Assessing the Risk Factors of Violent and Non-violent Suicide Attempt Methods: A Population-based Cross-sectional Study

Amin Moradi[1], MSc; Ehsan Mosafarkhani[2], PhD; Fateme Nikbakht[1], Msc; Zahra Amiri[1], MSc; Ali Vafaee Najar[3], PhD

[1]Department of Epidemiology, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran;
[2]Department of Epidemiology, School of Health, Management and Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran;
[3]Social Determinants of Health Research Center, Mashhad University of Medical Sciences Mashhad, Iran

Correspondence:
Ali Vafaee Najar, PhD;
Website Unit, Public Relations Department of the University (Tardarandshjoo), East Door of Ferdowsi University,
Postal Code: 9177949025,
Mashhad, Iran
Tel: +98 9155158269
Email: vafaeea@mums.ac.ir
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What's Known

- Previous studies emphasized that preventing suicide requires addressing socioeconomic inequality and providing support to individuals with lower education levels and unstable job positions.

What's New

- The findings of the present study indicated that age, sex, marital status, place of residence, education, and occupation were significant risk factors for suicide. The findings of this study were the outcome of integrating the hospital information system (HIS) with the system of providing primary health care services at Mashhad University of Medical Sciences, which was implemented for the first time in Iran.

Abstract

Background: Suicide is a serious global public health issue. It is the fourth-leading cause of death among young people between the ages of 15 and 29. Therefore, the present study was conducted to determine the important risk factors associated with violent and non-violent methods of committing suicide.

Methods: This research was a cross-sectional study that included all people who attempted suicide between 2019 and 2023 and were part of the population covered by Mashhad University of Medical Sciences (Mashhad, Iran). Predictive variables for suicide attempts included age, sex, education, marital status, occupation, place of residence, drug abuse, smoking, psychiatric diagnoses, and the intended outcome of violent and non-violent methods. Logistic regression analysis was used to model the relationship between selected risk factors and the response variable. The data were analyzed using STATA software version 14. P<0.05 was considered statistically significant.

Results: Among the 18,281 people, 53% were men. Men, those who had lost their wives, people who lived in suburban areas, and people who had self-employed jobs or were unemployed, had higher rates of attempted suicide using violent methods. The chance of using violent methods was found to be 64% lower in women than in men (OR=0.36, 95%CI=0.30-0.43) and 45% higher in single individuals than in married people (OR=1.45, 95%CI=1.20-1.75).

Conclusion: This study found that several factors influenced the choice of method for committing suicide. Men, those who had lost their wives, suburban inhabitants, those with insecure jobs or unemployment, and single people were more prone to use violent methods. Meanwhile, women, the elderly, and those with higher education levels showed a preference for non-violent methods.

Introduction

Every 40 seconds, one person commits suicide, accounting for more than 700,000 fatalities worldwide each year.[1] Suicide victims not only suffer physically and emotionally, but they also experience severe psychological, social, and financial consequences.[2] This phenomenon poses a serious threat to public health and causes

a heavy financial burden on psychiatric and other healthcare services.[3] Additionally, suicide is a global issue and does not affect only high-income nations. In 2019, more than 77% of suicides worldwide occurred in low- and middle-income nations.[1] Concerns on both the national and international levels have been raised in recent years as suicide rates have increased.[4] According to a report from the World Health Organization, between 20 and 50 million people commit suicide each year, resulting in one million deaths, which exceeds the annual deaths from homicide and war.[4]

Suicide methods are classified into two main categories: violent and non-violent. Violent methods include using firearms or shotguns, hanging, cutting, and piercing with sharp objects, jumping from high places, and being run over by trains or other vehicles. Non-violent methods include using pesticides, gas poisoning, suffocation, and drug overdose.[5] Violent methods have been considered since they are more lethal, and there is compelling evidence that individuals who attempt suicide frequently have mental problems and engage in self-harm.[6] Research on suicide prevention methods is particularly important for reducing the risk of suicide in the general public.[7, 8]

Researchers discovered several determinants of suicide attempts, including age, sex, suicidal intent, mental health status, timing, and others.[9] A study of the Japanese population revealed that men were more likely than women to use lethal suicide methods, which was similar to the findings of studies conducted on European populations.[10, 11]

Biological (genetic), psychological (e.g., personality traits), clinical (including concurrent psychiatric problems), social, and environmental factors are all risk factors for suicide.[12] Social issues include the family, poverty, unemployment, marital status, criminal records, and divorce.[4] Additionally, psychological aspects can be defined as emotional distress, psychological problems, academic struggles, drug abuse, and a history of suicide, while physical issues can be classified as physical ailments, disability, and incurable diseases.[4] Evidence indicated that factors that reduce people's fear of pain, injury, and death might increase the risk of suicide.[13] In contrast, almost all of the major theories of suicide place a significant emphasis on stress and worry in daily life.[14] The sense of abandonment can raise the risk of suicide due to increased life stress, mental disorders, depression symptoms, and a decrease in social support.[15]

In today's society, the increasing prevalence of various social anomalies serves as a warning to both society and individuals.[16] Suicide, among these disorders, has become a national concern due to its complicated and multifaceted nature, as well as the annual growth in suicide attempts.[17] Regardless of the burden imposed on society, every suicide attempt impacts a wide range of people who may require support or medical and psychiatric services while coping with the loss of suicide victims.[18] Furthermore, research findings demonstrated that the method used in an unsuccessful suicide attempt may serve as a predictor for subsequent completed suicides, emphasizing the critical importance of investigating the risk factors associated with suicide methods in suicide prevention across diverse populations.[19] There is a paucity of studies on the significance of early risk factors in the selection of violent suicide attempt methods. Knowledge about risk factors for a specific method of suicide attempt or suicide is important for the prevention and evaluation of suicide risk in clinical settings.[20] Therefore, this study aimed to investigate and compare the potential risk factors associated with violent and non-violent suicide attempts in a population-based sample.

Patients and Methods

This research was a cross-sectional study. The required information was collected from two sources. One of these sources was the suicide attempt registry system in all government hospitals, affiliated with Mashhad University of Medical Sciences (Mashhad, Iran), which operated through the hospital information system (HIS). All cases of attempted suicide were recorded in the system after being confirmed by clinicians using the International Classification of Diseases (ICD-10). In addition, since suicide prevention services are linked to the primary healthcare system, suicide-related data have been integrated into Sina's electronic health record system (SinaEHR®) and linked to other health information of individuals. This study was approved by the Ethics Committee of Mashhad University of Medical Sciences (code: IR.MUMS. FHMPM.REC.1401.207) and conformed with the principles of human research.

This study used the census method. The inclusion criteria were having a documented suicide attempt between 2019 and 2023 and being part of the population covered by Mashhad University of Medical Sciences. The exclusion criteria included not fulfilling these documentation and timeframe criteria.

Instruments

Predictive variables were selected based on the review of existing studies, considerations

of the research team, and relevant suicide risk factors. Variables included age, sex, education, marital status, occupation, place of residence, drug abuse, smoking, and psychiatric diagnoses including depression (ICD-10: F32, F33), anxiety disorders (F41, F43), bipolar disorders ([F30, F31], F34), psychosis (F20, F22, F23, F25), mental retardation (F70-F73), drug use disorders (F10-F19), obsessive-compulsive disorder (F42), and other disorders (F44, F45, F50, F52, F40, F95, F84, F90, F91, G40, G41, T40, T51, F53).

The outcome variable was violent and non-violent methods of committing suicide. Suicide attempt cases were classified according to the ICD-10 classification from codes X60 to X80. The codes X60 to X69 were classified as non-violent, and codes X70 to X84 were classified as violent methods.

Statistical Analysis

The data were analyzed descriptively, and the Chi square test was used to investigate the associations between categorical variables. Then, binary logistic regression was utilized to establish a model for examining the relationship between selected risk factors and the outcome variable. In the regression analysis, odds ratios (ORs) and 95% confidence intervals (CIs) were calculated, and variables with a P≤0.25 were included in the multiple models. The data were analyzed using Stata (version 14.0, Stata Corp, College Station, Texas, USA). P<0.05 was considered statistically significant.

Results

Among 18,281 people, 53% were men. The

Table 1: Demographic characteristics of the study population by suicide attempt status

Variables		Violent Method n (%)	Non-violent Method n (%)	P value*
Sex	Female	7637 (44.44)	777 (70.96)	<0.001
	Male	9549 (55.56)	318 (29.04)	
Age (year)	<18	3257 (18.95)	173 (15.80)	<0.001
	18-29	7220 (42.01)	463 (42.28)	
	30-59	6172 (35.91)	443 (40.46)	
	≥60	537 (3.12)	16 (1.46)	
Marital status	Married	7248 (42.17)	378 (34.52)	<0.001
	Divorced/Widow	701 (4.08)	44 (4.02)	
	Single	9237 (53.75)	673 (61.46)	
Resident	Village	2896 (16.85)	165 (15.07)	<0.001
	Suburban	4408 (25.65)	359 (32.79)	
	Under one million habitant	2655 (15.45)	142 (12.97)	
	Metropolitan	7227 (42.05)	429 (39.18)	
Education	Elementary	4566 (26.57)	303 (27.67)	0.003
	High school	7944 (46.22)	516 (47.12)	
	College	1194 (6.95)	44 (4.02)	
	Other	3482 (20.26)	232 (21.19)	
Job-status	Student	5568 (32.40)	337 (30.78)	<0.001
	Housewife	5653 (32.89)	332 (3.32)	
	Self-employed	1841 (10.71)	179 (16.35)	
	Unemployed	399 (2.32)	51 (4.66)	
	Worker	999 (5.81)	94 (8.58)	
	Employee	328 (1.91)	17 (1.55)	
	Other	2398 (13.95)	85 (7.76)	
Mental disorder	No	14605 (84.98)	956 (87.31)	0.036
	Yes	2581 (15.02)	139 (12.69)	
Anxiety	No	16398 (95.41)	1055 (96.35)	0.150
	Yes	788 (4.59)	40 (3.65)	
Depression	No	15527 (90.35)	1022 (93.33)	0.001
	Yes	1659 (9.65)	73 (6.67)	
Other disorders	No	16748 (97.45)	1049 (95.80)	0.001
	Yes	438 (2.55)	46 (4.20)	
Drug abuse	No	16729 (97.34)	1048 (95.71)	0.001
	Yes	457 (2.66)	47 (4.29)	
Smoking	No	16311 (94.91)	1039 (94.89)	0.973
	Yes	875 (5.09)	56 (5.11)	

*Chi square test; P<0.05 was considered statistically significant. Data are expressed as numbers and percentages.

comparisons of suicide attempt methods indicated differences across demographic and risk factor groups. Violent suicide attempts were more frequently observed among men, individuals who had lost their spouse through death or divorce, suburban residents, and people who were self-employed or unemployed (table 1).

Table 2 presents the univariate and multivariate logistic regression results. The final model included variables such as age, sex, marital status, place of residence, education, occupation, mental disorders, depression, anxiety, and drug abuse. After adjusting the effect of other variables, the results showed that the odds of committing suicide by violent

methods were 64% lower in women than in men. In addition, the results indicated that the odds ratio of committing suicide using violent methods in the age group over 60 years was estimated at 0.41. Besides, people over 60 years old had a 59% less chance than the base group (<18 years old) to commit suicide by violent methods. Regarding marital status, the results indicated that compared to the married group, individuals who experienced their spouse's death or divorce had an odds ratio of 1.50 (95%CI=1.08-2.10) for committing suicide by violent methods. Furthermore, single individuals had an odds ratio of 1.45 (95% CI: 1.20-1.75) for committing suicide using violent methods.

Table 2: The results of univariate and multivariate analysis for suicide reattempt							
Variables		**Crude Odds Ratio**			**Adjusted Odds Ratio**		
		OR	95% Confidence interval	P value*	OR	95% Confidence interval	P value*
Sex	Male	Reference	-	-	-	-	-
	Female	0.32	(0.28-0.37)	<0.001	0.36	(0.30-0.43)	<0.001
Age	<18	Reference	-	-	-	-	-
	18-29	1.20	(1.00-1.44)	0.04	1.05	(0.84-1.32)	0.61
	30-60	1.35	(1.12-1.61)	0.001	1.22	(0.93-1.61)	0.13
	>60	0.56	(0.33-0.94)	0.02	0.41	(0.23-0.73)	0.002
Marital status	Married	Reference	-	-	-	-	-
	Divorced/Widow	1.20	(0.87-1.66)	0.259	1.50	(1.08-2.10)	0.014
	Single	1.39	(1.22-1.59)	<0.001	1.45	(1.20-1.75)	<0.001
Resident	Village	Reference	-	-	-	-	-
	Suburban	1.42	(1.18-1.72)	<0.001	1.30	(1.06-1.60)	0.01
	Under one million habitants	0.93	(0.74-1.18)	0.59	0.95	(0.75-1.21)	0.731
	Metropolitan	1.04	(0.86-1.25)	0.66	1.00	(0.80-1.24)	0.96
Education level	Elementary	Reference	-	-	-	-	-
	High school	0.97	(0.84-1.13)	0.77	0.91	(0.78-1.07)	0.30
	College	0.55	(0.40-0.76)	<0.001	0.59	(0.41-0.84)	0.003
	Other	1.00	(0.84-1.19)	0.96	0.82	(0.64-1.06)	0.14
Job-status	Student	Reference	-	-	-	-	-
	Housewife	0.97	(0.83-1.13)	0.70	1.08	(0.86-1.36)	0.48
	Self-employed	1.60	(1.33-1.94)	<0.001	1.30	(1.00-1.70)	0.04
	Unemployed	2.11	(1.54-2.88)	<0.001	1.60	(1.13-2.25)	0.007
	Worker	1.55	(1.22-1.97)	<0.001	1.18	(0.87-1.60)	0.28
	Employee	0.85	(0.51-1.41)	0.54	0.91	(0.53-1.55)	0.73
	Other	0.58	(0.45-0.74)	<0.001	1.11	(0.80-1.54)	0.51
Mental disorder	No	Reference	-	-	-	-	-
	Yes	0.82	(0.68-0.98)	0.03	1.07	(0.61-1.90)	0.79
Anxiety	No	Reference	-	-	-	-	-
	Yes	0.78	(0.57-1.09)	0.151	0.97	(0.56-1.69)	0.94
Depression	No	Reference	-	-	-	-	-
	Yes	0.66	(0.52-.0.85)	0.001	0.76	(0.45-1.31)	0.33
Other disorders	No	Reference	-	-	-	-	-
	Yes	1.67	(1.22-2.28)	0.001	1.60	(0.96-2.69)	0.07
Drug abuse	No	Reference	-	-	-	-	-
	Yes	1.64	(1.20-2.23)	0.002	1.35	(0.98-1.86)	0.06
Smoking	No	Reference	-	-	-	-	-
	Yes	1.00	(0.76-1.32)	0.973	-	-	-

*Univariate and multivariate logistic regression analysis for suicide reattempt; P<0.05 was considered statistically significant.

In addition, people living in the suburban area had 30% higher odds of committing suicide using violent methods than people living in villages. In this study, a significant relationship was observed between the level of education and attempted suicide with violent methods. Individuals with a university education were 41% less likely to attempt suicide using violent methods than those with only a primary education. In terms of employment, those who were self-employed and unemployed had 30% and 60%, respectively, higher chances of committing suicide using violent methods than the base group.

Discussion

The findings of this study indicated that age, sex, marital status, place of residence, education, and occupation were significant risk factors in determining the method of suicide. In this study, 11% of the participants used violent methods to commit suicide. The findings of this study were the result of integrating the information from the HIS with those of the system of providing primary health care services at the level of Mashhad University of Medical Sciences, which was implemented for the first time in Iran.

The findings of the present study indicated that individuals aged 60 years and above are 59% less likely to employ violent suicide methods than those in the younger age group (6-17 years old). In this regard, a study conducted on Chinese elderly people demonstrated that older people were more likely to select non-violent methods for suicide.[21] However, a previous study reported that individuals who employed violent methods for suicide were generally older than those who used non-violent methods.[20]

The results of previous studies indicated that suicide attempts with violent methods were significantly more common in men than in women,[16, 22] which was in line with the findings of the present study. In the present study, women used less violent methods to commit suicide than men.

The findings of the present study showed that, compared to the married group, individuals who lost their spouse through death or divorce, as well as those in the single group, were more prone to employ violent suicide methods. Therefore, in the single group due to death or divorce, the odds of using violent methods to commit suicide were 50% higher, and in the single group 45% higher, than the married group. These findings were consistent with previous research investigating suicide patterns by marital status in Hong Kong, which found that both men and women in the single, widowed, and divorced

groups had a higher risk of suicide than married individuals.[23] It is important to note that different studies might have different results depending on cultural and regional factors. For example, the results of a study conducted in Iran reported that drug overdose and pesticide poisoning were more common in single individuals, while self-immolation and drug poisoning were more common in married people.[24]

According to the findings of the present study, people living in the suburbs had 30% higher odds of committing suicide by violent methods than people living in the villages. The results of previous studies revealed that people living in rural areas used non-violent methods of suicide more than people living in the city.[21, 25] However, another study stated that the percentage of suicide attempts by all methods was higher in urban residents, except for the use of firearms, which was more reported in rural residents.[24] It appeared that the variation in suicide methods in different studies was attributed to the diverse cultures within the studied population.[26] For instance, in some populations, the availability of hunting weapons might lead to their use in suicide attempts. Thus, it contributed to an increase in violent suicides.[27]

The findings of other studies indicated that individuals with a lower level of education were more likely to use violent suicide methods than those with a higher level of education.[21, 28] The results of the present study were consistent with the previously reported findings, demonstrating that individuals with a university education level used violent methods of suicide 41% less than people with primary education. Previous studies suggested that the reason for this trend could be attributed to individuals with lower levels of education resorting to violent suicide methods due to limited problem-solving and decision-making skills.[29, 30]

In the present study, individuals who had a self-employed job or were unemployed selected violent methods of suicide significantly more than other people. Previous research demonstrated that an increase in the minimum wage was associated with a decrease in the suicide rate among the general population, while unemployment was associated with a higher incidence of suicide.[31, 32] In addition, it was reported that suicide attempts, using both violent and non-violent methods, were more common among unemployed people than employed people.[33] Overall, these findings emphasized the importance of addressing socio-economic inequalities and providing support to individuals with lower education levels and unstable job

positions to prevent suicide.

The present study had some limitations. First, the data was only obtained from government hospitals. Thus, any suicide attempts treated at private hospitals were not included. Furthermore, completed suicides that resulted in fatalities were not included in this study.

Conclusion

This study identified several factors related to the choice of method for suicidal behavior. Violent suicide attempts were more likely among men, single individuals, those living in suburban areas, and people with unstable employment or unemployment. In contrast, non-violent attempts were more likely in women, the elderly aged 60 years or above, and those with a university education. Additional factors, such as mental health challenges and substance abuse might increase the chance of suicide in general. Further research on environmental conditions and access to lethal means would shed more light on the motivations behind this decision. Understanding major socio-demographic and individual risk factors could inform preventive efforts targeting specific high-risk groups to minimize violent versus non-violent suicide behaviors, based on the methods preferred by the affected populations.

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Authors' Contribution

A.M: Study concept and design, drafting the work; E.M: Data acquisition, reviewing the work; F.M: Statistical analysis, drafting the work; Z.A: Study concept and design, drafting the manuscript; A.V: Recruitment and screening of the participants, data collection, reviewing the work; All authors have revised and approved the final version of the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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