Completed Suicide and Associated Risk Factors: A Six-Year Population Based Survey

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Abstract

Introduction: The investigations on suicide conducted within low- and middle-income countries are limited. This study evaluated the trend of suicide and its associated risk factors in the west of Iran.

Methods: This six-year population-based survey was conducted in Kermanshah Province, in 2012. The data on suicide was extracted from the suicide database of the Provincial Health Center, which was collected for six successive years. Multivariate logistic regression analysis was performed and odds ratio (OR) as well as its 95% confidence intervals (CI) was reported.

Results: During the study period, 13,810 attempted suicides occurred of which 1,564 (11.33%) were completed. The incidence rate of suicide has increased in recent years. Based on logistic regression analysis, OR estimate of completed suicide increased 1.46 (95% CI: 1.36, 1.56) fold for every 10-year increase in age. Moreover, OR estimate of completed suicide was 2.53 (95% CI: 1.94, 3.31) in men compared to women. Compared to married people, the OR estimate of completed suicide was 1.41 (95% CI: 1.15, 1.72) in single people, 1.92 (95% CI: 1.15, 3.23) in widowers and widows, and 1.97 (1.32, 2.95) in divorced people. The lower the educational level, the higher the risk of completed suicide. Compared to school/college students, the risk of completed suicide was higher among housewives, employed people or employees, and retirees. A majority of the suicides (90.05%) occurred at home. Taking medications was the most common way (69.13%) of a suicide attempt.

Conclusion: We indicated that associated factors with completed suicide vary in Iran compared to other developed and developing countries and that factors associated with attempted suicide are different from that of completed suicide.

Keywords: Assisted suicide, attempted suicide, incidence, Iran, risk factors

Introduction

Suicide is an important health problem which receives an increasing attention worldwide. The estimated global mortality of suicide is 14.5 deaths per 100,000 people per year, which equates to one million deaths per year.2 It has been indicated that suicide rates vary substantially across countries, even within the same region with similar levels of development.3 The burden of suicide is highest in low- and middle-income countries.4 A population-based study which was conducted in Iran during 2006 to 2010 revealed that intentional self-harm was among elderly people in many countries, while has risen in young people.

Rates also vary across different ethnic origins, employment status, and occupations.3 Most people who die by suicide have psychiatric disorders.5 Bipolar disorder is strongly associated with suicide ideation and suicide attempts.6 Substance abuse, unmarried, low education, anxiety, psychotic, mental and personality disorders, as well as previous self-harm are the major risk factors of suicide.1,7,8 In addition, suicide is associated with physical characteristics such as low body mass index and smoking.1,9 Family history of suicidal behavior and marital disputes are also important.1,10

Most investigations on suicide have been conducted in western, high-income countries while it is unclear whether the incidence rate of suicide and associated risk factors identified in such countries can be generalized to low- and middle-income countries.8 The present study was conducted on a large dataset collected during six successive years in Kermanshah Province, the west of Iran, as a developing country, in order to evaluate the incidence rate of suicide attempt and completed suicide as well as associated factors that increase the risk of death from suicide.

Materials and Methods

This six-year population-based survey was conducted in Kermanshah Province, the west of Iran, in 2012. The Research Committee of Hamadan University of Medical Sciences approved the study (N: 9107252601). The data on suicide was extracted from the suicide database of the Provincial Health Center (PHC), which is compatible with the International Classification of Diseases Revision 10 (ICD-10).11 In the Islamic Republic of Iran, PHC is...
primarily responsible for collecting morbidity and mortality data including suicide reported from district health centers and hospi-
tals throughout the province. The data on suicide was collected 
for six successive years from 21 March 2006 to 20 March 2011 
(based on Iranian calendar time). In order to confirm a complete 
suicide, the data were compared with and adapted by information 
on suicide recoded by the Center of Province Forensic Medicine. 
In cases, where there was inconsistency between the two datasets, 
the judgment was based on forensic identification because foren-
sic medicine is the only legal authority in the country that judge 
on unusual and suspicious deaths.

In order to estimate the annual incidence rate of suicide, the 
population of the province in 2006 to 2011 was considered as the 
denominator and the number of attempted and completed suicide 
was considered as the numerator. The suicide rate was reported 
per 100,000. The data on population of the province was extracted 
from the statistics released by the Statistical Center of Iran based 
on the last Population and Housing Census in 2006 and the subse-
quent estimates for the following years till 2011.

The effects of several factors on suicide were investigated, in-
cluding: date of suicide (year and month), location of suicide, gen-
der, age, marital status, educational level, occupational status, as 
well as way of suicide, reason of suicide, and the death from sui-
cide. Multiple logistic regression analysis was used for measuring 
the association between the risk factors of interest and suicide. All 
analyses were performed at 0.05 significant levels using the Stata 
version 11.2 (StataCorp, College Station, TX, USA).

Results

During the six-year study period, 13,810 attempted suicides oc-
curred of which 1,564 (11.33%) were completed. The distribution 
of absolute number of suicides and the incidence rate of attempt-
ed and completed suicide is given in Table 1. The results show 
that incidence rates of attempted suicide have increased in recent 
years, although the incidence rates of completed suicide were not 
changed significantly. Furthermore, the frequency of suicide by age 
groups over the years is shown in Figure 1. This figure indi-
cates that the number of suicides decreased from 2006 to 2008 
and then increased in subsequent years, particularly in age groups 
of 10 – 19 and 20 – 29 years.

The characteristics of the study population are given in Table 2. 
Most of people who attempted suicide were women, 20 – 29 years 
old, single, intermediate educated, and jobless or housewife. Out 
of 13,810 subjects who attempted suicides, 8038 (58.2%) were 
female and 5772 (41.8%) were male. Nonetheless, OR estimate of 
completed suicide was 2.53 in males compared to females.

Most of the people who attempted suicide aged between 10 to 30 
years, in particular among 20 – 29 years old subjects. However, 
the risk of completed suicide was higher among elderly people, 
therefore OR estimate of completed suicide was 1.46 (95% CI: 
1.36, 1.56) for every 10-year increase in age.

A majority of people who attempted suicide were single. None-
theless, the odds ratio of completed suicide was 1.41 (95% CI: 
1.15, 1.72) in single people, 1.92 (95% CI: 1.15, 3.23) in widowed 
persons, and 1.97 (95% CI: 1.32, 2.95) in divorcees compared to 
mARRed married people.

A majority of the suicide attempts committed by people with the 
educational level of secondary or high school. However, risk of 
completed suicide had an inverse correlation with education level, 
therefore the OR estimate of completed suicide in illiterate people 
was 3.26 (95% CI: 2.09, 5.09) compared to subjects with aca-
demic education. In other words, the lower the educational level, 
the higher the risk of completed suicide.

### Table 1. Incidence rate of suicide attempt and completed suicide per 100,000 and by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Attempted</th>
<th>Completed</th>
<th>Total</th>
<th>Attempted</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1,879,385</td>
<td>2080</td>
<td>245</td>
<td>2325</td>
<td>110.7</td>
<td>13.0</td>
</tr>
<tr>
<td>2007</td>
<td>1,892,553</td>
<td>1672</td>
<td>251</td>
<td>1923</td>
<td>088.3</td>
<td>13.3</td>
</tr>
<tr>
<td>2008</td>
<td>1,905,722</td>
<td>1379</td>
<td>304</td>
<td>1683</td>
<td>072.4</td>
<td>16.0</td>
</tr>
<tr>
<td>2009</td>
<td>1,918,890</td>
<td>2064</td>
<td>256</td>
<td>2320</td>
<td>107.6</td>
<td>13.3</td>
</tr>
<tr>
<td>2010</td>
<td>1,932,058</td>
<td>2515</td>
<td>240</td>
<td>2755</td>
<td>130.2</td>
<td>12.4</td>
</tr>
<tr>
<td>2011</td>
<td>1,945,227</td>
<td>2536</td>
<td>268</td>
<td>2804</td>
<td>130.4</td>
<td>13.8</td>
</tr>
</tbody>
</table>

![Figure 1. The frequency of suicide by age groups and years](image-url)
Table 2. The characteristics of the study population and odds ratio (OR) estimates of completed suicide using bivariate and multivariate logistic regression analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Attempted N = 12,246a</th>
<th>Completed N = 1,564a</th>
<th>Unadjusted OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted OR (95% CI)b</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7,381</td>
<td>657</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>Male</td>
<td>4,865</td>
<td>907</td>
<td>2.09 (1.88, 2.33)</td>
<td>0.001</td>
<td>2.53 (1.94, 3.31)</td>
<td>0.001</td>
</tr>
<tr>
<td>Age group (year)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10–19</td>
<td>3,858</td>
<td>237</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>20–29</td>
<td>6,163</td>
<td>646</td>
<td>1.71 (1.46, 1.99)</td>
<td>0.001</td>
<td>1.64 (1.30, 2.06)</td>
<td>0.001</td>
</tr>
<tr>
<td>30–39</td>
<td>1,276</td>
<td>307</td>
<td>3.92 (3.27, 4.69)</td>
<td>0.001</td>
<td>3.47 (2.60, 4.65)</td>
<td>0.001</td>
</tr>
<tr>
<td>40–49</td>
<td>498</td>
<td>144</td>
<td>4.71 (3.75, 5.91)</td>
<td>0.001</td>
<td>3.87 (2.71, 5.54)</td>
<td>0.001</td>
</tr>
<tr>
<td>50–59</td>
<td>217</td>
<td>90</td>
<td>6.75 (5.11, 8.92)</td>
<td>0.001</td>
<td>5.23 (3.36, 8.13)</td>
<td>0.001</td>
</tr>
<tr>
<td>60–69</td>
<td>79</td>
<td>48</td>
<td>9.89 (6.75, 14.49)</td>
<td>0.001</td>
<td>8.86 (5.21, 10.69)</td>
<td>0.001</td>
</tr>
<tr>
<td>70–79</td>
<td>50</td>
<td>51</td>
<td>16.60 (11.00, 25.06)</td>
<td>0.001</td>
<td>13.65 (7.46, 24.99)</td>
<td>0.001</td>
</tr>
<tr>
<td>≥80</td>
<td>44</td>
<td>32</td>
<td>11.84 (7.37, 19.02)</td>
<td>0.001</td>
<td>6.71 (3.14, 14.33)</td>
<td>0.001</td>
</tr>
<tr>
<td>Per 10 years increase in age</td>
<td>12,246</td>
<td>1,564</td>
<td>1.57 (1.52, 1.63)</td>
<td>0.001</td>
<td>1.46 (1.36, 1.56)</td>
<td>0.001</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>4,745</td>
<td>685</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>Single</td>
<td>7,173</td>
<td>759</td>
<td>0.73 (0.66, 0.82)</td>
<td>0.001</td>
<td>1.43 (1.15, 1.72)</td>
<td>0.001</td>
</tr>
<tr>
<td>Widow</td>
<td>80</td>
<td>47</td>
<td>4.07 (2.81, 5.89)</td>
<td>0.001</td>
<td>1.92 (1.15, 3.23)</td>
<td>0.013</td>
</tr>
<tr>
<td>Divorced</td>
<td>243</td>
<td>58</td>
<td>1.65 (1.23, 2.23)</td>
<td>0.001</td>
<td>1.97 (1.32, 2.95)</td>
<td>0.001</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic</td>
<td>860</td>
<td>54</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>High</td>
<td>4,343</td>
<td>401</td>
<td>1.47 (1.10, 1.97)</td>
<td>0.010</td>
<td>1.45 (0.98, 2.14)</td>
<td>0.064</td>
</tr>
<tr>
<td>Secondary</td>
<td>3,606</td>
<td>401</td>
<td>1.77 (1.32, 2.38)</td>
<td>0.001</td>
<td>1.92 (1.29, 2.88)</td>
<td>0.001</td>
</tr>
<tr>
<td>Primary</td>
<td>1,762</td>
<td>357</td>
<td>3.23 (2.40, 4.35)</td>
<td>0.001</td>
<td>3.71 (2.45, 5.62)</td>
<td>0.001</td>
</tr>
<tr>
<td>Illiterate</td>
<td>1,058</td>
<td>328</td>
<td>4.94 (3.65, 6.68)</td>
<td>0.001</td>
<td>3.26 (2.09, 5.09)</td>
<td>0.001</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School/College students</td>
<td>2,210</td>
<td>136</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>Housewives</td>
<td>4,721</td>
<td>545</td>
<td>1.89 (1.55, 2.29)</td>
<td>0.001</td>
<td>3.15 (2.23, 4.44)</td>
<td>0.001</td>
</tr>
<tr>
<td>Employed people/Employees</td>
<td>1,712</td>
<td>464</td>
<td>1.37 (1.11, 1.70)</td>
<td>0.004</td>
<td>2.58 (1.83, 3.62)</td>
<td>0.001</td>
</tr>
<tr>
<td>Retirees</td>
<td>30</td>
<td>25</td>
<td>4.40 (3.60, 5.39)</td>
<td>0.001</td>
<td>5.08 (2.43, 10.65)</td>
<td>0.001</td>
</tr>
<tr>
<td>Unemployed people</td>
<td>3,094</td>
<td>261</td>
<td>13.54 (7.75, 23.67)</td>
<td>0.001</td>
<td>1.08 (0.78, 1.51)</td>
<td>0.631</td>
</tr>
<tr>
<td>Military people</td>
<td>205</td>
<td>67</td>
<td>5.31 (3.83, 7.36)</td>
<td>0.001</td>
<td>1.62 (0.99, 2.66)</td>
<td>0.057</td>
</tr>
<tr>
<td>Othersc</td>
<td>39</td>
<td>43</td>
<td>17.92 (11.23, 28.57)</td>
<td>0.001</td>
<td>7.46 (3.67, 15.17)</td>
<td>0.001</td>
</tr>
<tr>
<td>Reason of suicide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conflict with family/relatives</td>
<td>6,665</td>
<td>155</td>
<td>1.00</td>
<td>- - -</td>
<td>1.00</td>
<td>- - -</td>
</tr>
<tr>
<td>Poverty/Jobsless</td>
<td>502</td>
<td>90</td>
<td>7.71 (5.85, 10.15)</td>
<td>0.001</td>
<td>6.68 (4.97, 8.99)</td>
<td>0.001</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>642</td>
<td>156</td>
<td>10.45 (8.25, 13.24)</td>
<td>0.001</td>
<td>7.23 (5.37, 9.39)</td>
<td>0.001</td>
</tr>
<tr>
<td>Physical disease</td>
<td>255</td>
<td>35</td>
<td>5.90 (4.01, 8.70)</td>
<td>0.001</td>
<td>3.33 (2.16, 5.15)</td>
<td>0.001</td>
</tr>
<tr>
<td>Psychological disorders</td>
<td>2,349</td>
<td>201</td>
<td>3.68 (2.97, 4.56)</td>
<td>0.001</td>
<td>3.02 (2.41, 3.78)</td>
<td>0.001</td>
</tr>
<tr>
<td>Lovely relationship</td>
<td>406</td>
<td>11</td>
<td>1.17 (0.63, 2.17)</td>
<td>0.629</td>
<td>1.37 (0.72, 2.60)</td>
<td>0.339</td>
</tr>
<tr>
<td>Othersd</td>
<td>434</td>
<td>913</td>
<td>90.46 (74.36, 110.05)</td>
<td>0.001</td>
<td>121.65 (97.13, 152.36)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*Sum of subgroups are less than total number due to missing data; bOR adjusted for all variables mentioned in the table; cOthers included prisoners, servant, beggar, or unknown; dOthers included garden, road, mountain, dormitory, cemetery, etc; eOthers included loneliness, infertility, disappointment, economic failure, or unknown.

Figure 2. The ways of suicide (percentages show the proportion of completed suicide to attempted suicide, i.e. death rate)
In terms of occupational status, a majority of the study population comprised of college/school students, housewives, and employees. However, the risk of completed suicide was higher among housewives, employed people or employees, and retirees compared to school/college students.

Motivation and reasons of suicides were complex. A majority of people who had attempted suicide mentioned a history of conflict with family members, relatives, or colleagues. The second most common motivation of suicide was psychological disorders. However, the risk of completed suicide due to other reasons was much higher than suicide due to conflict with family members or relatives. Poverty and joblessness increased the risk of completed suicide 6.98 fold, substance abuse 7.23 fold, physical diseases 3.33 fold, and psychological disorders 3.02 fold compared to those who had conflicts with their family members or relatives. Furthermore, the OR estimate of completed suicide due to other reasons such as loneliness, infertility, disappointment, and economic failure was 121.65 (95% CI: 97.13, 152.36) compared to suicide due to conflict with family members or relatives.

About 90.05% (11,914) of the suicide cases occurred at home, 2.20% (291) at workplace, and 7.75% (1025) in other places such as garden, road, mountain, dormitory, cemetery, and etc. The ways of attempting suicide and the proportion of completed suicide from each way are given in Figure 2. The results show that taking medications was the most common (69.13%) way of suicide attempt. Nonetheless, only 2% of those who had attempted suicide by taking medications had eventually died. On the other hand, only a minority of people attempted suicide through dangerous ways such as firearm, hanging, or self-immolation. However, most of them had died. In other words, 95% of those who used a firearm, and 91% of those who hanged themselves and 60% of those who immolated themselves had died.

**Discussion**

The individual and environmental factors contribute to suicide. We showed that rates of attempted suicide are different from the rates of completed suicide so that rate of attempted suicide may be higher in one group while the rate of completed suicide may be higher in another group. For example, most of the people who attempted suicide were women, whereas the rate of completed suicide was much higher in men. The rate of suicide varies in men and women across different countries and regions. In developed countries, the male-to-female ratio for suicide is between two and four to one while in China, the male-to-female ratios of suicides are much lower.  

Studies which were conducted in other parts of Iran were consistent with the result of our study. The male-to-female OR estimate of completed suicide was reported 2.27 (95% CI: 1.63, 3.14) by Amiri et al.  

We concluded that factors associated with completed suicide vary in Iran compared to other developed and developing countries. Furthermore, we indicated that factors associated with attempted suicide were different from that of completed suicide. These findings may have implications for health policy making and planning prevention program to reduce suicide rate and its associated risk factors.

A study conducted in another part of Iran is consistent with our findings. Amiri et al. indicated that for every 10-year increase in age, the risk of completed suicide increases 1.48 (95% CI: 1.39, 1.59) fold. That means elderly people are more serious to kill themselves than young people. In addition, the results of similar studies conducted in other countries confirmed this finding and indicated that the completed suicide rate was higher in elderly people. However, suicide rates vary across countries and even within countries. A study, which was conducted in Iran showed that a substantial disparity presents in the distribution of suicide mortality across the provinces. Some investigations have shown an increasing trend of suicide in young people and decreasing trend in elderly people. While recent evidence has shown that suicide rates in young people, particularly in men, have decreased in some developed countries. In the present study, we indicated that the overall incidence rate of suicide has increased in recent years particularly in young people.

We showed that a majority of the study population comprised of housewives. The reason is that a most of middle aged and old women in Iran are housewives. Therefore, it seems reasonable that a major part of the women who attempted suicide are housewives. This finding is consistent with another study conducted in the west of Iran.

According to our results, various ways were used for attempting suicide. Taking medications was the most common way used mostly by women and young people. Similar results were seen in the previous studies conducted in other parts of Iran. Shojaei et al. showed that younger individuals more frequently select a highly violent way, such as firearms while older persons more often use hanging and poisoning. They concluded that gender, age, and educational level are variables that have an effect on adopting different suicide ways. However, selecting suicide tools depends on the socioeconomic determinants and the accessibility of the suicide tools.

There is a general consensus that suicide rates are usually underreported. We used data on suicide recorded in Province Health Center. The quality and accuracy of the data depends primarily on the quality of the recorded data. We compared the data on completed suicide with the data available in the forensic medical center to verify the quality of the data and reduce information bias. However, we were unable to verify the data on attempted suicide, because the data were not recorded in the forensic medical center. This issue may raise the possibility of the information bias and might have lead led to underestimation of the attempted suicide rate. Another limitation of this study was that, unintentional death due to substance overdose among addicts might sometimes be considered and recorded as suicide. This might lead to measurement bias.

Despite its limitations, an important strength of this study was that the data on attempted and completed suicide as well as the associated risk factors were analyzed and assessed separately. Another major advantage of this study was that crude and adjusted correlations between completed suicide and various risk factors that were investigated and reported.

We concluded that factors associated with completed suicide vary in Iran compared to other developed and developing countries. Furthermore, we indicated that factors associated with attempted suicide were different from that of completed suicide. These findings may have implications for health policy making and planning prevention program to reduce suicide rate and its associated risk factors.
Acknowledgments

This was part of the MSc thesis in epidemiology. We would like to appreciate the Vic-chancellor of Education for technical supports and the Vic-chancellor of Research and Technology for financial supports of this study. We would also like to thank Kermanshah University of Medical Sciences and Dr. Salari, the manager of Kermanshah Forensic Medicine Organization in collaboration with this work.

Funding

This study was funded by the Vic-chancellor of Research and Technology, Hamadan University of Medical Sciences.

Conflict of interest statement

The authors declare that they have no conflicts of interest in this work.

References