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Original Article

Years of Life Lost due to Suicide in Southern Iran 2011–18: A Population–Based Study

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Abstract

Background: Suicide is a major public health concern with diversity in epidemiological aspects and applied methods. In this study, we estimate years of life lost (YLLs) related to completed suicidal in the Fars province, southern Iran.

Methods: Our study included data of all mortality events during 2011-2018 from Fars Suicide Surveillance System (FSSS). The validity of qualitative and quantitative variables was assessed through contrasting data between different sources and phone call justification. Case-fatality rates, age-specific and gender-specific mortality rates, ASR (age standardized rate), and YLLs through WHO's 2015 "YLL template" were calculated.

Results: During the study period, 2384 mortalities with a mean age of 32.73 ± 15.65 had been registered. Most of them were males (male: 70.05% vs. female: 29.95%; male-female ratio: 2.33), hanging was the most frequent method (29.94%), and an increasing pattern in successful suicidal attempts was observed. The total YLLs were calculated to be 58 669 years (14.71 per 1000 persons). Regardless of year or gender, suicide had the largest YLLs amongst those aged 15-29 years.

Conclusion: Regarding the increasing trend in YLLs and observing the highest rate of successful suicidal attempts amongst active and productive members of community, a comprehensive inter organizational reaction is demanded.

Keywords: Burden, Premature death, Suicide, YLL

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Introduction

Suicide is defined as a deliberate attempt of self-killing.[1] It is a major public health concern that carries a substantial burden in all communities, accounting for 1.4 and 1.48% of all mortalities in 2012 and 2015, respectively.[2] Globally, it has been estimated that 800 000 suicide events occur annually, 78% of which pertain to low- and middle-income countries.[3] The World Health Organization (WHO) reported that suicide is one of the three leading causes of mortality among the 15–44 years age group,[4] since adolescents and early adulthood claim the highest share of premature death due to suicidal attempts.[5] Also, in Asia, suicide is one of the main fifteen causes of mortality. Available data suggest that for each successful suicidal attempt, 8 to 40 attempts occur.[6]

Suicide is a complex and multifactorial phenomenon, which is linked to individual, familial, and social factors,[7] including male gender (But suicidal attempts are more common in women), younger age, mental disorders like depression or schizophrenia, white race, low income, right to keep and bear arms, job loss, drug abuse, etc.[8,9] A diversity exists in the most frequent methods of suicide in different regions; however, hanging, drowning, falling, poisoning, and firearms are more prevalent.[5]

In Iran, the rate of annual suicidal attempts has been reported at 3.6 per 100 000 people, which is lower than worldwide estimates.[1] Furthermore, while the premature death related to suicidal attempts in Iran is substantially lower than European countries, the measure of years of life lost (YLLs) in Iran is higher than European countries at younger ages.[3] The mortality and morbidity of suicidal attempts in Iran cause YLLs of 200 in every 100 000 individuals, which ranks as the fifth leading cause of premature death.[10]

The Fars province with 122 608 square kilometers is located in southern Iran and is the fourth most populous province in the country with 4851274 residents in 2016.[11] In this study, we sought to estimate mortality rate, age-specific and gender-specific mortality rate, and YLLs related to completed suicide in the Fars province, during an 8-year period from 2011 to 2018.

Materials and Methods

Settings and Data Acquisition

In this cross-sectional study, we included all mortality events in the Fars province during 2011–2018. This data was acquired from Mental Health and Suicide Surveillance Systems that is Fars Suicide Surveillance System (FSSS). Conventionally, in FSSS, data collection and data analysis for research purposes are permitted by patients or their

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parents/relatives/caregivers through written informed consents. These data would be codified, except for their identity information.

Worth noting, relatives were not directly contacted other than a randomly selected 5% to confirm the validity of surveillance data by contrasting with verbally declared autopsy results.

We investigated the data of all affiliated centers, mortality and morbidity of all diseases as well as their causes, including suicidal attempts. FSSS registers demographic information, medical history, suicidal history, as well as causes, methods and outcome of suicidal events. The surveillance system data were rechecked with data of psychiatric clinics, hospitals, local forensic medicine office, death registries, urban and rural health centers, medical toxicology centers, and emergency medicine departments. Then, duplicates were excluded, which resulted in 2384 events of successful suicide.

The validity of qualitative and quantitative variables was assessed through contrasting data between different sources and phone call justification

The population of the province was estimated using local health centers' databases and national census reports, with respect to the estimated annual population growth, which yielded a 4851274-person population in 2018.

Statistical Analysis

Descriptive analysis was carried out using the Statistical Package for Social Sciences (SPSS) (Version 22.0 for Windows, Released 2013. Armonk, NY: IBM Corp.), which included frequency (percent) of mortality events, sex ratio, and mean ± Standard Deviation (SD) of age at the time of suicidal attempt.

To calculate age-specific and gender-specific mortality rates, first, case-fatality rates were obtained; then based on the 2013 standards for low- and medium-income countries, ASR (age standardized rate) measures were obtained.[12]

YLLs analysis was carried out using the WHO's 2015 "YLL template", which ran in Microsoft Excel spreadsheet (2007). YLLs were calculated by two different methods. To do this, we applied the simple method (A) and the complex method (B) that are represented in the WHO's second edition of "National burden of disease studies: a practical guide" booklet in 2001(Table 1).[13]

YLLs were estimated in 5-year age intervals for each gender. Afterwards, those were integrated and reconstructed to 10-to-15-year age intervals, comprising 5–14, 15–29, 30–44, 45–59, 60–69, 70–79, and > 80 years of age.

Table 1. Methods A and B in Calculating YLLs Related to Successful Suicidal Attempts During 2011–2018

Method A	$SEYLL = N*L$
Method B	$SEYLL = N\ Ce^{(ra)} / (\beta+r)^2\ [e^{-(\beta+r)(L+a)}\ [-(\beta+r)(L+a)-1] - e^{-(\beta+r)a}\ [-(\beta+r)a-1]$

N, Number of mortalities in a specific age group and gender; L, Standardized QoL (quality of life) in a specific age group and gender; r, Discounting rate, 0.03; β, Age weight, 0.04; C, Correction factor of age weight, 0.1658; a, Age at death; e, 2.71828.

Results

During 2011–2018 in the Fars province, 2384 mortalities with a mean age of 32.73 ± 15.65 had been confirmed due to suicide. Males were dominant (male: 70.05% vs. female: 29.95%; male-female ratio: 2.33) and had a higher age at the time of suicidal attempt (male: 34.07 ± 16.49, female: 30.34 ± 14.79). The main method used for suicide was hanging (29.94%) (Table 2). Generally, the mortality rate due to suicide in the Fars province showed an increasing pattern during the study period, and the highest mortality rate was observed in the last year of the study (frequency: 400, 9.68 per 100 000) (Table 3).

The total YLLs due to premature death in the 8-year period were 40 659 years (20.16 per 1000 persons) in males, 18 010 years (9.14 per 1000 persons) in females and 58 669 years (14.71 per 1000 persons) in total. Regardless of year or gender, suicide had the largest YLLs in persons aged 15–29 years, followed by 30–44, 45–59, and 5–14

Table 2. Absolute and Relative Frequency of Successful Suicidal Attempts in the Fars Province, Iran During 2011–2018

Variable	Frequency	Percent
Marital status		
Single	1011	42.40
Married	898	37.66
Missing value	475	19.94
Suicide method		
Hanging	714	29.94
Drug overdose	301	16.81
Toxic agent	274	11.49
Firearms	128	5.36
Cold weapon	18	0.75
Burning	233	9.77
Alcohol poisoning	2	0.08
Drowning	2	0.08
Falling	35	1.46
Others	46	1.92
Missing value	531	22.28

Table 3. Frequency and Mortality Rate (Per 100 000) of Successful Suicidal Attempt in the Fars Province, Iran During 2011–2018

Year	Male		Female		Total	
	Frequency	Rate	Frequency	Rate	Frequency	Rate
2011	193	9.52	73	3.81	266	6.90
2012	143	7.29	78	4.03	221	5.67
2013	208	10.48	113	5.79	321	8.16
2014	222	11.07	97	4.93	319	8.03
2015	248	12.23	90	4.53	338	8.42
2016	242	11.80	80	3.99	322	7.94
2017	128	6.17	68	3.36	196	4.79
2018	286	13.65	114	5.59	400	9.68

age groups (Tables 4 and 5). In addition, hanging (17 515 years, 4.39 per 1,000 persons) claimed the largest YLLs among different methods used for suicide (Table 6).

Discussion

In the present study, we investigated YLLs related to successful suicidal attempts in the Fars province, Iran during 2011–2018. We found that the suicide mortality rate increased from 6.9 in 2011 to 9.6 in 100 000 persons in 2018, and this upward trend was observed in both genders. We believed that this increase could be linked to economic crises that might be accompanied by psychological problems, substance abuse, unemployment, financial issues and other consequences.

Successful suicide and its related YLLs were higher in men, which is consistent with many other studies.[2,8,14-16] This observation might be linked to several reasons. First, women often suicide to direct attention and do not apply life-threatening suicidal methods. Second, men are more prone to be in a high-risk social condition; for example, men consume psychedelic and addictive drugs much

Table 4. Age-specific and gender-specific YLLs* related to successful suicidal attempt in the Fars province, Iran during 2011–2018.

2018	2017	2016	2015	2014	2013	2012	2011	Age-groups
Male								
203	0	231	260	116	145	29	87	5–14
3431	1635	2698	3484	3166	2998	2473	2945	15–29
2154	921	2230	1586	1596	1263	592	1204	30–44
904	315	558	514	525	559	310	365	45–59
121	15	111	167	115	67	114	128	60–69
28	8	53	53	10	46	30	20	70–79
6	17	6	12	6	13	0	16	+80
6847	2911	5887	6076	5534	5091	3548	4765	Total
Female								
59	88	147	117	59	88	117	59	5–14
1497	980	1203	1276	1331	1917	1229	1362	15–29
684	452	550	654	663	580	505	329	30–44
202	126	124	210	333	247	118	120	45–59
159	49	42	30	49	63	16	16	60–69
27	0	12	18	9	21	32	0	70–79
23	0	0	0	7	0	0	11	+80
2651	1695	2078	2305	2451	2916	2017	1897	Total
Total								
262	88	378	377	175	233	146	146	5–14
4928	2615	3901	4760	4497	4915	3702	4307	15–29
2838	1373	2780	2240	2259	1843	1097	1533	30–44
1106	441	682	724	858	806	428	485	45–59
280	64	153	197	164	130	130	144	60–69
55	8	65	71	19	67	62	20	70–79
29	17	6	12	13	13	0	27	+80
9498	4606	7965	8381	7985	8007	5565	6662	Total

*YLL, years of life lost

Table 5. Age-Specific and Gender-Specific YLLs Per 1000 Person Related to Successful Suicidal Attempt in the Fars Province, Iran During 2011–2018

Age Groups	2011	2012	2013	2014	2015	2016	2017	2018
Male								
5–14	0.28	0.09	0.45	0.36	0.79	0.69	0	0.59
15–29	4.28	3.72	4.68	5.14	5.89	4.75	3.01	6.61
30–44	2.48	1.16	2.36	2.86	2.72	3.68	1.46	3.29
45–59	1.26	1.03	1.80	1.63	1.55	1.63	0.89	2.50
60–69	1.59	1.29	0.70	1.11	1.50	0.93	0.11	0.90
70–79	0.35	0.54	0.82	0.18	0.99	1.01	0.15	0.55
+80	0.48	0	0.38	0.17	0.35	0.17	0.48	0.17
Total	2.45	1.80	2.56	2.75	2.99	2.87	1.40	3.26
ASR	2.14	1.61	2.31	2.50	2.82	2.64	1.32	3.20
Female								
5–14	0.20	0.39	0.29	0.19	0.37	0.46	0.27	0.18
15–29	2.00	1.88	3.06	2.38	2.23	2.20	1.89	3.04
30–44	0.68	1.00	1.10	1.20	1.14	0.92	0.72	1.06
45–59	0.41	0.39	0.80	1.06	0.64	0.37	0.36	0.57
60–69	0.17	0.16	0.59	0.43	0.25	0.33	0.36	1.12
70–79	0	0.60	0.39	0.16	0.33	0.22	0	0.50
+80	0.37	0	0	0.23	0	0	0	0.73
Total	0.99	1.04	1.49	1.27	1.16	1.03	0.83	1.30
ASR	0.84	0.92	1.35	1.18	1.08	1.01	0.83	1.33
Total								
5–14	0.24	0.23	0.37	0.27	0.58	0.58	0.13	0.39
15–29	3.14	2.81	3.88	3.82	4.09	3.50	2.46	4.88
30–44	1.58	1.08	1.73	2.04	1.94	2.31	1.09	2.19
45–59	0.84	0.71	1.31	1.35	1.10	1.01	0.63	1.55
60–69	0.84	0.70	0.64	0.76	0.85	0.62	0.24	1.01
70–79	0.18	0.57	0.61	0.17	0.66	0.61	0.07	0.52
+80	0.43	0	0.20	0.20	0.18	0.09	0.25	0.43
Total	1.72	1.42	2.03	2.03	2.08	1.96	1.12	2.29
ASR	1.49	1.26	1.83	1.86	1.96	1.83	1.08	2.28

YLL, years of life lost; ASR, Age standardized rate

Table 6. YLLs by External Causes of Death (Methods) Due to Successful Suicidal Attempt in the Fars Province, Iran During 2011–2018

External Causes of Death	YLLs (years)			YLLs Rate (Per 1000 Persons)		
	Male	Female	Total	Male	Female	Total
Hanging	14172	3343	17515	7.02	1.69	4.39
Drug overdose	6394	3955	10349	3.16	1.99	2.58
Toxic agent	4397	2337	6734	2.17	1.18	1.68
Alcohol poisoning	57	0	57	0.02	0	0.01
Firearms	2889	381	3270	1.43	0.19	0.82
Cold weapon	303	103	406	0.15	0.05	0.10
Burning	1778	4132	5910	0.88	2.09	1.48
Drowning	27	22	49	0.38	0.18	0.28
Other (N=83)	782	361	1143	4.88	1.71	3.31
Unknown	9860	3376	13236	0.01	0.02	0.01

YLL, years of life lost

more than women. Third, men implement more intense methods for suicide that obviously increase the chance of premature death.

The highest mortality rate and YLLs due to suicide were observed in the age group 15–29 years. The results of a study by Izadi et al in Iran is in-line with this finding.[3] In addition, in a study conducted in China, the highest mortality was reported for the age group of 20–24 years.[4] This concerning finding imposes a heavy economic burden on families and the society. Given the fact that adolescents and young adults may be highly influenced by psychological and emotional stimulants and importantly physical and social reforms occur at these ages, any disability in psychosocial adjustment will increase the chance of attempting suicide. Also, this age group may commit fatal suicidal attempts under pressure of various factors and such as imitating their friends, substance abuse, family conflicts, economic problems, unemployment and financial poverty. These problems put people under the influence of psychological pressures. Eventually, because the pressure of these problems exceeds the resilience of people, it leads to suicide in these

The most frequently used method of suicide in our study was hanging, which claimed the highest YLLs. This finding is in-line with many other studies,[2,5,14] and apparently might not be dependent on geographical diversity. For instance, in a study conducted in Canada, 46% of suicidal attempts occurred by hanging.[16] The pervasiveness of hanging could be due to its accessibility. Additionally, it does not require special tools and brings a fast outcome; for example, consuming lethal doses of toxins or drugs cannot be straightforward; on the other hand, hanging is not as agonizing and dreadful as some methods such as self-immolation.

We showed that YLLs related to successful suicidal attempts increased from 1.7 in 2011 to 2.2 per 100 000 persons in 2018 for both genders, which is consistent with the increasing number of suicidal attempts in the same region. As mentioned earlier, this upward trend might be linked to the deteriorating socioeconomic status and social welfare. The WHO declares that the suicide-related mortality rate in Iran is lower than many countries; nevertheless, premature death cannot be neglected in public health's policy making.[3] Life expectancy in Iran is around the mid-70s that is far from the ages of 15–29, where most lethal suicides occurred. These members of community are active and productive; in other words, mortality at these ages carries a heavy economic burden for the society, and potentially causes demographic changes. Hence, this is on health policymakers to identify and appropriately respond to the causes of suicidal attempts by implementing preventive strategies according to the cultural norms and economic conditions of the region.

In conclusion, we found an increasing trend in YLLs during the study period. Also, the highest rate of successful suicidal attempts was observed in adolescence and early adulthood. A comprehensive reaction to these figures demands the so-called interorganizational system and integrated efforts between the health, justice and other related ministries.

Authors' Contributions

AbH was responsible for the field working including data collection and management and analysis. ML wrote manuscript. RF collected data. MA edited the final version of the manuscript. MA and HN wrote the part of article.

Conflict of Interest Disclosures

The authors declare that they have no competing interests.

Data Availability

Data will not be shared because the university from which the information is collected does not
consent to provide the information.

Ethics Statement

This study was approved by research ethics committee of Fars University of Medical sciences (Ethics code: IR.SUMS.REC 1395. S950).

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