidental cases on nonpharmaceutical poisoning in Iran (Eizadi-Mood et al. 2026), but this study was conducted to investigate the demographics, toxicological characteristics, past history, and determinants of intentional pharmaceutical poisoning among patients admitted to a referral poisoning center in Isfahan, Iran, employing both traditional statistical analyses and machine learning methods.

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, a large city in the central part of Iran. The study was conducted in accordance with the *Basic & Clinical Pharmacology & Toxicology* policy for experimental and clinical studies (Tveden-Nyborg et al. 2023). Ethical approval was granted by the Ethics Committee of Isfahan University of Medical Sciences (under the code: IR.MUI.MED.REC.1397.316). Written informed consent was obtained from all participants or their legal guardians.

2.2 | Participants

Patient information was retrieved from hospital archives. The study population consisted of individuals admitted to the poisoning center between January 2015 and December 2019 due to exposure to pharmaceutical agents, identified according to discharge diagnosis codes of T36–T50 (drugs, medicaments, and biological substances) based on the International Classification of Diseases, 10th Revision (ICD-10).

Binary logistic regression was used to quantify the association of determinant of intentional poisoning by odds ratio (ORs) and 95% confidence interval (95% CI) for OR. A *p*-value less than 0.05 was considered statistically significant.

Patients with incomplete data records were excluded. The diagnosis of pharmaceutical poisoning was determined by the patient's or their companions' reported history, physical examination, laboratory toxicology results, and toxicology urine analysis when required.

2.3 | Data Collection

A structured data extraction form was used to obtain information on demographics, past medical history, and toxicological findings, including sex, age, education level (illiterate, middle school degree, diploma, and college education), place of poisoning, marital status (single and married), type of exposure (intentional and unintentional), child number, route of exposure (inhalation, ingestion, intravenous, and mixed [combination of two routes or more]), past medical history (diabetes, cardiac, renal, pulmonary, and others), history of psychiatric disease, addiction (opioids, alcohol, cigarettes smoking, and others [including stimulants and drugs]), previous history of attempted suicide, self-harm, suicide in the family, and criminal records were collected.

2.4 | Statistical Analysis

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software for Windows version 26 (IBM Corp. Released 2019. Armonk, NY: IBM Corp). Numerical variables were presented as mean and standard deviation, which were assessed using the Kolmogorov–Smirnov test, whereas categorical variables were expressed as frequency and percentage. For between-group comparisons, the independent *t*-test was employed for normally distributed continuous variables; categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate.

In addition to univariate comparisons, a multivariable binary logistic regression analysis (enter method) was performed to

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TABLE 1 | Demographics, toxicologic characteristics, and history of patients according to type of exposure.

		Total $N=3096$	Intentional $N=2923$	Accidental $N=173$	p
Gender	Female	1980 (64.0%)	1897 (64.9%)	83 (48.0%)	<0.001
	Male	1116 (36.0%)	1026 (35.1%)	90 (5.0%)	
Age (year)	Mean ± SD	32/00 ± 11.53	32.14 ± 10.74	29.81 ± 20.69	0.15
	<20	282 (9.2%)	218 (7.6%)	64 (37.4%)	<0.001
	20–40	2246 (73.5%)	2181 (75.7%)	65 (38.0%)	
	41–60	434 (14.2%)	409 (14.2%)	25 (14.6%)	
	>60	92 (3.0%)	75 (2.6%)	17 (9.9%)	
Marital status	Single	1438 (46.4%)	1346 (46.0%)	92 (53.2%)	0.068
	Married	1658 (53.6%)	1577 (54.0%)	81 (46.8%)	
Education level	Illiterate	19 (0.09%)	14 (7.1%)	5 (35.7%)	0.004
	Middle school degree	62 (29.4%)	60 (30.5%)	2 (14.3%)	
	Diploma	95 (45.0%)	90 (45.7%)	5 (35.7%)	
	College education	35 (16.6%)	33 (16.8%)	2 (14.3%)	
Child number	No child	1721 (73.6%)	1618 (73.3%)	103 (78.6%)	0.003
	1–4	589 (25.2%)	566 (25.6%)	23 (17.6%)	
	≥5	28 (1.2%)	23 (1.0%)	5 (3.8%)	
Nationality	Iranian	3013 (97.4%)	2849 (97.6%)	164 (94.8%)	0.026
	Afghan	80 (2.6%)	71 (2.4%)	9 (5.2%)	
City of residency	Esfahan	3045 (98.8%)	2877 (98.8%)	168 (97.7%)	0.16
	Other cities of Iran	38 (1.2%)	34 (1.2%)	4 (2.3%)	
Place of poisoning	Home	2396 (97.8%)	2259 (97.8%)	137 (98.6%)	0.41
	At work	53 (2.2%)	51 (2.2%)	2 (1.4%)	
Route of exposure	Oral	3071 (99.5%)	2901 (99.6%)	170 (98.3%)	0.007
	Inhalation	5 (0.2%)	3 (0.1%)	2 (1.2%)	
	Intravenous	1 (0.0%)	1 (0.0%)	0 (0.0%)	
	Mixed	8 (0.3%)	7 (0.2%)	1 (0.6%)	
Past medical history	Yes	830 (34.4%)	778 (34.2%)	52 (37.1%)	0.48
	No	1584 (65.6%)	1496 (65.8%)	88 (62.9%)	
History of psychiatric disease	Yes	742 (26.1%)	711 (26.6%)	31 (19.0%)	0.033
	No	2098 (73.9%)	1966 (73.4%)	132 (81.0%)	
Self-harm history	Yes	230 (11.8%)	229 (12.4%)	1 (1.0%)	0.001
	No	1711 (88.2%)	1612 (87.6%)	99 (99.0%)	
Suicide history	Yes	657 (26.4%)	653 (27.6%)	4 (3.3%)	<0.001
	No	1829 (73.6%)	1711 (72.4%)	118 (96.7%)	
Suicide family history	Yes	183 (7.1%)	180 (7.4%)	3 (2.1%)	0.015
	No	2401 (92.9%)	2259 (92.6%)	142 (97.9%)	

(Continues)

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TABLE 1 | (Continued)

		Total $N = 3096$	Intentional $N = 2923$	Accidental $N = 173$	p
Addiction type	Heroin/opium	92 (3.0%)	83 (2.8%)	9 (5.2%)	0.19
	Smoke	182 (5.9%)	174 (6.0%)	8 (4.6%)	
	Alcohol	21 (0.7%)	21 (0.7%)	0 (0.0%)	
	Other	2801 (90.5%)	2645 (90.5%)	156 (90.2%)	
Addiction history	Yes	582 (19.7%)	553 (19.8%)	29 (17.7%)	0.51
	No	2379 (80.3%)	2244 (80.2%)	135 (82.3%)	
Criminal history	Yes	61 (2.4%)	56 (2.3%)	5 (3.3%)	0.28
	No	2519 (97.6%)	2373 (97.7%)	146 (96.7%)	
Somatic disease	Yes	830 (26.8%)	778 (26.6%)	52 (30.1%)	0.48
	No	1584 (51.2%)	1496 (51.2%)	88 (50.9%)	
	Not reported	682 (22.0%)	649 (22.2%)	33 (19.1%)	

Note: The results are presented as number (percent) for categorical or mean ± SD for continuous variables. Categorical variables were compared between groups with chi-square or Fisher's exact tests where appropriate and continuous variables were compared with independent samples t-test. The p value less than 0.05 were considered as statistically significant.

identify independent risk factors associated with intentional versus accidental poisoning. Variables with a p-value < 0.05 in the univariate analysis were entered into the logistic regression model. The model's goodness-of-fit was assessed using the Hosmer–Lemeshow test, and adjusted ORs with 95% CIs were reported. To address multicollinearity among several key demographic predictors (e.g., age and number of children) and to explore complex nonlinear relationships beyond the scope of conventional regression, we also employed a complementary machine learning approach. A multilayer perceptron (MLP) neural network was implemented using SPSS version 26 to enhance predictive performance. The dataset was randomly partitioned into training (80%) and testing (20%) subsets, with no holdout sample. To ensure comparability across different scales, all continuous covariates (age and number of children) were standardized (Z-scores) prior to model training. Model performance was evaluated on both training and testing samples using classification accuracy, sensitivity, specificity, and the area under the receiver operating characteristic curve (AUC). The relative contribution of each predictor to the model was assessed using the normalized variable importance metric, derived from the partitioning of connection weights.

3 | Results

A total of 3524 patients with acute pharmaceutical poisoning were included in our study, of whom 428 (12.1%) patients were excluded due to incomplete data record of intentionality. The majority had attempted intentional self-poisoning ($n = 2923$, 94.4%). Table 1 presents demographics, toxicologic characteristics, and history of patients according to type of exposure.

The mean (SD) age of patients with intentional poisoning was 32.14 (10.74) years. The age distribution showed significant differences ($p < 0.001$). Most intentional cases were concentrated in the 20–40-year age group (75.7%). In contrast, accidental poisonings were disproportionately concentrated in younger patients, with 37.4% of cases occurring in those under 20 years and 38.0% in those aged 20–40 years. With respect to marital status, slightly more than half of the overall sample were married (53.6%). Intentional poisoning had somewhat a higher proportion among married individuals, whereas accidental poisoning was more common among single patients; however, this difference did not reach statistical significance ($p = 0.068$).

Educational attainment demonstrated significant differences between groups ($p = 0.004$). Among patients with intentional poisoning, most had a diploma-level of education (45.7%), whereas accidental poisoning was more common among those who were illiterate and those with diploma-level of education (35.7%). Significant differences were also observed in the number of children, their nationality, and the route of exposure (all $p < 0.05$). Oral ingestion was the main route of exposure for both patients with intentional and accidental poisoning (99.6% vs. 98.3%). Most exposures occurred at home (97.8%), with no significant difference between the two groups ($p = 0.41$).

Patients with intentional poisoning had a significantly higher proportion of previous psychiatric disorder ($p = 0.033$), self-harm ($p = 0.001$), and prior suicide attempts ($p < 0.001$). Similarly, a family history of suicide was significantly more frequent among intentional cases (7.4% vs. 2.1%; $p = 0.015$).

3.1 | Determinants of Intentional Poisoning

Logistic regression analysis revealed several significant determinants of intentional pharmaceutical poisoning compared to accidental cases (Table 2). Female sex was associated with a twofold higher likelihood of intentional poisoning (OR = 2.01, 95% CI: 1.47–2.73). Compared with patients younger than 20 years, those aged 20–40 years (OR = 9.85, 95% CI: 6.79–14.29) and 41–60 years (OR = 4.80, 95% CI: 2.94–7.85) had significantly

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

TABLE 2 | Factors associated with intentional poisoning compared to accidental poisoning.

		Univariable model OR (95% CI)	*p*
Age (year)	< 20	1	—
	20–40	9.85 (6.79–14.29)	< 0.001
	41–60	4.80 (2.94–7.85)	< 0.001
	> 60	1.30 (0.71–2.35)	0.40
Gender	Male	1	—
	Female	2.01 (1.47–2.73)	< 0.001
Education level	Illiterate	1	
	Middle school degree	10.71 (1.88–61.04)	0.008
	Diploma	6.43 (1.65–25.08)	0.007
	College education	5.89 (1.02–34.08)	0.048
Child number	No child	1	—
	1–4	1.57 (0.99–2.49)	0.06
	≥ 5	0.29 (0.11–0.79)	0.02
Nationality	Iranian	2.20 (1.08–4.48)	0.03
	Afghan	1	—
Route of exposure	Oral	4.85 (1.29–16.84)	0.05
	Others (Inhalation/ intravenous/ mixed)	1	—
History of psychiatric disease	No (ref)	1.54 (1.03–2.3)	0.04
Self-harm history	No (ref)	14.06 (1.95–101.32)	0.01
Suicide history	No (ref)	11.26 (4.14–30.62)	< 0.001

Abbreviations: CI, confidence interval; OR, odd ratio; ref, reference category.

greater odds of intentional poisoning. Educational attainment was also significantly associated with intentional poisoning. Compared with illiterate individuals, patients with a middle school education (OR = 10.71, 95% CI: 1.88–61.04), a high school diploma (OR = 6.43, 95% CI: 1.65–25.08), or a college education (OR = 5.89, 95% CI: 1.02–34.08) had significantly higher odds of intentional poisoning. Additionally, in Table 2, a history of psychiatric disease (OR = 1.54, 95% CI: 1.03–2.3), suicide history (OR = 11.26, 95% CI: 4.14–30.62), and self-harm (OR = 14.06, 95% CI: 1.95–101.32) increased the odds of intentional poisoning. Having five or more children (OR = 0.29, 95% CI: 0.11–0.79) decreased the odds of intentional poisoning.

The MLP network with two hidden layers demonstrated substantially improved performance in distinguishing accidental from intentional poisonings. In the training sample (80% of the dataset), the model correctly classified 45.5% of accidental cases (5 out of 11) and 98.6% of intentional cases (69 out of 70), yielding an overall training accuracy of 91.4%. In the testing sample (20% of the dataset), the model achieved perfect classification, correctly identifying all accidental (1 out of 1) and intentional (13 out of 13) cases, resulting in an overall testing accuracy of 100%.

The area under the curve (AUC) values were 0.859 for both accidental and intentional poisoning categories, indicating excellent overall discriminative ability of the model.

The variable importance chart (Figure 1) illustrates the relative contribution of each predictor to the model. Based on the raw importance scores, the most impactful variables were number of children (0.22), followed by education (0.12), history of psychiatric disease (0.11), nationality (0.10), route of exposure (0.09), history of self-harm (0.08), gender (0.06), and history of suicide attempts (0.04). However, when examining the normalized importance (where the strongest predictor is scaled to 100%), age emerged as the dominant predictor (100%), closely followed by number of children (92.3%), education (52.5%), history of psychiatric disease (46.0%), nationality (45.6%), and route of exposure (42.8%). Variables such as history of self-harm (35.8%), gender (16.4%), and history of suicide attempts (4.9%) showed comparatively lower predictive weights.

These findings highlight that demographic and familial factors particularly age and number of children are the principal determinants of poisoning type, although psychiatric history and nationality also contributed meaningfully to the model's predictive capacity. Importantly, the marked improvement in sensitivity for accidental cases (45.5% in the training set) confirms that the model no longer defaults to the majority class and now possesses tangible clinical utility. Nevertheless, given the limited number of accidental cases in the testing subset ($n = 1$), these results should be interpreted with caution, and future research with larger, more balanced datasets is warranted to further validate these findings.

4 | Discussion

Identifying factors associated with suicide by self-poisoning is a crucial step in developing effective suicide prevention strategies, since it can be used to choose the right interventions and determine how to implement them (Zheng et al. 2023). Therefore, we retrospectively evaluated patients hospitalized with acute pharmaceutical poisoning and nonpharmaceutical substances in a referral poisoning center in the central part of Iran (Eizadi-Mood et al. 2024). However, the aim of the current study was to evaluate the factors associated with intentional pharmaceutical poisoning in these individuals according to this point that we recently reported factors that can influence intentional nonpharmaceutical poisoning in Iran (Eizadi-Mood et al. 2026).

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

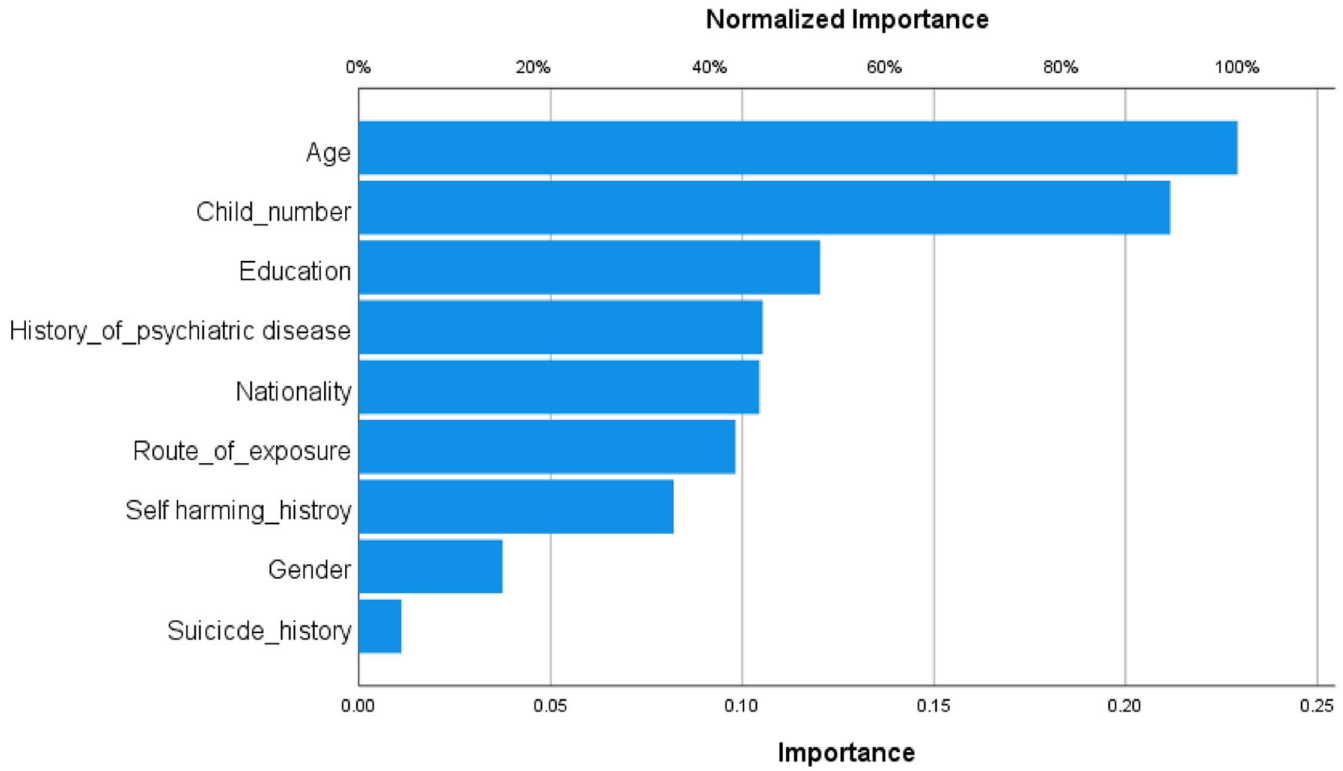

FIGURE 1 | Predictor importance ranking derived from the multilayer perceptron model for distinguishing accidental from intentional poisonings.

The importance rate derived from the MLP neural network highlighted age group, number of children, nationality, and educational level as the most influential predictors of intentional pharmaceutical poisoning.

Age emerged as the most important determinant, with young adults, particularly those aged 20–40 years, showing the highest likelihood of intentional poisoning, up to about 10 times higher. Alwan et al. (2020) conducted a study on patients with pharmaceutical poisoning and found that the incidence of poisoning was highest among individuals aged 20–29 years. Another study conducted in India on pharmaceutical poisoning showed that intentional poisoning was higher, with the highest number of patients aged 21–30 years (Nair and Revi 2015). Other studies in India, New Zealand, and other parts of Iran showed that younger ages were more involved in intentional self-poisoning (Kumpula et al. 2020; Abhilash et al. 2022; Azizpour et al. 1993). Mental stress, which can stem from various sources such as unemployment, starting new employment, relationship failures, educational challenges, emotional instability, or immaturity in handling extreme mental pressure, could play a role in the increased odds of intentional poisoning in this age group (Alwan et al. 2020; Uzun et al. 2009; Fergusson et al. 2000; Zhao et al. 2015; Zhang and Jia 2011).

Nationality and educational attainment were also among the important factors, with Iranian patients and individuals with middle school, diploma, or college education demonstrating higher odds compared with Afghan patients and illiterate individuals. Those with a middle school degree had the highest odds of intentional pharmaceutical poisoning compared to illiterate patients. In another study, the highest rate of suicide events was reported among those with an education level of under diploma (Azin et al. 2008). Educated individuals may face psychosocial pressures such as academic competition, unemployment, or unfulfilled aspirations. Psychological research indicates that disappointment or feeling regret about an unattained goal, particularly in relation to education or career, is associated with depression (Mossakowski 2011). Conversely, Zheng et al. reported that a higher education level was a protective factor for intentional self-poisoning (Zhang and Jia 2011).

The number of children was also a strong factor, showing a complex association between the number of children and the odds of intentional pharmaceutical poisoning. Patients with one to four children demonstrated higher odds of intentional self-poisoning compared with those without children, whereas having five or more children significantly reduced the likelihood of such attempts. Dehara et al. (2021), in a study in Sweden, found a strong association between parenthood and a lower risk of suicide in both women and men aged 25–44. Sörberg Wallin et al. (2022) also reported similar results, showing a lower risk of suicide in parents that decreased with age. Although traditional beliefs suggest that parenthood is protective against suicide due to the sense of connectedness and responsibility (Sörberg Wallin et al. 2022), our findings suggest that this relationship is not straightforward. The contrasting effects observed between smaller and larger family sizes highlight the need for further research in this area to clarify the mechanisms through which parenthood influences suicide with self-poisoning.

In our study, a history of psychiatric disease was associated with an increased likelihood of intentional pharmaceutical poisoning (OR: 1.54, 95% CI: 1.03–2.30). However, it is important to note the marginal significance of this finding, and the lower bound

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

approaching the null value of 1.0 suggests that while a trend exists, psychiatric history may be a less robust predictor in our specific cohort compared to other factors like prior self-harm or age. These results are broadly consistent with international literature (Zheng et al. 2023; Lumpe et al. 2022), but should be interpreted with caution. The relatively small number of cases in certain subgroups, such as the accidental poisoning group with a psychiatric history, limits the precision of this estimate. Previous studies have indicated that individuals with any form of psychiatric disorder face an elevated risk of suicide, with the highest rates observed among those with psychotic, mood, or personality disorders (Lumpe et al. 2022; San Too et al. 2019; Moitra et al. 2021).

This study has several limitations that should be acknowledged. First, its cross-sectional design restricts the ability to establish causal relationships between the identified determinants and intentional poisoning. Second, the data were obtained from hospital medical records, which may be subject to incomplete documentation or recall bias from patients and their families. Finally, the study was conducted in a single referral poisoning center in Isfahan, which may limit the generalizability of the findings to other regions of Iran or different healthcare settings. Furthermore, the limited sample size within specific subgroups, particularly the accidental poisoning group, resulted in wide CIs and marginal significance for certain variables like psychiatric history and higher education levels. This lack of statistical precision is a notable constraint on the replicability of these specific findings and necessitates caution when asserting them as definitive determinants. Future multicenter studies with larger, more balanced cohorts are required to refine these risk estimates.

5 | Conclusion

This study sheds light on factors associated with intentional poisoning in patients with pharmaceutical poisoning. Age, number of children, nationality, and educational level are the most influential predictors of intentional pharmaceutical poisoning in this study. Our findings indicate that female sex, younger age groups (20–60 years), and a history of self-harm or prior suicide attempts are strong determinants of intentional pharmaceutical poisoning. Other factors, including specific educational levels and a history of psychiatric disease, showed potential associations but exhibited marginal statistical significance and lower precision. Therefore, while these factors may contribute to the risk profile, they should be viewed as secondary indicators until further research with larger subgroup populations can confirm their predictive strength. Based on these findings, addressing educational and occupational pressures that may contribute to distress, especially among individuals with middle school and diploma-level education, is essential. Furthermore, family-centered interventions should be encouraged, since larger family structures may provide protective support against self-poisoning behaviors. Prevention strategies should also focus on early psychiatric screening and timely interventions for individuals with a history of psychiatric disease, self-harm, or previous suicide attempts, alongside the development of community-based mental health programs targeting young adults, particularly women.

Funding

Nastaran Eizadi-Mood reports that financial support was provided by the Isfahan University of Medical Sciences. Nastaran Eizadi-Mood reports a relationship with Isfahan University of Medical Sciences that includes employment. Nastaran Eizadi-Mood has a patent licensed to IR.MUI.MED.REC.1397.316.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

References

Abhilash, K. P. P., S. Murugan, N. A. S. Rabbi, et al. 2022. "Deliberate Self-Poisoning and Harm: A Meticulous Quest of Methods in Vogue." *Journal of Family Medicine and Primary Care* 11, no. 1: 233–239.

Alinejad, S., N. Zamani, M. Abdollahi, and O. Mehrpour. 2017. "A Narrative Review of Acute Adult Poisoning in Iran." *Iranian Journal of Medical Sciences* 42, no. 4: 327–346.

Alwan, I. A., A. I. Awadh, B. Tangiisuran, H. R. M. Khan, N. Yahaya, and M. I. Majid. 2020. "Pharmaceuticals Poisoning: Reported by the National Poison Centre in Malaysia Between 2010 and 2015." *Journal of Pharmacy & Bioallied Sciences* 12, no. 4: 475–481.

Aryaie, M., R. Dokoohaki, A. Rezaeian Mehrabadi, and F. Bakhsha. 2012. "Epidemiological Study of Poisoning in Teaching Hospitals in Shiraz in 1387." *Alborz University Medical Journal* 1, no. 2: 71–76.

Azin, S. A., A. Shahidzadeh-Mahani, S. Omidvari, M. Ebadi, and A. Montazeri. 2008. "Self Poisoning With Suicidal Intent—Part I [in Persian]." *Payesh (Health Monitor Journal)* 7, no. 2: 97–106.

Azizpour, Y., K. Asadollahi, K. Sayehmiri, S. Kaikhavani, and G. Abangah. 1993. "Epidemiological Survey of Intentional Poisoning Suicide During 1993–2013 in Ilam Province, Iran." *BMC Public Health* 16, no. 1: 902.

Cowans, C., A. Love, B. Tangiisuran, and S. A. Jacob. 2023. "Uncovering the Hidden Burden of Pharmaceutical Poisoning in High-Income and Low-Middle-Income Countries: A Scoping Review." *Pharmacy (Basel)* 11, no. 6: 184.

Dehara, M., M. B. Wells, H. Sjöqvist, K. Kosidou, C. Dalman, and A. Sörberg Wallin. 2021. "Parenthood Is Associated With Lower Suicide Risk: A Register-Based Cohort Study of 1.5 Million Swedes." *Acta Psychiatrica Scandinavica* 143, no. 3: 206–215.

Eizadi-Mood, N., S. Ghadiri, A. Feizi, et al. 2026. "Evaluation of Factors Associated With Intentional Non-Pharmaceutical Poisoning in Iran." *Journal of Forensic and Legal Medicine* 111: 103155.

Eizadi-Mood, N., H. Sanjari, A. Feizi, et al. 2024. "Clinico-Epidemiological Evaluation of Pharmaceutical/Non-Pharmaceutical Poisoning in a Referral Poisoning Emergency in the Central Part of Iran." *Scientific Reports* 14, no. 1: 10493.

Fergusson, D. M., L. J. Woodward, and L. J. Horwood. 2000. "Risk Factors and Life Processes Associated With the Onset of Suicidal Behaviour During Adolescence and Early Adulthood." *Psychological Medicine* 30, no. 1: 23–39.

Finkelstein, Y., E. M. Macdonald, S. Hollands, et al. 2015. "Risk of Suicide Following Deliberate Self-Poisoning." *JAMA Psychiatry* 72, no. 6: 570–575.

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Getie, A., and Y. M. Belayneh. 2020. "A Retrospective Study of Acute Poisoning Cases and Their Management at Emergency Department of Dessie Referral Hospital, Northeast Ethiopia." *Drug, Healthcare and Patient Safety* 12: 41–48.

Ghazi-Khansari, M., and S. Oreizi. 1995. "A Prospective Study of Fatal Outcomes of Poisoning in Tehran." *Veterinary and Human Toxicology* 37, no. 5: 449–452.

Kumpula, E.-K., B. Lambie, P. Quigley, S. Nada-Raja, and P. Norris. 2020. "Prescribers Aware: A Cross-Sectional Study From New Zealand Emergency Departments on the Substances Used in Intentional Self-Poisoning and Their Sources." *Journal of Primary Health Care* 12, no. 3: 235–243.

Laflamme, L., E. Lindholm, and J. Möller. 2024. "Repeated Hospital Admission for Intentional Poisonings Among Older Adults—A Swedish National Register-Based Study." *BMC Geriatrics* 24, no. 1: 157.

Lumpe, M., J. Schurr, C. Rabe, et al. 2022. "Socio-Demographic and Psychiatric Profile of Patients Hospitalized due to Self-Poisoning With Suicidal Intention." *Annals of General Psychiatry* 21, no. 1: 16.

Moitra, M., D. Santomauro, L. Degenhardt, et al. 2021. "Estimating the Risk of Suicide Associated With Mental Disorders: A Systematic Review and Meta-Regression Analysis." *Journal of Psychiatric Research* 137: 242–249.

Mossakowski, K. N. 2011. "Unfulfilled Expectations and Symptoms of Depression Among Young Adults." *Social Science & Medicine* 73, no. 5: 729–736.

Nair, P. K., and N. G. Revi. 2015. "One-Year Study on Pattern of Acute Pharmaceutical and Chemical Poisoning Cases Admitted to a Tertiary Care Hospital in Thrissur, India." *Asia Pacific Journal of Medical Toxicology* 4, no. 2: 79–82.

Naseri, K., Z. Kiani, Z. S. Sajadi, et al. 2023. "Pharmaceutical Toxicity Is a Common Pattern of Inpatient Acute Poisonings in Birjand City, East of Iran." *Scientific Reports* 13, no. 1: 1312.

Owens, D., C. Wood, D. C. Greenwood, T. Hughes, and M. Dennis. 2005. "Mortality and Suicide After Non-Fatal Self-Poisoning: 16-Year Outcome Study." *British Journal of Psychiatry: The Journal of Mental Science* 187, no. 5: 470–475.

Piekarska-Wijatkowska, A., K. Kobza-Sindlewska, A. Rogaczewska, R. Zajdel, and A. Krakowiak. 2016. "Intentional Poisoning Among Elderly People—Residents of a Large Urban Agglomeration in Poland." *Human & Experimental Toxicology* 35, no. 12: 1328–1336.

Salem, W., P. Abdulrouf, B. Thomas, et al. 2024. "Epidemiology, Clinical Characteristics, and Associated Cost of Acute Poisoning: A Retrospective Study." *Journal of Pharmaceutical Policy and Practice* 17, no. 1: 2325513.

San Too, L., M. J. Spittal, L. Bugeja, L. Reifels, P. Butterworth, and J. Pirkis. 2019. "The Association Between Mental Disorders and Suicide: A Systematic Review and Meta-Analysis of Record Linkage Studies." *Journal of Affective Disorders* 259: 302–313.

Sörberg Wallin, A., H. Sjöqvist, M. Dehara, et al. 2022. "Parenthood and Lower Risk of Suicide in Women and Men: The Total Swedish Population Followed Across Adulthood." *Social Psychiatry and Psychiatric Epidemiology* 57, no. 11: 2241–2250.

Telayneh, A. T., S. D. Habtegiorgis, M. Y. Birhanu, et al. 2024. "Mortality of Acute Poisoning and Its Predictors in Ethiopia: A Systematic Review and Meta-Analysis." *Heliyon* 10, no. 8: e29741.

Tveden-Nyborg, P., T. K. Bergmann, N. Jessen, U. Simonsen, and J. Lykkesfeldt. 2023. "BCPT 2023 Policy for Experimental and Clinical Studies." *Basic & Clinical Pharmacology & Toxicology* 133, no. 4: 391–396.

Uzun, I., F. A. Karayel, E. U. Akyıldız, A. A. Turan, S. Toprak, and B. B. Arpak. 2009. "Suicide Among Children and Adolescents in a Province of Turkey." *Journal of Forensic Sciences* 54, no. 5: 1097–1100.

Zemedie, B., M. Sultan, and A. Zewdie. 2021. "Acute Poisoning Cases Presented to the Addis Ababa Burn, Emergency, and Trauma Hospital Emergency Department, Addis Ababa, Ethiopia: A Cross-Sectional Study." *Emergency Medicine International* 2021, no. 1: 6028123.

Zhang, J., and C. Jia. 2011. "Suicidal Intent Among Young Suicides in Rural China." *Archives of Suicide Research* 15, no. 2: 127–139.

Zhao, C.-j., X.-b. Dang, X.-l. Su, J. Bai, and L.-y. Ma. 2015. "Epidemiology of Suicide and Associated Socio-Demographic Factors in Emergency Department Patients in 7 General Hospitals in Northwestern China." *Medical Science Monitor* 21: 2743–2749.

Zheng, W., L. Gao, Y. Fan, et al. 2023. "Identification of Risk Factors for Attempted Suicide by Self-Poisoning and a Nomogram to Predict Self-Poisoning Suicide." *Frontiers in Public Health* 11: 1106454.

10991263, 0, Downloaded from https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/jat.70378 by saeed mahdavi - University Of Edinburgh , Wiley Online Library on [08/08/2026]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License