

## Seasonal Pattern in Suicide in Iran

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**Background:** Various studies have shown a seasonal pattern in suicide in the developed societies; however, this pattern is not taken into consideration in most countries including Iran.

**Objectives:** The current paper studied the seasonal pattern of committing suicide in Northern Iran.

**Materials and Methods:** The present study was a longitudinal study with time series features. Subject included suicide attempts recorded by emergency wards of all hospitals in Mazandaran province, Iran. The variable time, in this study, was defined as each month of study years (2005 - 2011), which included 84 monthly time points. To analyze data, the Student's independent t-test and analysis of variance (ANOVA) test were used.

**Results:** Of the 14,437 suicide attempts reported during the seven-year period, 5359 (37.1%) were related to males. Suicide attempts reached a peak in June (1418 cases) and November (1352 cases), but were at their lowest level in March (991 cases) ( $P = 0.877$ ).

**Conclusions:** The suicide seasonality range is broad in this part of Iran. Moreover, there were two noticeable suicide peaks in June and November.

**Keywords:** Attempted Suicide; Seasonal; Suicide

### 1. Background

Seasonality of suicide is an issue reported by researchers in the 19th century (1). Most studies show that its peak is in spring and summer. Since various social and mental factors have instant or long-term effects on a person's decision to commit suicide, suicide is not distributed equally in different periods of time. In addition to social and internal factors, physical changes, like changes in local climatic conditions, play an important role in suicide attempts through a synergy with social factors and modifying behaviors (1-3).

Suicide is one of the most important issues worldwide. Since suicide is a complex human behavior with multifactorial causation, it is difficult to evaluate its risks. It is correlated to serious mental health disorders, especially depression, bipolar depression, schizophrenia, alcohol addiction, and personality disorders. In addition to psychological damages, biological, genetic, socioeconomic, and environmental events also affect a person's decision to commit suicide (2-4). The average suicide rate in the world is 14.5 per 100,000 people (5).

A research in Cagliari, Italy, on 355 suicide victims

(78.30% males) indicated an annual increase in the number of suicides; that is, from 47 suicides in 1990 to 94 in 1994 (doubled in five years) (6). According to a study in Taiwan from 1997 to 2003, 18,083 people were committed suicide, and most of them were males (67.65%) aged 64 or higher (74.40%). The suicide rate in females was significantly higher in March and April (early-spring to mid-spring) than in other months, and the lowest rate was observed from June and August to September (late-summer to early-fall). However, suicide rate in males was low only in June, August, and September (7).

Suicide is a social abnormality, which has become prevalent in Iran. A study showed that Iran is the 58th country in the world regarding suicide frequency. Documents show that the suicide rate in Iran is nine per 100,000 people; among which 65% of males and 35% of females have had successful suicides. Successful suicides account for 1% of all mortalities in Iran (5). The suicide rates in Iran from 2001 to 2005 were 5.32%, 5.47%, 5.58%, 5.50%, and 5.70%, respectively. The highest rates were observed in the age groups of 18 - 24 (40.0%), 25 - 34 (30.0%), 35 and older

(20.7%), and 17 and younger (9.3%), respectively (8). In a study carried out in Nishabur, Iran, 207 people were hospitalized in the emergency rooms due to suicide, 69.1% of them were females (5).

Seasonal review of suicide attempts may be a way to evaluate the behavior etiology of those who commit suicide. Seasonal fluctuations are features of interest in epidemiology. Understanding why suicide follows seasonal fluctuations is a phenomenon that can have significant preventive potential. Although most studies have emphasized the seasonality of suicide attempts, this mechanism is still unknown. Moreover, seasonality of suicide is not confirmed in some communities (a study in California, the United States, and another one in Switzerland) (9, 10). Moreover, several studies have investigated the suicide seasonal pattern in some areas of Iran (5, 11, 12). However, to the researchers' knowledge, no studies were conducted in Mazandaran province, Iran, in this respect. Furthermore, suicide seasonal pattern can vary in different weather conditions.

## 2. Objectives

The current research examined suicide seasonality pattern in Mazandaran province, North of Iran, to present documents and evidence for mental health preventive programs.

## 3. Materials and Methods

This longitudinal study with time series feature was carried out in Mazandaran province, North of Iran, with 3028923 inhabitants (50.1% male) in 2011 (13). This region of Iran has a temperate and humid climate. The study population included all suicide attempts recorded by emergency departments of all hospitals in Mazandaran from 2005 to 2011.

The Accidents and Injuries Surveillance System, which is administered by the Health Deputy of Ministry of Health, was used for data collection. This system that is designed in the Microsoft Access format contains variables of name, last name, age, gender, place, and type of accident, and also consequences and date of the accident. Time variable of the present study was defined as every month of study years. Time series of monthly events was created by counting suicide attempts in each month; that is 84 monthly time points in the seven-year period of the study.

Due to confidentiality issues, patients' names were eliminated from the access file. To analyze data, after normal distribution check (Kolmogorov-Smirnov = 0.078, P = 0.600), the Student's independent t-test and analysis of variance (ANOVA) test were used. In cases where the result of ANOVA was significant among the compared groups, Least Significant Difference (LSD), and post-hoc comparative test was used. P-values lower than 0.05 were considered significant. It is noteworthy that SPSS (version

19.0; SPSS Inc., Chicago, IL, USA) and Excel software were used in the present study.

## 4. Results

### 4.1. General Results

During the study period (2005 - 2011), 14437 suicide attempts were reported, 5359 of which were committed by males (37.1%) (Table 1). The average age of this population was  $23.8 \pm 3.4$ . Of all suicide attempts, 163 were successful (58.9% male and 41.1% female).

According to Table 1 the highest suicide attempt rate belongs to the age group of 15-24 (54.4%). Furthermore, these rates were significantly different among all age groups (P = 0.001). Post-hoc (LSD) test revealed that these differences were significant among age groups of over 15, 15 - 24, and 25 - 39 years (P = 0.001), and age groups of below 15 and over 39 years (P = 0.040). It should be noted that the age of 1.8% of the subjects was unknown; therefore, they were excluded from ANOVA (Table 1).

Average monthly suicide attempts among males and females were  $63.8 \pm 26.3$  and  $108.1 \pm 42.4$ , respectively (P = 0.001) (Table 1). Figure 1 revealed that suicide cases increased from 1138 in 2005 to 2307 in 2011, peak in 2008 (18.9%). Moreover, the suicide rate was significantly higher in females than in males in all months and seasons of the year (P = 0.001) (Figure 2).

**Table 1.** Number, Rate, and Mean of Suicides in Month by Gender, Age Group, and Season

Variables	Values <sup>a</sup>		P Value
	No. (%)	Mean ± SD	
<b>Gender</b>			0.0001
Male	5359 (37.0)	63.8 ± 26.3	
Female	9078 (63.0)	108.1 ± 42.4	
<b>Age group, y</b>			0.0001 (LSD <sup>b</sup> = 6.8)
< 15	0397 (2.7)	04.7 ± 2.60	
15 - 24	7854 (54.4)	93.5 ± 36.2	
25 - 39	4758 (33.0)	56.6 ± 26.5	
> 39	1169 (8.1)	13.9 ± 7.00	
Unknown	0259 (1.8)	3.1 ± 3.5	
<b>Season</b>			0.0060 (LSD = 21.3)
Winter	3105 (21.5)	147.8 ± 51.5	
Spring	3789 (26.2)	180.4 ± 81.9	
Summer	3809 (26.4)	181.4 ± 66.7	
Autumn	3734 (25.9)	177.8 ± 63.4	
<b>Total</b>	14437		

<sup>a</sup> Data are presented as mean ± standard deviation, and No. (%).

<sup>b</sup> Least significant difference.

4.2. Seasonal Rhythms

Based on Figure 2, the maximum rate of suicide attempts were observed in June (1418 cases) and November (1352 cases), and the minimum in March (991 cases) and February (1008 cases); however, the observed difference was not statistically significant ( $P = 0.877$ ). Suicide peaks in males and females and in different age groups were in June and November (Figures 2 and 3). Concerning season, the lowest rate (21.5%) was in the winter, and the highest rate was in other seasons (spring, summer, and fall) (Table 1). According to the results of ANOVA and LSD test, a significant difference was observed between winter with spring ( $P = 0.001$ ), summer ( $P = 0.001$ ), and fall ( $P = 0.070$ ).

Average suicide attempts in both males ( $P = 0.040$ ) and females ( $P = 0.005$ ) was significantly higher in spring, summer, and fall than in winter (Table 2). According to the results of ANOVA and LSD test, the rate of suicide attempts in males during winter differed significantly from those of spring ( $P = 0.016$ ), summer ( $P = 0.013$ ), and fall ( $P = 0.041$ ). Furthermore, its rate in females during winter differed significantly from those of spring ( $P = 0.003$ ), summer ( $P = 0.002$ ), and fall ( $P = 0.004$ ). However, no statistically significant difference was observed in either genders in the three seasons of spring, summer, and fall ( $P = 0.309$ ).

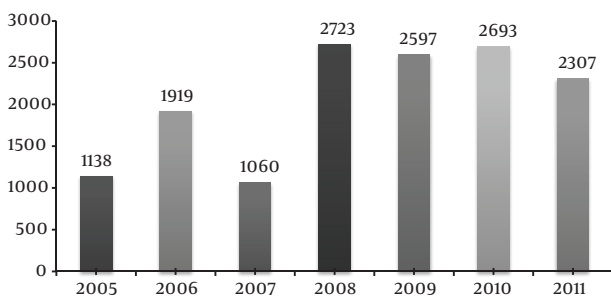


Figure 1. Number of Suicides by Years

Among different age groups, the average suicide rate in different seasons was not statistically different between people aged below 15 and over 39 ( $P = 0.820$  and  $P = 0.100$ , respectively). Nevertheless, its average in people aged 15 - 24 and 25 - 39 was lower in winter than other seasons (Table 2). Based on the results of ANOVA and LSD test, suicide rate in the age group of 15 - 24 in winter was significantly different from those of spring, summer ( $P = 0.002$ ), and fall ( $P = 0.004$ ). Moreover, among the age group of 25 - 39 years, its rate in winter differed significantly from those of spring and summer ( $P = 0.018$ ), and fall ( $P = 0.016$ ).

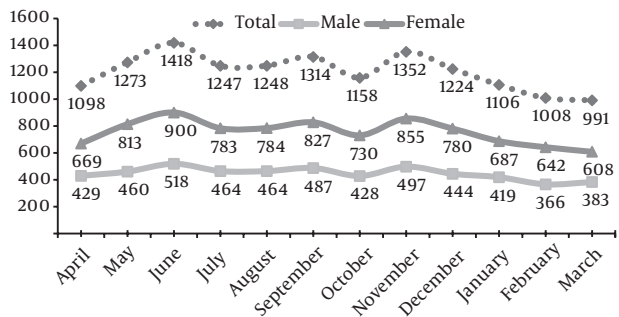


Figure 2. Seasonal Variation in the Number of Suicides by Gender Per Month

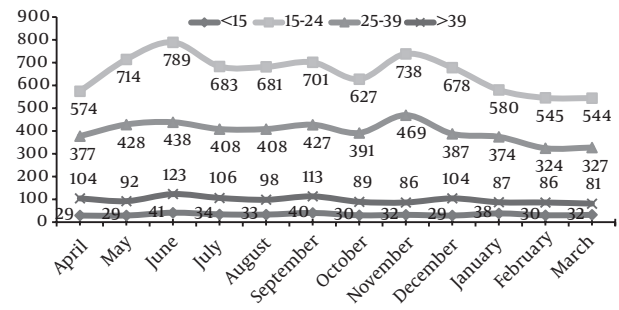


Figure 3. Seasonal Variation in the Number of Suicides by Age Group Per Month

Table 2. Seasonal Differences in Suicides by Gender and Age Group<sup>a</sup>

Variables	Winter	Spring	Summer	Fall	ANOVA <sup>b</sup>		
					F	P	LSD <sup>c</sup>
<b>Gender</b>							
Male	55.6 ± 17.9	067.0 ± 32.3	067.4 ± 28.6	065.2 ± 24.1	2.90	0.042	09.2
Female	92.2 ± 34.6	113.4 ± 50.7	114.0 ± 40.2	112.6 ± 41.4	4.70	0.005	13.7
<b>Age group, y</b>							
<15	04.8 ± 02.7	04.7 ± 03.1	05.1 ± 02.6	04.3 ± 03.1	0.30	0.820	-
15 - 24	79.5 ± 26.4	98.9 ± 45.1	98.3 ± 35.6	97.3 ± 33.9	5.00	0.004	12.0
25 - 39	48.8 ± 22.7	59.2 ± 30.5	59.2 ± 27.9	59.4 ± 24.7	3.01	0.038	08.5
> 39	12.1 ± 04.6	15.2 ± 10.1	15.1 ± 05.9	13.3 ± 06.2	2.20	0.100	-

<sup>a</sup> Data are presented as mean ± SD.

<sup>b</sup> Analysis of variance.

<sup>c</sup> Least significant difference.

## 5. Discussion

In the current study, 14437 suicide attempts were recorded in a period of seven years. It was shown that the rate in females was 1.7 times higher than that of males. However, the rate of deaths resulted from suicide in males was 1.4 times higher than that of females. Moreover, more than half of those who committed suicide aged 15 - 24 years. The rate of suicide attempt was high in spring, summer, and fall, but was significantly low in winter. It is worth mentioning that the lowest rate was in January and February (months of winter), and March (the first month of spring).

The rates of suicide attempts and deaths resulted from suicide were different between males and females in North of Iran. In a study on 318 deliberate self-burning cases in Mazandaran, 242 (79%) cases resulted in death, which was equal to six per 100000 general population. In addition, 264 (83%) of the subjects were female and 54 (17%) male (14). Moreover, 64.4% of suicide attempts were made by females (15). In another study in Nishabur, North-East of Iran, females accounted for 69.1% of all (207 cases) suicide attempts (15). In a study in Sabzevar, another city in North-East of Iran, the total reported cases were 106 and the rate was higher in females (50.9%) than males (11). In Ardabil, North-West of Iran, 73.50% of the 185 cases of death were male (16). In a seven-year study in Taiwan (1997 - 2003), 18083 deaths were reported due to suicide, mostly male (67.65%) (7). In a study by Rocchi et al. in Italy, average annual suicide rate in males and females was 2374 and 882, respectively (17). In another study in the same country, average annual suicide rate in males and females was 2888 and 1089, respectively; it is noteworthy that this rate in males was higher than females in all age groups (18). Thus, results of the present research are in agreement with those of the studies in other parts of Iran, regarding the rate of suicide attempts and successful suicides (deaths) in males and females. Moreover, it is in accordance with the results of the study by Lee et al. regarding the higher rates of death in males than females (7). However, the results of the present research concerning suicide attempts in both genders are not in agreement with those of the two studies carried out in Italy. This different pattern may be because suicide is under the influence of various social and psychological factors (unemployment, tensions, family problems, marital status from the standpoint of custom and tradition, and alcohol addiction) that are of great importance in different countries.

In the present study, the age group of 15 - 24 years accounted for the highest suicide attempts. In another study in Mazandaran, the majority of self-immolation attempts were made by individuals aged 20 - 29 years (19). This figure was observed in the 15 - 19 years age group in Kordkouy, Iran (15). In Nishabur, North-East of Iran, 66.2% of all suicide attempts were made by people aged 16 - 25 years and the lowest rate of suicide attempt (1%)

was observed in people aged 55 and over (5). In Sabzevar, North-East of Iran, and Ardebil, North-West of Iran, the mean suicide age was  $24.8 \pm 8.4$  and  $29.6 \pm 15.0$  years, respectively (11-14). In Taiwan, 74.7% of deaths were reported from people aged over 64 (7). Furthermore, in Italy, suicide distribution was significantly different in different age groups (18). Dominant suicide age in the present study and in other parts of Iran was the 20s, while in other countries suicide was committed in old age. This may be due to the differences in the nature of problems and social tensions among societies. That is, marriage problems, being single, addiction, unemployment, academic problems, marital discord, and divorce may be dominant in a society that has the highest suicide attempt rate in among young population. However, physical problems, loneliness and lack of attention to the elderly, concerns for lack of independence in old age, separation, etc., may be more prevalent in a society in which suicide rate is higher among the elderly (1, 3, 5, 6, 9-12).

The seasonal pattern observed in the current study revealed that the rate of suicide cases was high in most of the seasons (except for winter). Documents show that suicide frequency has been higher in spring and summer than fall and winter since the 19th century (1, 20). In another study in Mazandaran province, Iran the majority of deliberate self-burning cases were attempted in spring (19). In another study conducted in Kordkouy, North of Iran, suicide attempt rate was significantly higher in spring and summer (15). In a study in Ilam, Iran, the highest suicide incidence rate was in summer (12). In addition, in a study in Tehran, the highest suicide incidence rate was observed in winter and spring (5). In a study in the North of Finland, a strong correlation was reported between the seasons and suicide attempts (2, 3). Ajdacic-Gross et al. reported that suicide reaches a peak in spring and early-summer and its lowest rate is in the fall and winter (1). According to the study by Rocchi et al. in Italy, suicide cases showed a seasonal distribution in both males and females, with its peak in spring (17). In a study in Finland, violent suicide peak was in spring in a period from 1980 to 1984, but its peak was in the summer in all the studied years (21). A study in Greece revealed that suicide attempts in males increased during spring and summer, but it showed a significant decrease in September (22). Another study in Greece confirmed that deaths resulted from violent suicide had their peak in May (23). In England and Wales, the highest suicide attempt rate was in January (24). A review study showed that the peak of suicide rate was in spring (25). A review carried out in Switzerland, which evaluated the changes in suicide seasonality over 125 years showed that the seasonal effect of suicide decreased compared with that of the year 1900 (26). However, the seasonal scope of suicide increased in Australia (27). No evidence of the seasonal suicide was observed in California, Los Angeles, and Sacramento, the

United States, between 1968 and 1977 (9). In Switzerland, seasons have low influence over suicide rate; thus, it was difficult to accept the role of temperature in seasonality of suicide (10). Woo et al. reported that the amplitude of suicide peak decreased in spring, and other small peaks occurred in other seasons of the year (25).

These documents and evidence confirmed the effect of suicide seasonality in almost all studies, except for two (9, 10), with the dominant suicide seasons being spring and summer. In addition to these two seasons, the present study showed a high suicide attempt rate in fall. This is in agreement with the results of a study carried out in Australia (27). The most important point here is that, according to the results of the presented studies, intensity of the effect of suicide seasonality has decreased compared with the past.

Seasonality of suicide was first understood by scientists in the 19th century. Two basic concepts are proposed here, which point out that heat and climatic factors can increase vulnerability of the nervous system, and thus, result in higher suicide attempt rates in spring and early-summer (1-3). Sociological arguments emphasize the point that there are more social activities, and thus, higher number of social tensions in spring and summer; consequently, the peak of seasonal suicide rate is observed in these months (1-3). Partonen et al. stated that high levels of sun radiation are associated with increased risk of suicide (2). In some studies, cyclic pattern of suicide is believed to be related to increased social and agricultural activities, longer days and more social stress (28). In a study by Chen et al. (29) in Taiwan, the unemployment level had a positive correlation with suicide attempt rate.

Suicide causation is multifactorial; thus, healthcare policy makers should consider all of these factors in suicide prevention programs (30). Various parameters are studied in order to unravel the underlying causes of seasonality. They include biological, cultural, sociological, and socioeconomic factors (24, 25). Several studies indicate associations between age and the seasonal variation in suicide attempt. They reported that the suicide rate among younger people increased in spring, whereas the rate among older adults rose in late summer (16, 18). However, a study observed a suicide peak in fall among adolescents, particularly for those dying by violent methods (18). Studies show that suicides committed mainly with violent methods are characterized by seasonal variation with a peak in their rates in spring and a reduction in autumn. In a study in Greece, seasonal variation was associated with suicides by self-shooting and self-hanging (25). On the contrary, suicides committed with non-violent means show no seasonal variation for both genders (23). In the present study, the role of the lunar month in the incidence of suicide was not determined. Nevertheless, results of other studies show that suicide incidence, in some lunar months and holidays in the Islamic countries, is low. Ghale Eiha and Behrouzi Fard reported the lowest suicide incidence rate in Ramadan, Nowruz, and Moharram (31).

The above mentioned findings and the results of the current study can lead to gaining a better understanding of the nature of suicide. The better understanding of suicide mechanisms leading to seasonal peaks of suicide attempt, may lead to identifying factors amenable to preventative interventions, and in the longer run, in flattening seasonal peaks of suicide and possibly improving suicide prevention in general.

The current study had some limitations; since the existing data were used, the information regarding suicide methods and some factors affecting suicide incidence seasonality, such as ambient temperature, climate conditions, the lunar month, days of the week, and different hours of the day and night, had not been recorded; thus, they could not be reviewed. Moreover, due to the stigma of suicide in Iran, when people who have committed suicide are referred to the emergency departments, most often unintentional and accidental reasons are stated. Therefore, their names are not recorded in the suicide attempters list. Another limitation was the lack of judgment about the increasing or decreasing trend of suicide over time. This is the result of the influences of fluctuations in the care system on suicide cases recorded in different years; that is, the care system may pay more attention to this phenomenon in one year and no attention in another year. In spite of this doubt, the mentioned conditions have no effect on seasonality of suicide. If the healthcare system fails to perform well in this regard, it will have the same effects on all seasons of the year.

The current research found a broad scope of suicide seasonality in the Northern Iran and that suicide attempts only had a significant decrease in winter compared with other seasons. Moreover, there were two noticeable peaks of suicide in June and November.

It is suggested that similar studies should be carried out in other regions of Iran with different climates to obtain more suitable records regarding suicide seasonality in Iran to compare judgments about the cyclic nature of this phenomenon with the facts. Since some biological and sociocultural factors such as lifestyle, activities, social interactions, marital status, unemployment, etc., may be related to the seasonal distribution of suicide, it is strongly recommend to consider these factors in future studies.

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## Authors' Contributions

Data analysis, revision, and manuscript preparation: Mohammad Moqaddasi Amiri, Mahmood Moosazadeh. Data collection and manuscript preparation: Abdolkarim Ahmadi Livani, Mohammadreza Mirzajani, and Azizallah Dehghan.

## Declaration of Interest

None declared.

## References

- Ajdacic-Gross V, Wang J, Bopp M, Eich D, Rossler W, Gutzwiller F. Are seasonalities in suicide dependent on suicide methods? A reappraisal. *Soc Sci Med*. 2003;57(7):1173-81.
- Partonen T, Haukka J, Nevanlinna H, Lonnqvist J. Analysis of the seasonal pattern in suicide. *J Affect Disord*. 2004;81(2):133-9.
- Partonen T, Haukka J, Viilo K, Hakko H, Pirkola S, Isometsa E, et al. Cyclic time patterns of death from suicide in northern Finland. *J Affect Disord*. 2004;78(1):11-9.
- Kontaxakis V, Havaki-Kontaxaki B, Margariti M, Stamouli S, Kollias C, Christodoulou G. Suicidal ideation in inpatients with acute schizophrenia. *Can J Psychiatry*. 2004;49(7):476-9.
- Mohammadi G, Saadati A. [Epidemiology and etiology of suicide and its relationship with demographic variables among patients of emergency the Hospital 22 Bahman of Neishabour in 2003 year.]. *J Fundam Ment Health*. 2004;6(23-24):117-25.
- Altamura C, VanGastel A, Pioli R, Mannu P, Maes M. Seasonal and circadian rhythms in suicide in Cagliari, Italy. *J Affect Disord*. 1999;53(1):77-85.
- Lee HC, Lin HC, Tsai SY, Li CY, Chen CC, Huang CC. Suicide rates and the association with climate: a population-based study. *J Affect Disord*. 2006;92(2-3):221-6.
- Moidfar S, Hasanpanah H. Sociological study of suicide in Kurdistan. *Iran J Soc Prob*. 2010;1(3):123-43.
- Tietjen GH, Kripke DF. Suicides in California (1968-1977): absence of seasonality in Los Angeles and Sacramento counties. *Psychiatry Res*. 1994;53(2):161-72.
- Ajdacic-Gross V, Lauber C, Sansossio R, Bopp M, Eich D, Gostynski M, et al. Seasonal associations between weather conditions and suicide—evidence against a classic hypothesis. *Am J Epidemiol*. 2007;165(5):561-9.
- Ramim T, Mobayen M, Shoar N, Naderan M, Shoar S. Burnt wives in Tehran: a warm tragedy of self-injury. *Int J Burns Trauma*. 2013;3(1):66-71.
- Rezaeian M, Sharifirad GR, Foroutani MR, Moazam N. Recognition of some of the risk factors for suicide and attempted suicide within Ilam province and their direction of function. *J Health Syst Res*. 2010;6(1):86-94.
- Statistical Center of Iran. *The results of general census of Population and Housing in 2011*. Statistical Center of Iran; 2010.
- Zarghami M, Khalilian A. Deliberate self-burning in Mazandaran, Iran. *Burns*. 2002;28(2):115-9.
- Zarghami M, Khalilian A. [Epidemiology of committing suicide in Kordkouy]. *Pejuhandeh*. 2003;8(5):361-70.
- Sharghi A, Mashoufi M, Valizadeh B, Ziapoor S. [Study of demographic and suicide methods in suicide victims and suicide incidence in Ardabil city based on suicide death registries in legal medicine center from 1997 to 2006]. *Sci J Forensic Med*. 2009;15(2):108-14.
- Rocchi MB, Sisti D, Cascio MT, Preti A. Seasonality and suicide in Italy: amplitude is positively related to suicide rates. *J Affect Disord*. 2007;100(1-3):129-36.
- Preti A, Miotto P, De Coppi M. Season and suicide: recent findings from Italy. *Crisis*. 2000;21(2):59-70.
- Zarghami M, Khalilian AR. Self-Burning in the Province of Mazandaran. *Iran J Psychiatry Clin Psychol*. 2002;7(4):13-24.
- Ajdacic-Gross V, Bopp M, Ring M, Gutzwiller F, Rossler W. Seasonality in suicide—a review and search of new concepts for explaining the heterogeneous phenomena. *Soc Sci Med*. 2010;71(4):657-66.
- Hakko H, Rasanen P, Tiihonen J. Secular trends in the rates and seasonality of violent and nonviolent suicide occurrences in Finland during 1980-95. *J Affect Disord*. 1998;50(1):49-54.
- Vougiouklakis T, Boumba VA, Mitselou A, Peschos D, Gerontopoulos K. Trends in suicide mortality in the deprived region of Epirus (north-west Greece) during the period 1998-2002. *Med Sci Law*. 2005;45(1):39-46.
- Christodoulou C, Papadopoulos IN, Douzenis A, Kanakaris N, Leukidis C, Gournellis R, et al. Seasonality of violent suicides in the Athens greater area. *Suicide Life Threat Behav*. 2009;39(3):321-31.
- Page LA, Hajat S, Kovats RS. Relationship between daily suicide counts and temperature in England and Wales. *Br J Psychiatry*. 2007;191:106-12.
- Woo JM, Okusaga O, Postolache TT. Seasonality of suicidal behavior. *Int J Environ Res Public Health*. 2012;9(2):531-47.
- Ajdacic-Gross V, Bopp M, Sansossio R, Lauber C, Gostynski M, Eich D, et al. Diversity and change in suicide seasonality over 125 years. *J Epidemiol Community Health*. 2005;59(11):967-72.
- Rock D, Greenberg DM, Hallmayer JF. Increasing seasonality of suicide in Australia 1970-1999. *Psychiatry Res*. 2003;120(1):43-51.
- Christodoulou C, Efstathiou V, Bouras G, Korkoliakou P, Lykouras L. Seasonal variation of suicide: A brief review. *Encephalos*. 2012;49:73-9.
- Chen VC, Chou JY, Lai TJ, Lee CT. Suicide and unemployment rate in Taiwan, a population-based study, 1978-2006. *Soc Psychiatry Psychiatr Epidemiol*. 2010;45(4):447-52.
- Nazarzadeh M, Bidel Z, Ayubi E, Asadollahi K, Carson KV, Sayehmiri K. Determination of the social related factors of suicide in Iran: a systematic review and meta-analysis. *BMC Public Health*. 2013;13:4.
- Ghale Eiha A, Behrouzi Fard F. [Epidemiologic survey of suicide attempters hospitalized in Hamadan Sina Hospital in 2001-2002.]. *Sci J Hamdan Univ Med Sc*. 2006;13(4):58-63.