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Original Article

Suicide and Associated Risk Factors in Hamadan Province, West of Iran, in 2008 and 2009

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ABSTRACT

Background: Hamadan is a province with high incidence rate of suicide. The present study was conducted to assess suicide and its associated risk factors in this province.

Methods: In this cross-sectional study, all cases of suicide occurred in the province, were investigated from April 2008 to March 2010. The data were collected from Provincial Health Center and Forensic Medicine's databases using a checklist developed according to the available records.

Results: A number of 5414 suicide attempts had occurred (with 8.4% deaths) including 2753 women (with 3.4% death) and 2660 men (with 13.7% death). Majority of the suicide attempts and completed suicides occurred among adults aged 20-29 years. About 6.7% of the cases who attempted for suicide and 14.2% of the cases who died from suicide had a previous history of suicide attempt ($P<0.001$). Familial problems (49.7%) and psychiatric disorders (31.6%) were among the most common reasons of suicide attempt. Using drugs (74.0%) were the most common method of attempting suicide while hanging (83.6%), burning (74.2%), and gunshot (52.4%) were the most common leading causes of completed suicide ($P<0.001$). Adjusted odds ratio estimate of completed suicide in males against females was 2.27 (95% CI: 1.63, 3.14). The odds of completed suicide increased 1.43 (95% CI: 1.30, 1.57) fold per 10 years of age.

Conclusion: This survey identified and highlighted the most common and important potential risk factors for suicide. In addition, the effects of various demographic risk factors on suicide attempt and completed suicide were examined. These evidences may be useful for future research, policy, and treatment efforts aimed at understanding and preventing suicide.

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Introduction

Suicide is one the ten top leading causes of death worldwide. In many countries, suicide is the second and third leading cause of death among age groups of 10 to 24 and 15 to 44 years old respectively¹. According to the report of WHO, about one million people die due to suicide in the world. Furthermore, suicide attempt is 10 to 20 times more than deaths from suicide. These statistics means that almost one death from suicide occurs every 40 seconds and one suicide attempt occurs every 3 seconds in the world^{1,2}. Approximately 10% of people who attempt for suicide will eventually kill themselves³.

The incidence rate of death due to suicide was 13.5 per 100,000 populations worldwide in 2000 and increased to 16.0 per 100,000 at present. Almost 1.8% of the burden of diseases

worldwide in 1998 was due to suicide^{1,2}. In addition, it is estimated that about 1.53 million people will die due to suicide in the world in 2020 and almost 10 to 20 times the number of suicide will be⁴. In 2004, Iranian Ministry of Health and Medical Education reported suicide as thirteenth cause of death in Iran⁵. Based on this report, the incidence rate of death from suicide on average was 6.9 per 100,000 (8.9 in men and 4.9 in women).

Hamadan was among the first three provinces of the country in which the incidence rate of death from suicide was the highest in two consecutive years during 2002 and 2003⁶. A recent survey which was conducted in 2012 in Hamadan Province showed that, after transport accidents, suicide was the second most common cause of premature death from external

causes of morbidity in this province⁷. Data on suicidal behaviors resulted from observational studies would provide a unique opportunity to evaluate the consistency of prevalence estimates and risk factors for suicide behaviors, and would greatly inform research, policy, and treatment efforts more broadly aimed at understanding and preventing suicide⁸.

The purpose of the current study was to estimate the incidence rate of suicide and to examine the risk factors for this lethal behavior in Hamadan Province.

Methods

This cross-sectional study is part of an MPH thesis, approved by the Human Subject Review Board of Tehran University of Medical Sciences.

This large population survey was conducted in 2010. We enrolled all cases of suicide (attempted and completed) which occurred in Hamadan Province, the west of Iran, from April 2008 to March 2010. The data on suicide was derived from Hamadan Vice-chancellor of Health Services' and Forensic Medicine's databases in which all cases of suicide occurred throughout the province were recorded. Cases of suicide related to the neighboring provinces, which had been referred to health centers of the province were excluded. A case of suicide related to foreigners was excluded from the study too. The students and soldiers who were staying in the province were considered as the residents of the province.

The data collection tool was a checklist developed according to the demographic and epidemiological data recoded in the databases. The demographic data included gender, age, marital status, education, occupation, and residence. The epidemiological data included date, method, reason, and previous history of suicide, as well as the result of suicide attempt.

The possibility of reporting repeated cases existed because data on suicide were reported from all health centers and hospitals throughout the province. In order to identify the repeated cases, the subjects' names were investigated. The similar names were

further evaluated for other characteristics including age, residence, date and method of suicide. The cases with similar characteristics were excluded from the analysis. The cases with similar characteristics but different dates of suicide with at least two weeks apart were considered as re-attempted suicide. In cases where all the characteristics of the subjects were the same except the method of suicide, the forensic report was considered as criterion.

According to the statistics released by the Statistical Center of Iran based on the last Population and Housing Census in 2006, the population of Hamadan Province is estimated 1,703,267 people (856,837 males and 846,430 females). In order to estimate the incidence rate of suicide, the population of the province in 2006 was considered as the denominator.

Stata version 11 (StataCorp, College Station, TX, USA) was used for data analysis. Chi-squared test was used for measuring association between nominal variables and logistic regression to assess the effect of potential risk factors on suicide attempt at 0.05 significant levels. A backward stepwise regression method was chosen to fit the data well and to exclude unnecessary variables from the model. For this purpose, we started with full model and then excluding variables one at a time, while checking via the likelihood ratio test to determine whether the reduced model or the full model fitted the data significantly well⁹.

Results

During the two years study period, a total of 5414 cases of suicide attempt were recorded (2954 cases in the first and 2460 cases in the second year) out of which 457 (8.4%) cases had led to death. Accordingly, the incidence rate of completed suicide in Hamadan Province was estimated 14.68 and 12.15 per 100,000 populations in the first and second year respectively. The incidence rate of completed suicide among men and women was 22.68 and 6.77 per 100,000 in the first year and 20.22 and 4.08 per 100,000 in the second year (Table 1). The most incidence rate of attempted suicide in the province in the first year occurred in Nahavand County (23.8 per 100,000) and in the second year occurred in Bahar County (18.0 per 100,000).

Table 1: Distribution of suicide attempt and incidence rate of completed suicide per 100,000 population by sex, age groups, and year

Age group (yr)	Female				Male				Total			
	Population	AS	CS	IR	Population	AS	CS	IR	Population	AS	CS	IR
1st year: from April 2008 to March 2009												
0-9	123,327	0	0	0.00	116,354	0	0	0.00	239,681	0	0	0.00
10-19	202,017	535	8	3.96	196,619	341	29	14.75	398,636	876	37	9.28
20-29	188,293	633	19	10.09	192,297	712	74	38.48	380,590	1345	93	24.44
30-39	122,814	204	21	17.10	122,376	189	36	29.42	245,190	393	57	23.25
40-49	91,584	96	5	5.46	87,141	93	23	26.39	178,725	189	28	15.67
50-59	54,554	31	1	1.83	59,902	55	18	30.05	114,456	86	19	16.60
60-69	36,317	12	1	2.75	37,772	23	10	26.47	74,089	35	11	14.85
70-79	27,294	12	2	7.33	24,343	12	2	8.22	51,637	24	4	7.75
≥80	10,637	3	1	9.40	9,626	3	0	0.00	20,263	6	1	4.94
Total	856,837	1,526	58	6.77	846,430	1,428	192	22.68	1,703,267	2954	250	14.68
2nd year: from April 2009 to March 2010												
0-9	123,327	0	0	0.00	116,354	0	0	0.00	239,681	0	0	0.00
10-19	202,017	381	2	0.99	196,619	267	16	8.14	398,636	648	18	4.52
20-29	188,293	566	17	9.03	192,297	649	83	43.16	380,590	1215	100	26.27
30-39	122,814	165	10	8.14	122,376	136	21	17.16	245,190	301	31	12.64
40-49	91,584	68	3	3.28	87,141	77	20	22.95	178,725	145	23	12.87
50-59	54,554	28	1	1.83	59,902	55	18	30.05	114,456	83	19	16.60
60-69	36,317	6	0	0.00	37,772	17	6	15.88	74,089	23	6	8.10
70-79	27,294	7	1	3.66	24,343	23	6	24.65	51,637	30	7	13.56
≥80	10,637	4	1	9.40	9,626	5	2	20.78	20,263	9	3	14.81
Total	856,837	1,225	35	4.08	846,430	1,229	172	20.32	1,703,267	2454 ^a	207	12.15

AS: Attempted suicide; CS: Completed suicide; IR: Incidence rate per 100,000 population

Of the 5414 cases of suicide attempt, 2753 cases (51%) were female and 2660 (49%) were male. However, the number of completed suicide in males was much more than females (364 versus 93) (Table 1). In other words, the proportion of completed suicide in males was significantly higher than in females, 13.7% (364/2660) compared to 3.4% (93/2753) respectively ($P<0.001$).

The mean age of subjects who attempted suicide was 26.3 years (25.3 years in females and 27.3 years in males) ranged from 10 to 90 years. More than 75.4% of the cases (4084/5414) aged less than 30 years. Majority of the suicide attempts (2560/5414) and completed suicides (193/457) occurred among adults aged 20 to 29 years (Table 1). However, the proportion of completed suicide was higher among older ages ($P<0.001$).

Approximately 54.2% of the cases were single; nonetheless, the proportion of completed suicide among married individuals (5.7%) was higher than among single people (4.0%) ($P<0.001$). In addition, most of the cases (95.2%) who attempted suicide were either illiterate or low educated ($P<0.001$) and 36.7% were housewives ($P<0.001$) (Table 2).

Table 2: The effect of potential risk factors on completed suicide, there were some missing data among subgroups, hence, the sum of subgroups may be less than total

Variable	Completed N=457	Attempted N=4957	Crude Odds Ratio (95% CI)	P value
Gender				
Female	93	2,660	1.00	
Male	364	2,296	4.53 (3.59, 5.73)	0.001
Age group (yr)				
10-19	55	1,470	1.00	
20-29	193	2,367	2.22 (1.60, 2.96)	0.001
30-39	88	605	3.89 (2.74, 5.52)	0.001
40-49	51	283	4.82 (3.22, 7.20)	0.001
50-59	38	131	7.75 (4.94, 12.2)	0.001
60-69	17	41	11.1 (5.92, 20.7)	0.001
70-79	11	43	6.84 (3.35, 13.9)	0.001
80-90	4	11	9.72 (3.00, 31.5)	0.001
Trend for 10 years of age	-	-	1.48 (1.39, 1.59)	0.001
Marital status				
Single	112	2,672	1.00	
Married	132	2,205	1.43 (1.10, 1.85)	0.007
Divorce/Widow	5	8	11.9 (3.54, 40.2)	0.001
History				
No	151	4,522	1.00	
Yes	25	324	2.31 (1.49, 3.58)	0.001
Education				
Illiterate	276	5.83	1.00	
Primary school	459	9.7	0.98 (0.57, 1.66)	0.926
Secondary school	932	19.69	0.65 (0.39, 1.07)	0.087
High school	1,867	39.44	0.35 (0.21, 0.57)	0.001
Academic	1,200	25.35	0.35 (0.21, 0.60)	0.001
Occupation				
Housewife	58	1,781	1.00	
Jobless	32	796	1.23 (0.80, 1.92)	0.348
Student	21	654	0.99 (0.59, 1.64)	0.957
Collegian	2	219	0.28 (0.07, 1.16)	0.079
Soldier	10	73	4.21 (2.07, 8.56)	0.001
Worker	27	342	2.42 (1.51, 3.88)	0.001
Employee	8	43	5.71 (2.57, 12.7)	0.001
Self-employment	56	708	2.43 (1.67, 3.54)	0.001
Retired	4	15	8.19 (2.64, 25.4)	0.001
Farmer/Shepherd	16	142	3.46 (1.94, 6.17)	0.001

Although suicide attempt had occurred in urban areas more than rural areas (65.5% versus 34.5%), the proportion of completed suicide was not statistically different between the two regions ($P=0.080$). The proportion of suicide attempts during spring and summer was higher than autumn and winter ($P=0.099$).

About 6.7% of the cases who attempted for suicide and 14.2% of the cases who died from suicide had a previous history of suicide attempt (Table 2). There was a positive correla-

tion between suicide and history of suicide attempt ($P<0.001$). Although familial problems (49.7%) and psychiatric disorders (31.6%) were among the most common reasons of suicide attempt, jobless and poverty (25.0%) as well as addiction (16.3%) were the most common reasons of completed suicide ($P<0.001$) (Figure 1). Using drugs (74.0%) was the most common method of attempting suicide while hanging (83.6%), burning (74.2%), and gunshot (52.4%) were the most common leading causes of completed suicide ($P<0.001$) (Figure 2).

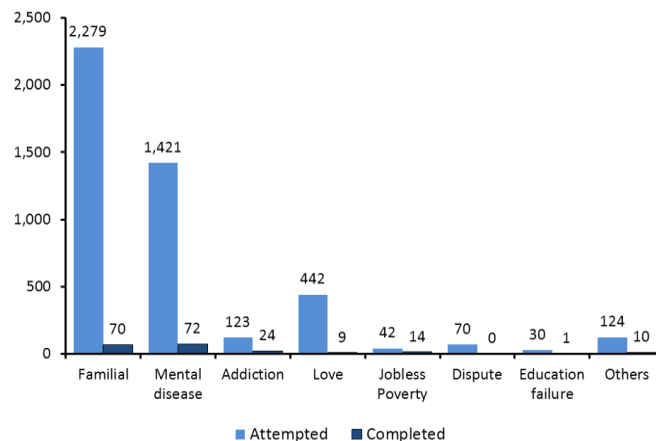


Figure 1: Distribution of suicide attempt and complete suicide by reason of suicide

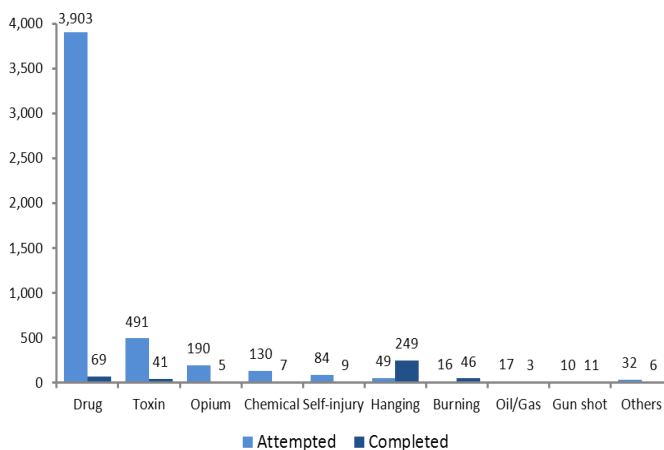


Figure 2: Distribution of suicide attempt and complete suicide by method of suicide

According to the logistic regression analysis the crude (Table 2) and adjusted (Table 3) odds ratio (OR) estimates of completed suicide in males against females were 4.53 (95% CI: 3.59, 5.73) and 2.27 (95% CI: 1.63, 3.14) respectively ($P<0.001$). The odds of completed suicide was higher among older age groups than younger ones so that the adjusted OR estimate of completed suicide among people aged 60 to 69 years against people aged 10 to 19 years was 10.2 (95% CI: 4.29, 24.2) ($P<0.001$). In addition, odds of completed suicide increased 1.43 (95% CI: 1.30, 1.57) fold per 10 years of age ($P<0.001$).

The odds of completed suicide was higher among married and divorced individuals compared to single people ($P<0.001$), among those individuals with a previous history of suicide compared to those without a history of suicide ($P<0.001$), and among illiterate and low educated individuals compared to high educated individuals (Table 2), although adjusted subgroup analysis of these covariates was not statistically significant (Data not shown).

Table 3: The effect of potential risk factors on completed suicide, adjustment was done for all variables shown in the table, there were some missing data among subgroups, hence, the sum of subgroups may be less than total

Variable	Completed N=457	Attempted N=4957	Adjusted Odds Ratio (95% CI)	P value
Gender				
Female	93	2,660	1.00	
Male	364	2,296	2.27 (1.63, 3.14)	0.001
Age group (yr)				
10-19	55	1,470	1.00	
20-29	193	2,367	1.57 (0.99, 2.47)	0.053
30-39	88	605	2.57 (1.50, 4.42)	0.001
40-49	51	283	3.52 (1.91, 6.48)	0.001
50-59	38	131	5.18 (2.62, 10.2)	0.001
60-69	17	41	10.2 (4.29, 24.2)	0.001
70-79	11	43	5.24 (1.90, 14.5)	0.001
80-90	4	11	8.94 (1.83, 43.6)	0.007
Trend for 10 years of age	-	-	1.43 (1.30, 1.57)	0.001
History				
No	151	4,522	1.00	
Yes	25	324	2.22 (1.42, 3.47)	0.001

Discussion

We focused on the completed suicide, because deaths from suicide are generally reported and documented more accurately than cases of suicide attempts. The reason is that reporting the deaths from suicide is unavoidable. In addition, the causes of all suspected deaths such as suicide are investigated by forensic medicine. While cases of suicide attempts are prone to underreporting for the sake of saving reputation or preventing deprivation of insurance services.

According to our findings, the most common risk factors for suicide attempt included female gender, the third decade of life, being single, previous history of suicide, low education level, familial problems and psychiatric disorders. Nonetheless, the most common risk factors for completed suicide included male gender, senescence, being married or divorce, jobless, poverty and addiction. Although drug abuse was the most common method to attempt suicide, hanging was the most common leading cause of death from suicide. Results of previous studies confirm these findings. A cross-national survey conducted Nock et al in 2008 revealed that female gender, younger ages, less educated, and unmarried were the most common risk factors of suicide⁸. In addition, according to the results of survey conducted by Naghavi et al in 2007, suicide death rate in men was almost twofold in men than in women (7.6 versus 4.1 per 100,00)⁵. Another study conducted in China indicated that death rate from suicide was higher in men than in women¹⁰. Ghaleiha et al conducted a similar study in Hamadan and reported that the most common method of suicide (78.1%) was hanging¹¹.

Majority of the subjects in our survey attempted for suicide in the third decade of life. This finding is approximately similar to the results of national survey in 2001¹². In addition, the mean age of the subjects in our survey was relatively less than that of national survey (26.3 versus 30.7 respectively). This may be a warning sign that the mean age of suicide attempt is decreasing over time. On the other hand, 10% of the people who attempt for suicide will eventually kill themselves³. These evidences confirm that young adults are the most susceptible and high-risk group among general population and should be the focus of special attention for preventive and screening programs. Regional studies in the country reported similar results. For example, the mean age of suicide attempt was 30.9 years in West Azarbaijan Province during 2004 to 2009¹³; 24.9 years in Central Province during 2002 to 2006¹⁴; 25.2 years in Kurdi-

stan Province in 2009¹⁵; and 26.0 years in Alborz Province in 2005¹⁶. There are several risk factors associated with youth suicide. Psychiatric disorder has been reported in up to 80-90% of adolescent suicide victims^{17,18}. Mood, anxiety, and substance abuse (alcohol and drug) disorders are the most common psychiatric conditions in both attempted and completed suicide¹⁷.

In 2008, the incidence rate of suicide was highest in Nahavand County (23.8 per 100,000), then decreased to 15.1 per 100,000 in 2009. This decreasing trend may be due to preventive program, which was carried out in this county during 2009 in order to reduce suicide attempts. In this preventive program, the high-risk individuals who were suspected to be depressed people were screened. Then the depressed people were referred to health centers for medical treatment and psychiatric consultation.

There were several limitations in this survey. First, suicide attempt is generally an embarrassed action and therefore prone to under reporting. This issue may raise the possibility of measurement bias. The data on suicide were collected by a surveillance system, which is usually prone to under-reporting¹⁹, hence, lack of accurate and systematic recording and reporting of all cases of suicide attempt is another source under reporting which might lead to measurement bias. In addition, unintentional death due to drug abuse overdose among addicts may sometimes be reported as suicide. This might lead to over-estimation of suicide rate among this subgroup of general population.

Despite its limitations, the current study may have a number of implications for health care policy. First, the most common risk factors for suicide were identified in the target population. Second, the effects of several demographic risk factors on suicide attempts and deaths due to suicide were measured quantitatively. These findings may help policymakers who plan preventive program to reduce suicide rate and its associated predisposing factors. A systematic review of suicide prevention programs which was conducted in 2005 indicated that restricting access to lethal means and recognizing and treatment of depression and suicidal behavior have shown considerable effects in reducing suicide rates^{20,21}.

Conclusion

The results of this survey identified and highlighted the most common and important potential risk factors for suicide.

In addition, the effects of various demographic risk factors on suicide attempt and completed suicide were examined. These evidences may be useful for future research, policy, and treatment efforts aimed at understanding and preventing suicide.

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Conflict of interest statement

The authors declare that they have no conflicts of interest.

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