

# Clinical Outcomes Following Suicide Attempts: In-Hospital Mortality and Discharge Against Medical Advice



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## ABSTRACT

**Objective:** Suicide attempts remain a major public health concern worldwide. This study aimed to analyze factors associated with in-hospital mortality and treatment Discontinuation Against Medical Advice (DAMA) following suicide attempts.

**Methods:** This retrospective, record-based, single-center observational study included adult patients who presented to the emergency department after a suicide attempt between January 2009 and December 2024. Data were obtained from the hospital information system, medical records, and forensic notification files. Factors associated with in-hospital mortality and DAMA were evaluated using logistic regression analyses.

**Results:** A total of 2,909 individuals were included (mean age 30±12 years; 64.4% female). Drug ingestion was the most common suicide method (84.2%). In-hospital mortality was observed in 2.2% of cases (n=63), with the highest lethality rate (94.1%) among individuals who attempted suicide by jumping from heights of five floors or higher. In multivariable analysis, older age (OR: 1.04; 95% CI: 1.02–1.06), male sex (OR: 4.40; 95% CI: 2.29–8.43), schizophrenia (OR: 3.63; 95% CI: 1.02–12.88), and alcohol use (OR: 2.38; 95% CI: 1.34–4.24) were identified as independent predictors of in-hospital mortality. Discontinuation against medical advice (DAMA) occurred in 53.8% of cases (n=1,564) and was significantly associated with younger age, absence of a prior suicide attempt, and fewer psychiatric comorbidities.

**Conclusions:** Suicide attempt aftercare should extend beyond acute medical stabilization and incorporate proactive, individualized strategies aimed at improving patient engagement and mitigating method-specific risks.

**Keywords:** Discharge against medical advice, in-hospital mortality, risk factors, suicide, treatment rejection

## INTRODUCTION

Suicide remains a major public health concern worldwide. Approximately 700,000 individuals die by suicide each year, constituting a substantial burden of premature mortality, particularly among younger populations (WHO, 2025). Suicide is the third leading cause of death among individuals aged 15–29 years, with higher mortality rates observed in men compared to women (WHO, 2025).

Data from Türkiye are consistent with these global trends. Analyses based on data from the Turkish Statistical Institute (TURKSTAT) reported a total of 66,819 suicide cases between 1995 and 2019, with 68.3% occurring in men (Kartal et al. 2022). Individuals aged 15–24 years represent the highest-risk group, and hanging has been identified as the most commonly used method across all age groups and in both sexes (Kartal et al. 2022). More recent analyses incorporating updated TURKSTAT data indicate that suicide

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rates in Türkiye have increased significantly since 2017, with a more pronounced rise among men (Zencirci et al. 2025).

The societal impact of suicide extends beyond mortality, encompassing substantial economic and productivity losses. A study covering the period from 2012 to 2023 in Türkiye estimated the total economic burden of premature deaths due to suicide at approximately USD 10.8 billion, with an average annual loss of USD 898 million (Zencirci et al. 2025). The same study reported that each suicide-related death corresponded to an average of 37 years of life lost, with this burden concentrated primarily among individuals of working age.

Suicide rates in Türkiye show marked variation by sex and age group. The rate among men has been reported to be approximately three times higher than that among women, with the highest rates observed in the 20–29 age group (Emiral et al. 2021). In terms of method, hanging is the most common in both sexes, while firearm use is more frequently reported among men, and poisoning with chemical substances and jumping from height are more common among women (Emiral et al. 2021).

Discharge against medical advice (DAMA) has emerged as an increasingly notable phenomenon in recent years. The prevalence of DAMA has been reported as 0.8% among hospitalized adolescents, rising to 27.1% among adults hospitalized for poisoning and up to 36.9% among general emergency department presentations (Gwun et al. 2019, Elik et al. 2022, Pierson et al. 2024). Discharge against medical advice is a well-established risk factor for recurrent suicide attempts (de la Torre-Luque et al. 2023). A meta-analysis including 248,829 individuals across 110 studies reported that 20% of individuals exhibited repeated suicide attempts; the risk was higher among women, individuals engaging in self-cutting, and those with psychiatric disorders. In contrast, preventive interventions, particularly those based on psychotherapy, were associated with a significant reduction in recurrence rates (de la Torre-Luque et al. 2023).

Individuals with recurrent suicide attempts typically exhibit more severe psychopathology, including higher levels of depression, suicidal ideation, and hopelessness (Lübbert et al. 2021). A family history of suicide, childhood emotional abuse, and adverse personality traits such as impulsivity under negative affect, excitability, aggression, and anger are also more frequently reported in this group (Lübbert et al. 2021). The lethality of the method used is another critical determinant. In a large cohort of hospitalized self-harm cases, 9.5% of individuals (predominantly those using firearms) died during the index event; among survivors, the one-year incidence of non-fatal repeat suicide attempts was 11.7%, and

suicide mortality was 0.8% (Thomas et al. 2021). Notably, many individuals were observed to change methods across attempts, underscoring the predictive role of underlying psychiatric or substance use disorders in addition to method-specific lethality (Thomas et al. 2021).

Individual and environmental vulnerabilities, including major depressive disorder, affect regulation difficulties associated with heightened anger, dysfunctional self-schemas characterized by self-criticism or dependency, unemployment, and adverse early parenting experiences, have been identified as significant risk factors for suicidal behavior (Maino et al. 2019). Conversely, beliefs supporting survival and coping resources, morally grounded attitudes that inhibit suicide, and strong parental attachment constitute protective factors, while individuals at certain developmental stages may demonstrate increased susceptibility (Maino et al. 2019). The method of suicide attempt strongly influences clinical outcomes. In a Swedish cohort of 48,649 hospitalized suicide attempters, individuals who attempted hanging, strangulation, or suffocation exhibited the highest subsequent suicide risk; more than half ultimately died by suicide, with most deaths occurring within the first year (Runeson et al. 2010). Firearms, gas exposure, jumping from height, and drowning are also associated with high lethality, whereas poisoning and self-harm using sharp objects are linked to lower long-term mortality risk (Runeson et al. 2010). A meta-analysis of 34 studies supported these findings, identifying firearms (89.7%) and hanging (84.5%) as the most lethal methods, followed by drowning (80.4%), gas poisoning (56.6%), drug overdose (8.0%), and self-injury with sharp objects (4.0%) (Cai et al. 2022).

Despite extensive research on suicidal behavior, the determinants of in-hospital mortality and DAMA remain insufficiently elucidated. This study hypothesizes that demographic characteristics, the presence of psychiatric diagnoses, and the methods of suicide attempts are key determinants of these outcomes. By comprehensively analyzing the clinical characteristics of suicide attempts, method-specific lethality, and the prevalence of DAMA in a tertiary care hospital between January 2009 and December 2024, this study aims to identify the principal factors associated with increased risk.

## METHODS

### Study Design

In this retrospective, registry-based observational study, adult individuals presenting to the emergency department with suicide attempts over a 15-year period at a tertiary

care hospital were examined. Cases of suicide attempt were identified through the hospital information management system and patient records. ICD-10 diagnostic codes were used for record screening, with codes X60–X84 encompassing suicide attempts. Specifically, codes X60–X64 were used for drug/poisoning, X70 for hanging, X71 for drowning, X72–X74 for firearm-related attempts, and X80 for jumping from height. Data were screened according to these codes, and patient files as well as forensic case notification forms were reviewed for verification. All individuals aged 18 years and older who presented to the emergency department following a suicide attempt between January 2009 and December 2024 were included. Individuals younger than 18 years, those with missing core clinical data (e.g., age, sex, method of attempt, or outcome), and migrant individuals who could not be reliably linked to national health records due to the absence of a national identification number were excluded.

During the study period, records of 3,491 individuals presenting with suicide attempts to the emergency department were reviewed. Of these, 436 individuals younger than 18 years, 35 individuals with migrant status, and 111 individuals with missing key clinical variables were excluded. Following these exclusion criteria, 2,909 individuals were included in the analysis. For individuals with a history of multiple suicide attempts, only the most recent attempt was analyzed to preserve the assumption of independent observations; therefore, a total of 1,016 repeated suicide attempts were excluded from the analysis.

### Data Collection and Variables

Electronic health records were independently reviewed by two investigators, and discrepancies were resolved by consensus. Extracted data included demographic characteristics (age, sex, marital status, pregnancy status, and incarceration status), psychiatric history, comorbid conditions, substance use, characteristics of the suicide attempt, clinical presentation findings, laboratory results, complications, and hospital outcomes.

Marital status was categorized as “single,” “married,” “divorced,” or “widowed.” Pregnancy status was determined based on obstetric consultation or  $\beta$ -hCG testing. At our center, all individuals presenting with suicide attempts undergo psychiatric evaluation. Psychiatric history included diagnoses of depression, bipolar disorder, schizophrenia, anxiety disorders, obsessive–compulsive disorder, attention-deficit/hyperactivity disorder, personality disorders, and substance use disorders. Individuals with a prescription for antidepressants were classified as “antidepressant users.” When available, chronic medical conditions such as migraine,

epilepsy, dementia, type 1 diabetes mellitus, and malignancy were also recorded.

Chronic alcohol use was defined as consumption of more than 14 standard drinks per week in men and more than 7 standard drinks per week in women, or documentation of a diagnosis of alcohol dependence.

History of suicide attempts was recorded as “none,” “1,” “2,” “3,” “4,” or “>4,” and only the most recent presentation was included in the analysis. Suicide methods were categorized as follows: drug poisoning, poisoning with other chemical substances (e.g., pesticides, chemicals), self-injury with sharp or penetrating objects, jumping from height, firearm use, hanging, other drowning methods, jumping in front of a moving object, other methods, or use of multiple methods. The use of more than one method within the same event was defined as a “combined attempt.”

### Clinical Outcomes and Complications

The primary outcome was defined as in-hospital mortality occurring during the hospitalization period related to the suicide attempt. Secondary outcomes included DAMA and medical complications such as acute kidney injury (according to KDIGO criteria) (Kellum et al. 2013), transaminase elevation (alanine aminotransferase or aspartate aminotransferase levels  $\geq 2$  times the upper limit of normal), hyperlactatemia (serum lactate  $>2$  mmol/L), shock (hemodynamic instability requiring vasopressor support), and the need for endotracheal intubation.

Discontinuation against medical advice was defined as the patient leaving the hospital voluntarily at any stage, either at the initiation of treatment or during hospitalization. Neurological status was assessed at an emergency department presentation using the Glasgow Coma Scale (GCS).

### Ethical Approval

The study was approved by the institutional Ethics Committee (Approval No: 2025/396, January 29, 2025). Due to the retrospective, registry-based observational design, the requirement for informed consent was waived. All data were anonymized, and the study was conducted in accordance with the Declaration of Helsinki.

### Statistical Analysis

All statistical analyses were performed using IBM Statistical Package for Social Sciences (SPSS) program version 24.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test and presented as mean  $\pm$  standard deviation (SD) or median

(interquartile range [IQR]), as appropriate. Categorical variables were expressed as frequencies and percentages.

For group comparisons, independent samples t-test or Mann-Whitney U test was used for continuous variables, and Pearson's chi-square test or Fisher's exact test was used for categorical variables.

Two separate logistic regression analyses were conducted to identify factors associated with in-hospital mortality and DAMA. For each outcome, univariate logistic regression analyses were first performed; variables with  $p < 0.05$  and clinically relevant covariates (age, sex, marital status, psychiatric diagnoses, alcohol and substance use, suicide method, GCS score, and presence of complications) were included in multivariable logistic regression models.

Results of regression analyses were reported as odds ratios (ORs) with 95% confidence intervals (CIs). Model fit and performance were evaluated using the Omnibus chi-square test, the Hosmer–Lemeshow goodness-of-fit test, and the Nagelkerke  $R^2$  coefficient. A two-tailed  $p < 0.05$  was considered statistically significant in all analyses.

## RESULTS

### Characteristics of the Study Population

A total of 2,909 individuals were included in the study. The mean age was  $30 \pm 12$  years (Table 1), and approximately two-thirds of the cohort were female (64.4%). Most individuals were single (48.2%), and 83.2% had no prior history of suicide attempts. Approximately half of the individuals had at least one psychiatric diagnosis, with depression being the most common (47.4%). Substance use disorder (8.6%) and other severe mental disorders were observed at lower frequencies.

The most commonly used method of suicide attempt was drug ingestion (84.2%). Overall, in-hospital mortality was 2.2%, and DAMA occurred in 53.8% of cases (Table 1).

### Sex-Based Differences

Male individuals were older on average compared to females ( $32 \pm 12$  vs.  $29 \pm 11$  years,  $p < 0.001$ ), and the proportion of single individuals was higher among men (59.7% vs. 41.8%) (Table 1).

Marked sex differences were observed in psychiatric profiles: depression was more prevalent in women (49.6% vs. 43.3%), whereas schizophrenia (2.4% vs. 0.6%) and substance use disorder (18.2% vs. 3.3%) were significantly more frequent in men. Alcohol use was also substantially higher among men (36.9% vs. 13.0%).

Differences in method selection were also evident. Drug ingestion was predominant among women (91.8% vs. 70.5%), whereas hanging (4.0% vs. 0.6%) and firearm use (2.1% vs. 0.1%) were more common among men.

Clinically, men exhibited greater severity at presentation and worse outcomes. GCS scores were lower in men ( $14.2 \pm 2.6$  vs.  $14.8 \pm 1.1$ ;  $p < 0.001$ ), and the frequency of shock (4.9% vs. 0.7%) and need for intubation (6.7% vs. 1.3%) was higher. In-hospital mortality among men was six times higher compared to women (4.8% vs. 0.7%,  $p < 0.001$ ) (Table 1).

### In-Hospital Mortality Rates

Among the 2,909 cases, in-hospital mortality occurred in 2.2% (63/2909). The mortality rate was 3.1% (38/1233) among individuals aged  $\geq 30$  years and 1.5% (25/1676) among those younger than 30 years. Mortality was 4.8% (50/1035) in men and 0.7% (13/1874) in women.

In-hospital mortality varied substantially by method: 0.4% (9/2450) for drug poisoning, 0.8% (1/128) for self-injury with sharp objects, 2.6% (4/154) for poisoning with other substances, 10.5% (2/19) for combined methods, 32.1% (18/56) for jumping from height, 32.1% (17/53) for hanging, and 45.8% (11/24) for firearm use. For attempts involving jumping from the fifth floor or higher, the in-hospital mortality rate was 94.1% (16/17).

According to psychiatric diagnoses, in-hospital mortality rates were 1.5% (21/1378) among individuals with depressive disorders, 1.6% (2/124) among those with bipolar disorder, 8.3% (3/36) among those with schizophrenia, and 5.3% (13/249) among those with substance use disorder. Among individuals with alcohol use, the mortality rate was 5.0% (31/626). Mortality rates were 2.1% (51/2419) in those without prior suicide attempts, 2.2% (6/277) in those with one prior attempt, and 2.8% (6/213) in those with multiple prior attempts.

### Discharge Against Medical Advice (DAMA)

Overall, 53.8% of individuals ( $n=1,564$ ) were discharged against medical advice (Table 2). Compared to others, these individuals were younger ( $29.5 \pm 10.3$  vs.  $31.2 \pm 12.9$  years,  $p < 0.001$ ), had shorter hospital stays (median 1 vs. 2 days,  $p < 0.001$ ), and had higher GCS scores ( $14.9 \pm 0.5$  vs.  $14.2 \pm 2.5$ ,  $p < 0.001$ ).

The prevalence of at least one psychiatric diagnosis was lower in this group (39.1% vs. 57.0%,  $p < 0.001$ ), with particularly lower rates of schizophrenia (0.5% vs. 2.1%) and depression (39.1% vs. 57.0%). The rate of antidepressant treatment was also lower (27.2% vs. 38.1%,  $p < 0.001$ ).

**Table 1.** Comparison of individual characteristics by sex and overall study population

| Variables                                            | Female<br>(n=1874) | Male<br>(n=1035) | Total<br>(n=2909) | P       |
|------------------------------------------------------|--------------------|------------------|-------------------|---------|
| <b>Age, mean <math>\pm</math> SD</b>                 | 29 $\pm$ 11        | 32 $\pm$ 12      | 30 $\pm$ 12       | <0.001* |
| <b>Marital status, n (%)</b>                         |                    |                  |                   |         |
| Single                                               | 784 (41.8)         | 618 (59.7)       | 1402 (48.2)       | <0.001* |
| Married                                              | 758 (40.4)         | 297 (28.7)       | 1055 (36.3)       | <0.001* |
| Divorced                                             | 310 (16.5)         | 112 (10.8)       | 422 (14.5)        | <0.001* |
| Widowed                                              | 22 (1.2)           | 8 (0.8)          | 30 (1.0)          | 0.305   |
| Length of hospital stay (days), median/IQR (min–max) | 1/4 (1–47)         | 1/6 (1–55)       | 1/4 (1–55)        | 0.034   |
| Pregnancy, n (%)                                     | 45 (2.4)           | 0 (0)            | 45 (1.6)          | N/A     |
| <b>Psychiatric history, n (%)</b>                    |                    |                  |                   |         |
| Depressive disorder                                  | 930 (49.6)         | 448 (43.3)       | 1378 (47.4)       | 0.001*  |
| Bipolar disorder                                     | 74 (3.9)           | 50 (4.8)         | 127 (4.3)         | 0.260   |
| Schizophrenia                                        | 11 (0.6)           | 25 (2.4)         | 36 (1.2)          | <0.001* |
| Anxiety disorder                                     | 87 (4.6)           | 35 (3.4)         | 122 (4.2)         | 0.104   |
| OCD                                                  | 13 (0.7)           | 8 (0.8)          | 21 (0.7)          | 0.809   |
| ADHD                                                 | 7 (0.4)            | 4 (0.4)          | 11 (0.4)          | 1.0     |
| Personality disorder                                 | 11 (0.6)           | 11 (1.1)         | 22 (0.8)          | 0.156   |
| Substance use disorder                               | 61 (3.3)           | 188 (18.2)       | 249 (8.6)         | <0.001* |
| <b>Other comorbid conditions, n (%)</b>              |                    |                  |                   |         |
| Migraine                                             | 24 (1.3)           | 2 (0.2)          | 26 (0.9)          | 0.003*  |
| Epilepsy                                             | 11 (0.6)           | 9 (0.9)          | 20 (0.7)          | 0.377   |
| Dementia                                             | 6 (0.3)            | 7 (0.7)          | 13 (0.4)          | 0.244   |
| Type 1 diabetes mellitus                             | 5 (0.3)            | 2 (0.2)          | 7 (0.2)           | 1.0     |
| Cancer                                               | 9 (0.5)            | 9 (0.9)          | 18 (0.6)          | 0.200   |
| Alcohol use, n (%)                                   | 244 (13.0)         | 382 (36.9)       | 626 (21.5)        | <0.001  |
| Antidepressant use, n (%)                            | 658 (35.1)         | 279 (27.0)       | 937 (32.2)        | <0.001* |
| <b>Number of prior suicide attempts, n (%)</b>       |                    |                  |                   |         |
| None                                                 | 1597 (85.2)        | 822 (79.4)       | 2419 (83.2)       | <0.001* |
| 1                                                    | 159 (8.5)          | 118 (11.4)       | 277 (9.5)         | 0.010*  |
| 2                                                    | 50 (2.7)           | 40 (3.9)         | 90 (3.1)          | 0.074   |
| 3                                                    | 41 (2.2)           | 37 (3.6)         | 78 (2.7)          | 0.027*  |
| 4                                                    | 12 (0.6)           | 8 (0.8)          | 20 (0.7)          | 0.171   |
| >4                                                   | 15 (0.8)           | 10 (0.9)         | 25 (0.8)          | 0.642   |
| <b>Method of suicide attempt, n (%)</b>              |                    |                  |                   |         |
| Drug poisoning                                       | 1720 (91.8)        | 730 (70.5)       | 2450 (84.2)       | <0.001* |
| Other poisoning                                      | 41 (2.2)           | 113 (10.9)       | 154 (5.3)         | <0.001* |
| Self-injury with sharp objects                       | 50 (2.7)           | 78 (7.5)         | 128 (4.4)         | <0.001* |
| Jumping from height                                  | 28 (1.5)           | 28 (2.7)         | 56 (1.9)          | 0.023*  |
| Firearm use                                          | 2 (0.1)            | 22 (2.1)         | 24 (0.8)          | <0.001* |
| Hanging                                              | 12 (0.6)           | 41 (4.0)         | 53 (1.8)          | <0.001* |
| Other drowning methods                               | 12 (0.6)           | 9 (0.9)          | 21 (0.7)          | 0.484   |
| Jumping in front of a moving vehicle                 | 0 (0)              | 1 (0.1)          | 1 (<0.01)         | N/A     |
| Other                                                | 1 (0.1)            | 2 (0.2)          | 3 (0.1)           | 0.289   |
| Multiple methods                                     | 8 (0.4)            | 11 (1.1)         | 19 (0.7)          | 0.042*  |
| GCS, mean $\pm$ SD                                   | 14.8 $\pm$ 1.1     | 14.2 $\pm$ 2.6   | 14.6 $\pm$ 1.8    | <0.001* |
| <b>Complications, n (%)</b>                          |                    |                  |                   |         |
| Acute kidney injury                                  | 40 (2.1)           | 65 (6.3)         | 105 (3.6)         | <0.001* |
| Transaminase elevation                               | 53 (2.8)           | 87 (8.4)         | 140 (4.8)         | <0.001* |
| Shock                                                | 13 (0.7)           | 51 (4.9)         | 64 (2.2)          | <0.001* |
| Endotracheal intubation                              | 24 (1.3)           | 69 (6.7)         | 93 (3.2)          | <0.001* |
| DAMA, n (%)                                          | 1029 (53.8)        | 535 (51.7)       | 1564 (53.8)       | 0.096   |
| In-hospital mortality, n (%)                         | 13 (0.7)           | 50 (4.8)         | 63 (2.2)          | <0.001* |

ADHD: attention-deficit/hyperactivity disorder; GCS: Glasgow Coma Scale; DAMA: discharge against medical advice; N/A: not applicable; IQR: interquartile range; OCD: obsessive-compulsive disorder; SD: standard deviation. \*p<0.05.

Individuals discharged with DAMA were more likely to have no prior history of suicide attempts (88.4% vs. 77.1%,  $p < 0.001$ ) and more frequently used drug ingestion as the method (86.3% vs. 81.9%,  $p = 0.001$ ). In contrast, individuals who remained hospitalized more frequently used highly lethal methods, including jumping from height (3.3% vs. 0.8%), firearm use (1.5% vs. 0.3%), and hanging (3.1% vs. 0.7%) (all  $p < 0.001$ ) (Table 2).

### Factors Associated with In-Hospital Mortality

Individuals who died in the hospital were older than survivors ( $37 \pm 17$  vs.  $30 \pm 11$  years;  $p < 0.001$ ), were more often male (79.4% vs. 34.6%;  $p < 0.001$ ), and had higher rates of substance use disorder (20.6% vs. 8.3%;  $p = 0.001$ ) and alcohol use (49.2% vs. 20.9%;  $p < 0.001$ ) (Table 3). In contrast, depression was less frequent among those who died (33.3% vs. 47.7%;  $p = 0.024$ ).

**Table 2.** Comparison of study population characteristics according to DAMA status

| Variables                                         | DAMA<br>(n=1564) | No DAMA<br>(n=1345) | p       |
|---------------------------------------------------|------------------|---------------------|---------|
| <b>Age, mean <math>\pm</math> SD</b>              | 29.5 $\pm$ 10.3  | 31.2 $\pm$ 12.9     | <0.001* |
| <b>Length of hospital stay (days), median/IQR</b> | 1 (1)            | 2 (2)               | <0.001* |
| <b>Sex, n (%)</b>                                 |                  |                     | 0.120   |
| Female                                            | 1028 (65.7)      | 846 (62.9)          |         |
| Male                                              | 536 (34.3)       | 499 (37.1)          |         |
| <b>Marital status, n (%)</b>                      |                  |                     |         |
| Single                                            | 750 (48.0)       | 652 (48.4)          | 0.778   |
| Married                                           | 565 (36.1)       | 490 (36.4)          | 0.864   |
| Divorced                                          | 238 (15.2)       | 184 (13.7)          | 0.240   |
| Widowed                                           | 11 (0.7)         | 19 (1.4)            | 0.059   |
| Pregnancy, n (%)                                  | 26 (1.7)         | 19 (1.4)            | 0.586   |
| <b>Psychiatric history, n (%)</b>                 |                  |                     |         |
| Depressive disorder                               | 612 (39.1)       | 766 (57.0)          | <0.001* |
| Bipolar disorder                                  | 55 (3.5)         | 69 (5.1)            | 0.032*  |
| Schizophrenia                                     | 8 (0.5)          | 28 (2.1)            | <0.001* |
| Anxiety disorder                                  | 60 (3.8)         | 62 (4.6)            | 0.300   |
| OCD                                               | 5 (0.3)          | 16 (1.2)            | 0.006*  |
| ADHD                                              | 6 (0.4)          | 5 (0.4)             | 0.958   |
| Personality disorder                              | 15 (1.0)         | 7 (0.5)             | 0.173   |
| Substance use disorder                            | 128 (8.2)        | 121 (9.0)           | 0.435   |
| Alcohol use, n (%)                                | 327 (20.9)       | 299 (22.2)          | 0.387   |
| Antidepressant use, n (%)                         | 425 (27.2)       | 512 (38.1)          | <0.001* |
| <b>Number of prior suicide attempts, n (%)</b>    |                  |                     |         |
| None                                              | 1382 (88.4)      | 1037 (77.1)         | <0.001* |
| 1                                                 | 110 (7.0)        | 167 (12.4)          | <0.001* |
| >1                                                | 72 (4.6)         | 141 (10.5)          | <0.001* |
| <b>Method of suicide attempt, n (%)</b>           |                  |                     |         |
| Drug poisoning                                    | 1349 (86.3)      | 1101 (81.9)         | 0.001*  |
| Other poisoning                                   | 79 (5.1)         | 75 (5.6)            | 0.397   |
| Self-injury with sharp objects                    | 86 (5.5)         | 42 (3.1)            | 0.001*  |
| Jumping from height                               | 12 (0.8)         | 44 (3.3)            | <0.001* |
| Firearm use                                       | 4 (0.3)          | 20 (1.5)            | <0.001* |
| Hanging                                           | 11 (0.7)         | 42 (3.1)            | 0.001*  |
| Other drowning methods                            | 10 (0.6)         | 11 (0.8)            | 0.569   |
| Jumping in front of a moving object               | 0 (0)            | 1 (0.1)             | N/A     |
| Other                                             | 2 (0.1)          | 1 (0.1)             | 1.0     |
| Multiple methods                                  | 11 (0.7)         | 8 (0.6)             | 0.717   |
| <b>GCS, mean <math>\pm</math> SD</b>              | 14.9 $\pm$ 0.5   | 14.2 $\pm$ 2.5      | <0.001* |
| <b>Complications, n (%)</b>                       |                  |                     |         |
| Acute kidney injury                               | 18 (1.2)         | 87 (6.5)            | <0.001* |
| Transaminase elevation                            | 43 (2.7)         | 97 (7.2)            | <0.001* |
| Shock                                             | 0 (0)            | 64 (4.8)            | <0.001* |
| Endotracheal intubation                           | 7 (0.4)          | 86 (6.4)            | <0.001* |

ADHD: attention-deficit/hyperactivity disorder; GCS: Glasgow Coma Scale; DAMA: discharge against medical advice; N/A: not applicable; IQR: interquartile range; OCD: obsessive-compulsive disorder; SD: standard deviation. \* $p < 0.05$ .

Use of highly lethal methods was strongly associated with in-hospital mortality; jumping from height (28.6% vs. 1.3%), firearm use (17.5% vs. 0.5%), and hanging (27.0% vs. 1.3%) were significantly more common among those who died (all  $p < 0.001$ ).

Glasgow Coma Scale scores were markedly lower in individuals who died ( $5.1 \pm 3.6$  vs.  $14.8 \pm 0.9$ ;  $p < 0.001$ ), and the frequencies of shock (85.7% vs. 0.4%) and need for intubation (95.2% vs. 1.2%) were substantially higher (Table 3).

### Logistic Regression Analysis of Factors Associated with DAMA

Multivariable logistic regression analysis identified younger age (OR: 0.998; 95% CI: 0.980–0.997;  $p = 0.006$ ), absence of prior suicide attempts (OR: 0.615; 95% CI: 0.493–0.768;  $p < 0.001$ ), and absence of depressive disorder (OR: 0.529; 95% CI: 0.450–0.620;  $p < 0.001$ ) as independent factors associated with DAMA (Table 4). Additionally, diagnoses of schizophrenia (OR: 0.314; 95% CI: 0.137–0.717;  $p = 0.006$ )

**Table 3.** Comparison of demographic and clinical characteristics according to in-hospital mortality

| Variables                                      | In-hospital mortality<br>(n=63) | No in-hospital mortality<br>(n=2846) | p       |
|------------------------------------------------|---------------------------------|--------------------------------------|---------|
| <b>Age, mean <math>\pm</math> SD</b>           | 37 $\pm$ 17                     | 30 $\pm$ 11                          | <0.001* |
| <b>Sex, n (%)</b>                              |                                 |                                      | <0.001* |
| Female                                         | 13 (20.6)                       | 1861 (65.4)                          |         |
| Male                                           | 50 (79.4)                       | 985 (34.6)                           |         |
| <b>Marital status, n (%)</b>                   |                                 |                                      |         |
| Single                                         | 29 (46.0)                       | 1373 (48.2)                          | 0.728   |
| Married                                        | 22 (34.9)                       | 1033 (36.3)                          | 0.757   |
| Divorced                                       | 10 (15.9)                       | 412 (14.5)                           | 0.755   |
| Widowed                                        | 2 (3.2)                         | 28 (1.0)                             | 0.136   |
| Pregnancy, n (%)                               | 0 (0)                           | 45 (1.6)                             | 0.625   |
| <b>Psychiatric history, n (%)</b>              |                                 |                                      |         |
| Depressive disorder                            | 21 (33.3)                       | 1357 (47.7)                          | 0.024*  |
| Bipolar disorder                               | 2 (3.2)                         | 122 (4.3)                            | 1.0     |
| Schizophrenia                                  | 3 (4.8)                         | 33 (1.2)                             | 0.042*  |
| Anxiety disorder                               | 3 (4.8)                         | 119 (4.2)                            | 0.747   |
| OCD                                            | 0 (0)                           | 21 (0.7)                             | 1.0     |
| ADHD                                           | 0 (0)                           | 11 (0.4)                             | 1.0     |
| Personality disorder                           | 0 (0)                           | 22 (0.8)                             | 1.0     |
| Substance use disorder                         | 13 (20.6)                       | 236 (8.3)                            | 0.001*  |
| Alcohol use, n (%)                             | 31 (49.2)                       | 595 (20.9)                           | <0.001* |
| Antidepressant use, n (%)                      | 10 (15.9)                       | 927 (32.6)                           | 0.005*  |
| <b>Number of prior suicide attempts, n (%)</b> |                                 |                                      |         |
| None                                           | 51 (81.0)                       | 2368 (83.2)                          | 0.636   |
| 1                                              | 6 (9.5)                         | 271 (9.5)                            | 1.0     |
| >1                                             | 6 (9.5)                         | 207 (8.3)                            | 0.461   |
| <b>Method of suicide attempt, n (%)</b>        |                                 |                                      |         |
| Drug poisoning                                 | 9 (14.3)                        | 2441 (85.8)                          | <0.001* |
| Other poisoning                                | 4 (6.3)                         | 150 (5.3)                            | 0.574   |
| Self-injury with sharp objects                 | 1 (1.6)                         | 127 (4.5)                            | 0.523   |
| Jumping from height                            | 18 (28.6)                       | 38 (1.3)                             | <0.001* |
| Firearm use                                    | 11 (17.5)                       | 13 (0.5)                             | <0.001* |
| Hanging                                        | 17 (27.0)                       | 36 (1.3)                             | <0.001* |
| Other drowning methods                         | 0 (0)                           | 21 (0.7)                             | N/A     |
| Jumping in front of a moving object            | 0 (0)                           | 1 (<0.1)                             | N/A     |
| Other                                          | 1 (1.6)                         | 2 (0.1)                              | 0.064   |
| Multiple methods                               | 2 (3.2)                         | 17 (0.6)                             | 0.062   |
| <b>GCS, mean <math>\pm</math> SD</b>           | 5.1 $\pm$ 3.6                   | 14.8 $\pm$ 0.9                       | <0.001* |
| <b>Complications, n (%)</b>                    |                                 |                                      |         |
| Acute kidney injury                            | 36 (57.1)                       | 69 (2.4)                             | <0.001* |
| Transaminase elevation                         | 33 (52.4)                       | 107 (3.8)                            | <0.001* |
| Shock                                          | 54 (85.7)                       | 10 (0.4)                             | <0.001* |
| Endotracheal intubation                        | 60 (95.2)                       | 33 (1.2)                             | <0.001* |

ADHD: attention-deficit/hyperactivity disorder; GCS: Glasgow Coma Scale; DAMA: discharge against medical advice; N/A: not applicable; OCD: obsessive-compulsive disorder; SD: standard deviation. \* $p < 0.05$ .

and obsessive-compulsive disorder (OR: 0.349; 95% CI: 0.124–0.986;  $p=0.047$ ) were associated with a lower likelihood of DAMA. Higher GCS scores (OR: 1.432; 95% CI: 1.271–1.614;  $p<0.001$ ) and absence of complications (OR: 0.361; 95% CI: 0.205–0.637;  $p<0.001$ ), reflecting greater clinical stability, were also independent predictors. In contrast, sex and suicide method were not significant in the multivariable model (Table 4).

### Logistic Regression Analysis of Factors Associated with In-Hospital Mortality

Multivariable logistic regression analysis identified increasing age (OR: 1.04; 95% CI: 1.02–1.06;  $p<0.001$ ), male sex (OR: 4.40; 95% CI: 2.29–8.43;  $p<0.001$ ), diagnosis of schizophrenia (OR: 3.63; 95% CI: 1.02–12.88;  $p=0.047$ ), and alcohol use (OR: 2.38; 95% CI: 1.34–4.24;  $p=0.003$ ) as independent predictors of in-hospital mortality due to suicide attempts (Table 5).

**Table 4.** Logistic regression analysis of factors associated with DAMA

| Variables                              | Univariate |             |         | Multivariate |             |         |
|----------------------------------------|------------|-------------|---------|--------------|-------------|---------|
|                                        | OR         | 95% CI      | p       | OR           | 95% CI      | p       |
| Age                                    | 0.987      | 0.981–0.994 | <0.001* | 0.998        | 0.980–0.997 | 0.006*  |
| Male sex                               | 0.884      | 0.759–1.029 | 0.112   | 1.126        | 0.943–1.344 | 0.191   |
| Marital status                         |            |             |         |              |             |         |
| Single                                 |            | Reference   |         |              | Reference   |         |
| Married                                | 1.002      | 0.854–1.177 | 0.977   | 1.173        | 0.962–1.431 | 0.116   |
| Divorced                               | 1.124      | 0.903–1.400 | 0.073   | 1.649        | 1.265–2.149 | <0.001* |
| Widowed                                | 0.503      | 0.238–1.065 |         | 0.925        | 0.398–2.151 | 0.857   |
| Suicide attempt via drug ingestion     | 1.391      | 1.139–1.698 | 0.001*  | 1.024        | 0.813–1.289 | 0.842   |
| History of prior suicide attempt (yes) | 0.443      | 0.363–0.542 | <0.001* | 0.615        | 0.493–0.768 | <0.001* |
| Depressive disorder                    | 0.486      | 0.419–0.564 | <0.001* | 0.529        | 0.450–0.620 | <0.001* |
| Antidepressant use                     | 0.607      | 0.519–0.710 | <0.001* |              |             |         |
| Bipolar disorder                       | 0.674      | 0.469–0.968 | 0.033*  | 0.910        | 0.615–1.346 | 0.637   |
| Schizophrenia                          | 0.242      | 0.110–0.532 | <0.001* | 0.314        | 0.137–0.717 | 0.006*  |
| OCD                                    | 0.266      | 0.097–0.729 | 0.010   | 0.349        | 0.124–0.986 | 0.047*  |
| Substance use disorder                 | 0.902      | 0.695–1.169 | 0.435   |              |             |         |
| Alcohol use                            | 0.925      | 0.775–1.104 | 0.387   |              |             |         |
| Pregnancy                              | 1.180      | 0.650–2.141 | 0.587   |              |             |         |
| GCS (per 1-point increase)             | 1.596      | 1.389–1.834 | 0.001*  | 1.432        | 1.271–1.614 | <0.001* |
| Any complication                       | 0.168      | 0.101–0.281 | <0.001* | 0.361        | 0.205–0.637 | <0.001* |

CI: confidence interval; GCS: Glasgow Coma Scale; DAMA: discharge against medical advice; OCD: obsessive-compulsive disorder; OR: odds ratio.

<sup>†</sup>Model performance: Omnibus  $\chi^2=304.21$ ,  $p<0.001$ ; Hosmer-Lemeshow  $\chi^2=10.99$ ,  $p=0.202$ ; Nagelkerke  $R^2=0.133$ . \* $p<0.05$ .

**Table 5.** Logistic regression analysis of factors associated with in-hospital mortality

| Variables                                         | Univariate |                |         | Multivariate |              |         |
|---------------------------------------------------|------------|----------------|---------|--------------|--------------|---------|
|                                                   | OR         | 95% CI         | p       | OR           | 95% CI       | p       |
| Age                                               | 1.040      | 1.023–1.058    | <0.001* | 1.042        | 1.022–1.062  | <0.001* |
| Male sex                                          | 7.267      | 3.928–13.442   | <0.001* | 4.397        | 2.294–8.428  | <0.001* |
| Marital status                                    |            |                |         |              |              |         |
| Single                                            |            | Reference      |         |              |              |         |
| Married                                           | 1.008      | 0.576–1.765    | 0.977   |              |              |         |
| Divorced                                          | 1.149      | 0.555–2.378    | 0.708   |              |              |         |
| Widowed                                           | 3.382      | 0.769–14.870   | 0.107   |              |              |         |
| History of prior suicide attempt (yes)            | 1.038      | 0.830–1.298    | 0.743   |              |              |         |
| Depressive disorder                               | 0.549      | 0.323–0.931    | 0.026   | 0.664        | 0.322–1.331  | 0.249   |
| Bipolar disorder                                  | 0.732      | 0.177–3.029    | 0.667   |              |              |         |
| Schizophrenia                                     | 4.262      | 1.272–14.282   | 0.019*  | 3.625        | 1.020–12.879 | 0.047*  |
| Substance use disorder                            | 2.875      | 1.540–5.370    | 0.001*  | 1.377        | 0.670–2.830  | 0.385   |
| Alcohol use                                       | 3.665      | 2.218–6.055    | <0.001* | 2.381        | 1.338–4.238  | 0.003*  |
| Antidepressant use                                | 0.391      | 0.198–0.771    | 0.007*  | 0.539        | 0.225–1.287  | 0.164   |
| Suicide attempt method (all methods) <sup>a</sup> |            | Not applicable |         |              |              |         |

CI: confidence interval; OR: odds ratio. <sup>†</sup>Model performance: Omnibus  $\chi^2=85.97$ ,  $p<0.001$ ; Hosmer-Lemeshow  $\chi^2=4.84$ ,  $p=0.774$ ; Nagelkerke  $R^2=0.155$ . <sup>a</sup>The method variable was not included in the model due to the limited number of events. \* $p<0.05$ .

In univariate analyses, depression and antidepressant use were associated with lower in-hospital mortality; however, these associations were not significant in the multivariable model (Table 5).

## DISCUSSION

The findings of this study, based on a retrospective analysis of data spanning 15 years, highlight persistent challenges in the management of individuals following suicide attempts. One of the most notable results is that a substantial proportion of cases left the hospital before completion of the care process. This behavior was generally associated with younger age, milder clinical presentation, and a lower prevalence of psychiatric disorders. Although overall in-hospital mortality was low, fatal outcomes were concentrated within specific demographic and clinical subgroups.

The age and sex distribution of the study population, as well as the distribution of suicide methods, are broadly consistent with previous registry-based studies. In one such study, women comprised 68.3% of the sample, and drug ingestion accounted for 61.1% of attempts, while pesticide ingestion was notably high at 36.6% (Tharani et al. 2022). In contrast, another study conducted in Türkiye reported an older mean age (37.8 years) and a more balanced sex distribution (51.7% male); drug ingestion remained the most common method (74.1%), followed by self-injury with sharp objects (6.0%) and chemical substance use (3.5%) (Boğan et al. 2024). Taken together, these findings suggest that drug overdose constitutes the predominant method in suicide attempts, while sociocultural differences including age, sex distribution, and regional factors such as access to pesticides contribute to variability across populations.

In the present study, women more frequently attempted suicide via drug ingestion, and depression was more prevalent among women. In contrast, schizophrenia, substance use disorder, and alcohol use were more common among men, who also more frequently employed highly lethal methods such as hanging and firearms. This pattern is consistent with prior literature. Studies examining suicide attempts have similarly reported that drug ingestion is more common among women, whereas highly lethal methods, including hanging, are more prevalent among men (Narishige et al. 2014, Berardelli et al. 2022). Although suicide attempts occur more frequently among women, the risk of fatal outcomes is significantly higher in men (Narishige et al. 2014, Berardelli et al. 2022). A notable contribution of the present study is that these differences extend beyond method selection to clinical course and in-hospital outcomes. Lower GCS scores, higher complication rates, and increased in-hospital mortality among men indicate that acute risk assessment should incorporate

not only psychiatric diagnoses but also sex-specific behavioral and biological factors.

More than half of the cases in this study involved DAMA. This rate is substantially higher than those reported in previous studies (Crane 2016, Gwun et al. 2019). This discrepancy is likely attributable to differences in definitions. Prior studies have typically defined DAMA as refusal of treatment at the emergency department level, whereas in the present study, DAMA was defined as voluntary discontinuation of treatment at any stage during hospitalization. Accordingly, individuals who left the hospital even after endotracheal intubation or intensive care follow-up were included in this category.

Individuals who engaged in DAMA were generally younger and had lower rates of psychiatric disorders and antidepressant use. This finding suggests that individuals who appear clinically stable may have a lower perception of risk and may be more likely to disengage from care during the early stages of treatment. Similarly, another study reported that young individuals without psychiatric diagnoses who attempted suicide were more likely to refuse ambulance transport to the hospital (Park and Lee, 2024).

The association between being divorced and DAMA is consistent with literature indicating that divorce and interpersonal conflict are linked to both suicidal behavior and the risk of recurrent attempts (Edwards et al. 2024; Choi et al. 2024). Increased psychosocial stress, loss of social support, and co-occurring alcohol or substance use during the post-divorce period may reduce adherence to treatment during crises and facilitate premature departure from healthcare settings.

In contrast, individuals who used highly lethal methods or experienced severe complications were more likely to remain hospitalized. An observational study reported that even clinically stable individuals discharged against medical advice remained at high risk for repeat attempts (Gwun et al. 2019). The persistence of risk among apparently stable DAMA cases suggests that early discharge may represent an underrecognized marker of vulnerability. In this context, DAMA should be considered not merely a compliance issue but also a potential clinical signal of future risk.

In this study, the majority of in-hospital deaths occurred among individuals without a prior history of suicide attempts, indicating that a first attempt may also carry a substantial risk of mortality. Multivariable analysis identified older age, male sex, schizophrenia, and alcohol use as independent predictors of in-hospital mortality. Depression and antidepressant use did not remain significant in the multivariable model, suggesting that their observed associations were not independent of other covariates.

These findings are consistent with previous studies demonstrating that male sex and the use of highly lethal methods increase mortality risk independently of psychiatric history (Chen et al. 2016, Thomas et al. 2021, Aguglia et al. 2022, Rozanov 2022). Beyond confirming these associations, the present study highlights the relationship between DAMA, engagement in care, and clinical outcomes. Furthermore, the association of alcohol use and severe mental disorders, particularly schizophrenia, with fatal outcomes underscores the importance of early identification, close monitoring, and comprehensive interventions in these high-risk groups (Ellison et al. 2024).

Evaluated together, these findings indicate that clinical outcomes following suicide attempts are determined not only by the lethality of the method used but also by demographic characteristics, psychiatric conditions, and the level of engagement in the care process. Accordingly, risk stratification approaches should be expanded beyond the severity of the attempt to include discharge behaviors and the propensity for DAMA. Integrating support mechanisms such as crisis hotlines and structured follow-up programs into comprehensive prevention strategies may be beneficial (Baldaçara et al. 2023).

This study has several limitations. First, its single-center, retrospective design limits generalizability. As data were derived from medical records, incomplete documentation may have introduced bias; however, all suicide cases were verified by at least two clinicians, and data were recorded in a standardized manner. Due to the retrospective and observational nature of the study, post-attempt follow-up and long-term psychosocial outcomes could not be assessed. Nevertheless, prior suicide history, including the number and methods of attempts, was obtained in detail from patient histories. Despite these limitations, the study provides valuable insights into the clinical characteristics, discharge behaviors, and method-specific lethality patterns among individuals who attempt suicide.

In conclusion, this study demonstrates that discharge against medical advice is common among individuals presenting with suicide attempts and that even patients who do not appear clinically unstable may leave care prematurely. In-hospital mortality is significantly associated with older age, male sex, schizophrenia, alcohol use, and the method of attempt. In contrast, DAMA is more frequently observed among younger individuals, often without psychiatric diagnoses. These findings suggest that post-attempt care should extend beyond acute medical management and incorporate individualized strategies aimed at early identification of high-risk groups, enhancing patient engagement, and mitigating method-specific risks.

**Ethics Committee Approval:** The study protocol was approved by the Buca Seyfi Demirsoy Training and Research Hospital Non-Interventional Research Ethics Committee on January 29, 2025, with decision number SBF 25/002.

**Conflict of Interest:** The authors declare no conflicts of interest.

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