



Characteristics and related factors of suicide attempts among patients admitted to an Iranian poisoning center: Implications for suicide prevention

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ABSTRACT

Background: Suicide is a major public health concern worldwide. Iran is no exception, with suicide rates increasing in recent years. Understanding the characteristics and related factors of suicide attempts can help inform suicide prevention efforts in Iran.

Methods: A cross-sectional study was conducted on patients who attempted suicide and were admitted to the poisoning emergency of an intoxication center in Shiraz, Iran, between November 2019 and January 2020. Data were collected using data sheets containing study variables completed by oral interviewers and analyzed using descriptive and inferential statistics.

Results: The study included 302 individuals, with the majority being females (63.6%), and the mean age was 28.19 (SD 19.25) years. The majority of patients were living in urban areas (82.5%) and unmarried (60.9%). Medical drug abuse was the most common method of self-poisoning (76.5%), followed by narcotics (15.6%). Suicide attempts were predominantly carried out at night (59.9%) and on working days (78.5%). Most patients had no history of previous suicidal attempts (64.2%), psychiatric problems (64.6%), or physical illnesses (84.8%). Female gender ($P = 0.017$) and the presence of an underlying disease ($P = 0.016$) were the two risk factors significantly associated with suicide on non-working days.

Conclusion: Our study highlights the need for comprehensive suicide prevention strategies that consider the complex interplay of individual, socio-cultural, and environmental factors that contribute to suicidal behaviors. The high proportion of female suicide attempters and the timing of suicide attempts suggest the need for gender-specific suicide prevention programs and focused suicide prevention efforts during high-risk periods. Additionally, the association between physical illnesses and suicide attempts underscores the importance of integrated mental and physical health care services.

1. Introduction

Suicide attempts result in over 700,000 deaths annually worldwide, according to the World Health Organization (WHO) estimation in 2021 [1]. While the age-standardized global suicidal rate declined by 36% over the past two decades (2000–2019), it still accounted for more than 1% of deaths (1.3%) in 2019 [1]. Despite being a significant health burden for many countries, the global suicide rate varies widely across regions [1]. The hospital emergency department (ED) is the most common initial line of care for individuals who attempt suicide, providing essential medical and mental health services [2,3].

Poisoning is the most prevalent method of suicide worldwide, particularly among young women [4]. It is also the most common method among adolescents [5], while men tend to prefer potentially more lethal and aggressive methods [6]. Self-poisoning is

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performed through various substances such as drugs and pesticides [4].

Demographic differences have been documented among patients with suicidal behaviors. Marital and employment status, substance use, and sex disparities have been associated with suicide [7,8]. Suicide is a multifactorial phenomenon affected by a range of biological and anthropological determinants [9].

Previous suicide attempt is the most important predictor of suicide attempts [10,11]. Attempts are also linked to psychiatric disorders, with depression being the most common [12]. Medical illness is another predisposing factor, specially among older people [13–15], however this association has also been reported in younger individuals (aged 17–39) [16]. We briefly reported socio-demographic profiles related to suicidal behaviors, but there is another critical aspect that must be considered: cultural norms and values. These factors also significantly determine suicide patterns and rates [17,18]. Available evidence on mentioned items, which we have named “sociocultural characteristics,” has not been studied as extensively as other aspects of suicide [17]. Therefore, despite the fact that numerous sociodemographic causes of suicide have been well-documented in previous studies, we have chosen to report on them in this study, particularly due to the unfamiliar culture and rules in our population.

In addition to the mentioned factors, several hypotheses have been proposed regarding the role of temporal patterns in suicide etiology. For instance, a multicenter analysis reported a recurring pattern of a decrease in suicide attempts before and during major holidays, followed by an increase afterward [19]. Conversely, other studies have reported increased psychological disorders during holidays due to changes in social relationships and interactions [20,21]. Several studies have reported that suicidal behaviors are more common after holidays, following a decrease before and during them, while others have found no temporal patterns at all [22–27]. In another study, Beauchamp et al. found that harmful actions were mainly committed by adults on Sundays and Mondays, whereas individuals younger than 19 tended to prefer Mondays and Tuesdays [28].

Overall, we aimed to examine and report demographic traits, suicide-related factors, and indicators in a representative sample of Iranian individuals who attempted suicide and were referred to a poisoning emergency department. Additionally, Given the potential confounding effects of climate and culture, we have divided the days into working and non-working days in our study. In this regard, we analyzed the association between suicide-related risk factors and suicides committed on non-working and working days to identify influential variables playing significant roles in suicidal behaviors during these special times.

2. Method

2.1. Study design and data collection

This cross-sectional study aimed to describe and analyze suicide attempts based on information collected from 302 patients who were referred to the poisoning emergency department at Aliasghar Hospital in Shiraz, Iran. This hospital serves as the main center for intoxication cases in the Fars province and southern Iran. Suicide attempt or behavior was defined as any action with the intention of ending a life, as identified by a healthcare professional during the hospitalization period. Data were collected from all cases over a 66-day period from November 2019 to January 2020. Based on a study by Faramarzian et al. [29], a sample size of at least 286 was required, with a power of 99% and $\alpha = 0.05$. We collected data from 302 patients who met the inclusion criteria. Before conducting the interview, patients were informed about the study's conditions and the confidentiality of their information. Patients who declined to participate or were unable to answer the questions due to their reduced level of consciousness were excluded from the study. Only conscious and cooperative patients were interviewed, and all data were collected through an oral interview and recorded on a checklist. We obtained written informed consent from each patient before enrollment.

2.2. Variables

The data gathering tool was a data sheet that contained study variables completed by oral interviewers using a convenience sampling method. The essential sociodemographic information of the patients, including gender, age, marital status, level of education, and living area, was collected. In addition, we collected and analyzed other relevant information, such as the history of physical and mental illnesses, history of attempted suicides, types of substances used for self-harm, and time of suicide attempts (day and night hours, days of the week, and working and non-working days). In Iran, non-working days include weekends (Fridays and Thursdays) and any religious or public holidays. All other days are considered working days.

2.3. Ethics statement

This study was approved by the ethics committee and Shiraz University of Medical Sciences (approval code: IR. SUMS.MED.REC. 1398.245). The identity of the patients who participated in this research was protected, and their names were not disclosed in the study.

2.4. Statistical analysis

Descriptive statistics were used to examine the demographic data for significant correlation with self-injury (percent for categorical variables and mean and standard deviation (mean \pm SD) for continuous variables). The Student t-test was used to compare two continuous variables, while Pearson's chi-square test was used to examine the association between categorical variables. All analyses were performed using SPSS version 22.0, with a significance level set at 0.05.

To investigate the correlation between suicidal behavior on working and non-working days and factors related to suicide, we employed the independent-samples *t*-test for comparing two groups, while the Pearson's chi-square test was utilized for categorical variables. Associations demonstrating a *P*-value of less than 0.05 were deemed statistically significant.

3. Results

3.1. Sociodemographic characteristics

During the study period, 302 individuals who had attempted suicide by self-poisoning were included. As shown in Table 1, 192 (63.6%) of these individuals were female and 110 (38.4%) were male, resulting in a male-to-female ratio of 1:1.6. In terms of marital status, the majority of participants (54%) were single, while 118 individuals (39.1%) were married. The remaining 21 (7%) were divorced or widowed. Overall, our study population consisted of 64.5% single, 32.7% married, and 2.7% divorced or widowed men, and 47.9% single, 42.7% married, and 9.3% widowed women.

The attempters' average age was 28.19 years (SD 19.25), ranging from 13 to 90 years. More than 80% of the cases were less than 40 years old. Additionally, the majority of patients had received an education level of matriculation or below. Our results also showed that 82.5% of the study population lived in urban areas, while only 17.5% lived in rural areas.

3.2. Factors correlated with suicide attempts

Table 2 displays the factors associated with suicidal behaviors and their likelihood. Our findings revealed that a greater number of participants had a negative history of previous suicidal intent, psychiatric disorders, and medical illnesses. Specifically, 64.2% of our study population reported no prior suicide attempts (refer to Table 2). The number of individuals without a past history of psychiatric disorders was nearly double that of those with a positive history.

A significant proportion (71.9%) of suicide attempters with psychiatric disorders reported major depression. Patients with major depression accounted for approximately one-fourth of the entire population, with a notable difference in mean age between this group (mean 31, SD 12.80) and the other participants (mean 27.23, SD 10.83) ($p = 0.013$). Table 2 provides detailed information on other mental disorders.

About three fifths (70%) of the mental health patients listed in Table 2 were receiving medical treatment, including SSRIs, benzodiazepines, and anticonvulsants. Table 3 outlines other drugs used by participants. Additionally, our study found that 84.8% of individuals did not report any physical (not mental) or medical diseases. Comparing the history of medical illnesses among three age groups (young group: <39 years, middle-aged group: 40–59 years, and older group: ≥60 years) revealed a significant association between physical illnesses and suicide in older adults (12.6%, 23.8%, and 66.7%, respectively; $p < 0.001$).

3.3. Types of consumed substance in self-poisoning

The types of consumed substances in self-poisoning were classified into four subgroups (as shown in Table 4). Our findings revealed that medical drugs were the most commonly used substance (76.5%) in self-poisoning cases, while alcohol and gasoline consumption

Table 1
Demographics of suicidal attempters (n = 302).

Parameters	Number	%
Sex		
Men	110	36.4
Women	192	63.6
Age (y)		
≤39	254	84.1
40–59	42	13.9
≥60	6	2
Marital status		
Single	163	54
Married	118	39.1
Separated ^a	21	7
Educational level		
Illiterate	9	3
High school	124	41.1
High school diploma	100	33.1
Associate degree	17	5.6
Bachelor degree	44	14.6
Master's degree and above	8	2.6
Living area		
City	249	82.5
Village	53	17.5

^a Separated/divorced or widowed.

Table 2
Suicidal risk factors (n = 302).

Parameters	Number	%
History of suicidal attempt		
Non	194	64.2
First time	73	24.2
Second time	23	7.6
Third time or more	12	4
History of psychiatric disorders		
Non	195	64.6
Major depression	77	25.5
Bipolar disorders	5	1.7
GAD	4	1.3
Schizophrenia	3	1
Borderline disorders	2	0.7
OCD	1	0.3
Impulse Control Disorders	1	0.3
Panic disorders	1	0.3
Others	13	4.3
History of medical diseases		
Negative	256	84.8
positive	46	15.2

Table 3
Frequency of drug use between suicide attempters with a history of psychiatric disorders.

Drugs	Number	%
Non	227	75.2
SSRI	29	9.6
Benzodiazepines	16	5.3
Anticonvulsants	11	3.6
TCA	5	1.7
Buspirone	4	1.3
Antipsychotics	4	1.3
Lithium	2	0.6
Did not know the name of the medicine	25	8.3

accounted for only a small proportion (0.7%). The gender of the participants appeared to be a significant contributing factor in substance preference ($p < 0.001$), with females constituting the majority of medical drug (71.9%) and pesticides-insecticides (77.3%) users. On the other hand, men were found to have misused narcotics at a rate about five times higher than women (83%–17%).

3.4. Committed suicides from the timing perspective

We examined the timing of suicides from three different perspectives: hours of the day, days of the week, and working days versus non-working days. Our analysis revealed that the number of suicide attempts significantly increased towards the end of the day (59.9%), in contrast to the morning hours, which had the lowest frequency of attempts (16.2%). We also evaluated the frequency of suicide attempts on different days of the week, which is presented in Fig. 1 as percentages. The results showed that suicide attempts were more common at the beginning of the week, starting from Saturday (based on the Iranian calendar). Furthermore, we found that 245 people committed suicide on working days, while 57 people did so on non-working days.

Regarding the factors associated with suicidal behaviors on work and non-workdays, we identified significant associations between committing suicide on working or non-working days and two risk factors (Table 5). Our results indicated that sex ($p = 0.017$) and previous history of medical disease ($p = 0.016$) are the only risk factors significantly related to suicide on working/non-working days. However, due to the cross-sectional background of this study, we were not able to explore any causal inferences about these associations. Our findings revealed that, in comparison to men, women exhibited a higher rate of suicide on non-working days (79.5% vs. 20.5%). However, on working days compared to non-working days, the rates of suicide were more similar between men and women.

Table 4
Types of substances used for suicide (n = 302).

Type of substances	Number	%
Medical drug	231	76.5
Narcotics	47	15.6
Pesticides-insecticides	22	7.3
Others	2	0.7

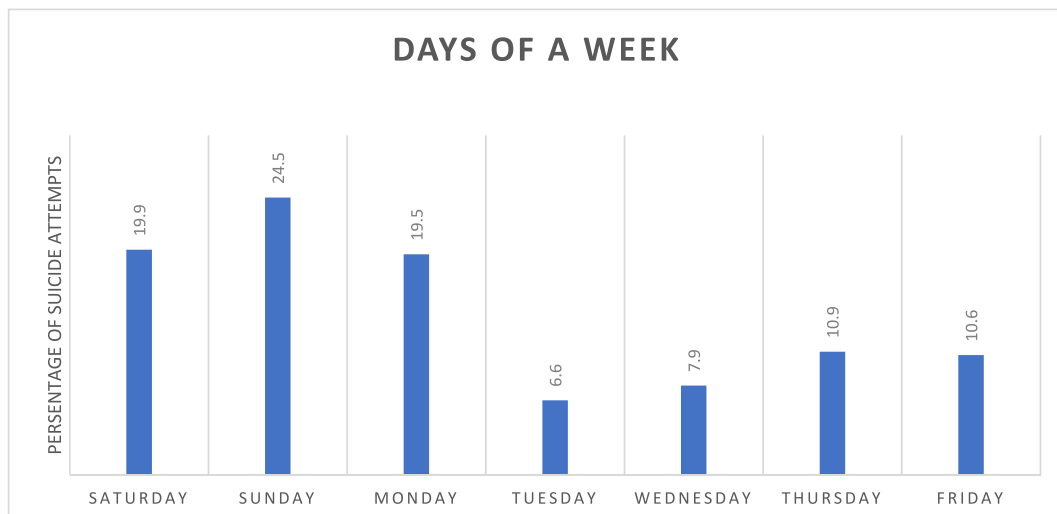


Fig. 1. Prevalence of suicidal behaviors based on the days of a week. The suicide risk is highest on the first three days of the week (especially on Sunday).

Table 5

Comparison of suicidal risk factors during working and non-working days among all participants (n = 302).

Variables	Non-Working days [Number (%)]	Working days [Number (%)]	Statistics (p value)
Sex			
Men	9 (20.5)	101 (39.1)	0.017
Women	35 (79.5)	157 (60.9)	
Marital Status			
Single	26 (59.1)	137 (53.1)	0.527
Married	14 (31.8)	104 (40.3)	
Separated	4 (9.1)	17 (6.6)	
Educational level			
Illiterate	1 (2.3)	8 (3.1)	0.249
High school	15 (34.1)	109 (42.2)	
High school diploma	15 (34.1)	85 (32.9)	
Associate degree	6 (13.6)	11 (4.3)	
Bachelor degree	6 (13.6)	38 (14.7)	
Master's degree and above	1 (2.3)	7 (2.7)	
Living area			
City	36 (81.8)	213 (82.6)	0.905
Village	8 (18.2)	45 (17.4)	
History of suicidal attempt			
Non	28 (63.7)	166 (64.3)	0.768
First time	10 (22.7)	63 (24.4)	
Second time	3 (6.8)	20 (7.8)	
Third time or more	3 (6.8)	9 (3.5)	
Type of substances			
Medical drug	40 (90.9)	191 (74)	0.098
Narcotics	2 (4.5)	45 (17.4)	
Pesticides-insecticides	2 (4.5)	20 (7.8)	
Others	0 (0)	2 (0.8)	
History of psychiatric disorders			
Negative	30 (68.2)	165 (64)	0.588
Positive	14 (31.8)	93 (36)	
History of medical disease			
Negative	32 (72.7)	224 (86.8)	0.016
Positive	12 (27.3)	34 (13.2)	
Age (Mean ± SD)	28.23 ± 14.58	28.19 ± 10.87	0.982

Student t-test used for age, remaining categorical outcomes were compared by Pearson's Chi-square, significance level: *p < 0.05.

Specifically, on these days, 60.9% of suicides were attributed to females, while 39.1% were attributed to males. Moreover, 27.3% of suicide attempts on non-working days were linked to underlying medical conditions, in contrast to only 13.2% of suicide attempts on working days. Therefore, female gender and having medical diseases are two factors that present a significant association with

suicidal behaviors on non-working days.

4. Discussion

4.1. Suicidal behaviors, sociodemographic characteristics, and other related factors and types of substance

In this study, we aimed to characterize the sociodemographic profiles and effective factors related to self-poisoning among suicidal attempters visiting the poisoning department of Ali Asghar Hospital in Shiraz, Iran. We found that the rate of suicide attempts was higher in women (63.6%) compared to male patients. This is consistent with previous studies conducted in Iran, such as Lumpe et al. [30] and Zarenezhad et al. [31], and with the Men-to-women ratios (1:1.6) reported by the WHO [32].

The majority of the study population was between 18 and 44 years old, with a mean age of 28.19 (SD 19.25) years, which is in line with a similar study published in 2022 by Lumpe et al. [30]. In the current study, the rate of suicide attempts was higher in single people (54%) compared to married (39.1%) and widows/widowers (7%) [33], which is consistent with some previous studies. However, it is important to note that the protective role of being married is not definite, as some studies have reported contrasting results, such as the meta-analysis by Zhong et al. [34] which found that being married was considered a suicide risk factor in prisons.

Regarding the level of education, our study showed that more than two-thirds of the participants did not have a university education, which is consistent with a meta-analysis study conducted in 2013 investigating suicide attempts related factors in Iran [35]. Moreover, we found that 89.5% of the entire cases were urban residents, which is consistent with the findings of previous studies [36, 37]. However, this finding may be influenced by the easier accessibility of the Ali Asghar hospital for city residents.

Our study also explored the relationship between socioeconomic determinants and self-harm actions. We found that most of those who attempted suicide by intentional poisoning had no previous history of suicide attempts (64.2%), which is contrary to previous studies that considered the history of suicide attempts as a significant risk factor for repeated suicide attempts [10,11,38,39]. Moreover, while only about one-third of all study subjects suffered from psychiatric illness, the most frequent psychiatric disorder diagnosed among patients from the emergency service was major depression (71.9% of the psychiatric cases), which is consistent with a previous investigation [3,40]. It is worth noting that the stressful situation in ED and the patients' concern about their physical health may have influenced this statistic.

In terms of medical illnesses, our study found that geriatric patients had a greater chance of suffering from medical illness than younger ones. This finding is consistent with previous studies suggesting physical illnesses as a significant risk factor for older adults' suicide [41–43]. Additionally, our results suggested that gender may influence substance preference, with females tending to choose medical drugs and men preferring to select narcotics. In terms of types of consumed substances, we observed more frequency of medical drug abuse, similar to previous studies [44,45].

In summary, our study sheds light on the sociodemographic profiles and effective factors related to self-poisoning among suicidal attempters visiting a specific hospital in Iran. However, as a cross-sectional study, our findings only provide a snapshot of the situation at a particular point in time, and further research is needed to better understand the factors influencing suicidal behaviors in Iran.

4.2. Timing of suicidal behaviors

Our study found that the time of day and the day of the week were significantly associated with suicide attempts. Suicide attempts occurred more frequently at the end of the day (59.9% at night, 23.8% at noon, and 16.2% in the morning), which is consistent with a previous study [46]. It is possible that accumulated stress throughout the day may contribute to the increased likelihood of suicide attempts in the evening and night.

Additionally, suicide attempts were more common on the first days of the week (based on the Iranian calendar), which is consistent with previous studies reporting a "Monday effect" on suicide [47,48]. Kim et al. conducted a case-control study with a population of 188,601 individuals, which found that the frequency of suicide attempts was highest on Mondays and decreased throughout the week, reaching its lowest point on Saturdays [48]. The reason for this phenomenon is not clear, but it may be related to the start of a new week, which can be stressful for some individuals.

The results also indicated that there were more suicide attempts on working days compared to non-working days. This finding was along with some previous studies that have reported fewer suicide rates during non-working days [49,50]. Possible explanation for the decrease in suicide rates during non-working days is the hypothesis that, because all family members are often at home, the person has less opportunity to act on their suicidal thoughts. Additionally, increased social connectedness during this time may also contribute to the decrease in suicide rates.

Our study found that gender and having an underlying disease are the only two significant risk factors correlated with suicide on working/non-working days. Based on our research, we have discovered a significant correlation between the gender of study participants and the incidence of suicide on working or non-working days. Specifically, we found that on non-working days, the rate of suicide among females was four times higher than among males, while on working days, the suicidal rate between men and women were much closer. This may be attributed to the lower employment rate of women in Iran relative to men [51], which leads to less exposure to work-related stress and pressure and therefore, a lower suicide rate among women on working days. However, our findings are consistent with a study by Griffin et al. [52], which demonstrated a significant association between male gender and increased suicide rates during holidays.

Based on various investigations, it is worth noting that certain medical conditions, such as cardiovascular diseases, may be exacerbated at the beginning of the week, particularly on Mondays [53,54]. This could be attributed to mental health disorders, such as

job stress, anxiety, and depression, which are linked to physical health issues during the first few days of the week [55]. This could justify the significant association between medical disease and suicide on working/non-working days.

4.3. Limitations

There are several limitations to our study. Firstly, the study was conducted in a single hospital, which may limit the generalizability of our findings to other settings. Secondly, the study used a cross-sectional design, which precludes any causal inferences about the associations observed. Thirdly, the study relied on self-reported data, which may be subject to reporting bias. Fourthly, the study did not collect data on the severity of suicide attempts, which could have been useful in further analyzing the characteristics of the study population. Fifthly, the specific category of medical drugs consumed for suicide was not available in our dataset. Finally, the study did not collect data on the reasons for suicide attempts, which could have provided important insights into the underlying factors that contribute to suicidal behaviors.

4.4. Implications for practice

The findings of our study have important implications for suicide prevention efforts in Iran. The high proportion of female suicide attempters in our study suggests the need for gender-specific suicide prevention programs. Additionally, the timing of suicide attempts, particularly the increased likelihood of attempts in the evening and on the first days of the week, suggests that suicide prevention efforts should focus on these high-risk periods. Finally, the association between physical illnesses and suicide attempts highlights the importance of integrated mental and physical health care services, particularly for older adults.

5. Conclusion

Our study provides important insights into the characteristics and related factors of suicide attempts in Iran. Our results suggested that the female gender and having an underlying disease considerably increase the odds of engaging in suicide attempts during non-working days. The high proportion of female suicide attempters, the timing of suicide attempts, and the association between physical illnesses and suicide attempts are important areas for future research and suicide prevention efforts. Overall, our study highlights the need for comprehensive suicide prevention strategies that consider the complex interplay of individual, sociocultural, and environmental factors that contribute to suicidal behaviors.

Author contribution statement

Ali Sahraian: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper. Seyedeh Niloofar Sepehrtaj: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper. Seyed Sadat Sepehrtaj: Performed the experiments; Analyzed and interpreted the data; Wrote the paper. Parnia Kamyab: Conceived and designed the experiments; Performed the experiments, Analyzed and interpreted the data, Contributed reagents, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data will be made available on request.

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Ethics approval and consent to participate

The project started after obtaining the permission of the ethics committee and the introduction letter from Shiraz University of Medical Sciences and was conducted in accordance with the principles of the Declaration of Helsinki.

Consent for publication

Not applicable.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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