

# INFLUENCE OF SEASONALITY ON SUICIDAL HANGING IN ISTANBUL, 1979-2012: ASSOCIATIONS WITH GENDER, AGE, LOCATION AND INSTRUMENTS OF SUICIDE

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## ABSTRACT

**Objective:** Seasonal variations in deaths by suicide have been reported in many countries. However, in Turkey there is no substantial research on this topic. The aim of this study is to examine the influence of the seasons on suicides by hanging in Istanbul during the period 1979 to 2012 and to assess the associations of seasonal suicide by hanging with gender, age, location and instruments.

**Material and Method:** This paper describes the demographic characteristics of suicidal hanging victims for the past 33 years. A total number of 82871 autopsies were performed in the Council of Forensic Medicine in Istanbul Turkey Morgue Department between 1979 and 2012; 4502 (5.43%) of these deaths occurred as a result of hanging. 4502 suicides by hanging were selected using the study criteria.

**Results:** In this study, most victims were male and the mean age was 37.8 years. Most suicides took place at home but also occurred in prisons, open and built-up areas and workplaces. 455 victims hanged themselves with rope. Inseasonal spring and summer, hangings peaked among total population. The seasonal distribution of the hangings showed a significant difference in both sexes as evidenced by the “goodness of the fit” test. There were no statistically significant seasonal variations of suicidal hanging for age, location and instrument.

**Conclusion:** The results show that the highest rates were observed in the warmest months. This study is an important source of epidemiological data for suicide by hanging.

**Key Words:** Suicide, hanging, seasonal variation, locations, instrument

## İSTANBUL'DAKİ ASİ İNTİHARLARININ MEVSİMSSEL ETKİLERİNİN CİNSİYET, YAŞ, LOKALİZASYON VE ASİ MATERYALİ AÇISINDAN İNCELENMESİ 1979-2012

### ÖZET

**Amaç:** Birçok ülkede intiharların mevsimsel farklılıklar gösterdiği rapor edilmiştir. Ancak Türkiye’de böyle bir araştırma bulunmamaktadır. Bu çalışmanın amacı mevsimlerin 1979-2012 yılları arasındaki asi intiharlarına etkisinin olup olmadığını araştırmak, asi intiharlarını cinsiyet, yaş, lokalizasyon, kullanılan materyal açısından incelemek ve aralarında mevsimsel bir ilişki olup olmadığını değerlendirmektir.

**Materyal ve Metod:** Bu çalışma asi intiharlarının 33 yıllık demografik özelliklerini tariflemektedir. Adli Tıp Kurumu Başkanlığı Morg İhtisas Dairesinde 33 yıl boyunca yapılan toplam 82871 adet otopsinin 4502 (%5,43) adedi asi intiharna bağlı ölümler nedeniyle yapılmıştır. Kriterlere uygun 4502 (%5,43) adet asi olgusu çalışmaya dahil edilmiştir.

**Bulgular:** Bu çalışmada olguların çoğu erkek olup ortalama yaş 37,8 olarak tespit edilmiştir. Çoğu intihar evde gerçekleşmiş olmakla birlikte cezaevlerinde, açık inşaat alanlarında ve işyerlerinde de gerçekleşen olgular vardır. 455 olgu kendisini ipe asmıştır. Toplumda ilkbahar ve yaz aylarında asılar pik yapmıştır. Asıların mevsimlere dağılımı her iki cinsiyet için de “goodness of the fit” testi ile incelendiğinde anlamlı olarak farklı bulunmuştur. Asi olguları mevsimsel olarak yaş, lokalizasyon ve kullanılan materyal açısından incelendiğinde istatistiksel olarak anlamlı bulunmamıştır.

**Sonuç:** Bulgular sıcak aylarda oranların daha yüksek olduğunu göstermektedir. Bu çalışma asi intiharları için epidemiyolojik veri oluşturması açısından önem arz etmektedir.

**Anahtar Kelimeler:** İntihar, asi, mevsimsel farklılık, lokalizasyon, materyal

## INTRODUCTION

Suicide is one of the leading causes of death in the world.<sup>1</sup> Methods can be classified as either violent (i.e., hanging, firearms, drowning, jumping, cutting, or self-immolation) or non-violent (i.e., ingestion of poisons, drugs, gases, or vapours) in terms of lethality based on the International Classification of Diseases.<sup>2</sup> Hanging was the predominant method of suicide in most countries in world.<sup>1,3-6</sup> Wu et al. reported that hanging was the most common method in 9 out of 17 countries/regions reviewed.<sup>7</sup>

Meteorological factors are well known to modulate the state of human health and the rate of death. The rate of suicides may also be influenced by climatic and seasonal triggers.<sup>6</sup> Seasonal variations in suicide deaths have been reported in many countries.<sup>8-13</sup> A number of researchers have reported a seasonal variation of violent suicides including hanging, jumping from a height, drowning, and firearms.<sup>14-16</sup> However, in Turkey there is no substantive body of research on seasonality per se. There have been five studies that have touched on this topic but only one assessed seasonal variation in self-destructive behaviour in terms of completed and attempted suicides in a three-year period from 2008 until 2010 in Van, Turkey.<sup>17-21</sup> Other studies have evaluated poisoning

cases or suicide attempts.<sup>17-21</sup> However, these studies are important sources of epidemiological data for suicidal hanging because report data spans 33 years.

The aim of this study is to examine the influence of seasonality on suicidal hanging in Istanbul during the period 1979 to 2012 and to assess the associations of seasonal suicide by hanging with gender, age, location and instruments.

## MATERIAL and METHOD

Data was obtained from the Council of Forensic Medicine Istanbul in Turkey that spanned a 33-year period between January 1, 1979, and December 31, 2011. Autopsy and investigative files of 82871 people whose deaths resulted from suicide were examined one by one, and 4502 (5.4%) suicide deaths by hanging were separated by the study criteria. These files contained records abstracted from death certificates. All cases were classified by gender, age, year, and month of death, as well as the location and instrument of hanging.

The Ministry of Justice approved this research. Ethical permission for the study was obtained from the Council of Forensic Medicine.



<b>Table:</b> Associations with demographic characteristics of victims of seasonality in suicidal hanging cases.											
Demographic Characteristics	TOTAL		SPRING		SUMMER		AUTUMN		WINTER		$\chi^2$ test p
	n	%	n	%	n	%	n	%	n	%	
<b>Age</b> (37.8±1.6; 10-96 years old)											
≤18 years old	440	9.8	121	9.9	111	9.3	99	9.7	109	10.2	NS
19-64 age	3655	81.2	988	80.8	967	80.8	830	81.7	870	81.7	
≥65 years old	407	9.0	114	9.3	120	10.0	87	8.6	86	8.1	
<b>Place of suicides</b>											
Unknown	1998	44.4	539	44.1	537	44.8	444	43.7	478	44.9	NS
Home	1424	31.6	396	32.4	378	31.6	328	32.8	322	30.2	
Prison and lockup	441	9.8	105	8.6	114	9.5	111	10.9	111	10.4	
Open and built area	260	5.8	76	6.2	72	6.0	53	5.2	59	5.5	
Workplace	201	4.5	57	4.7	50	4.2	49	4.8	45	4.2	
Hotel and nursing home	53	1.2	17	1.4	15	1.03	6	0.6	15	1.4	
Military area	43	1.0	12	1.0	11	0.9	8	0.8	12	1.1	
Psychiatry clinic	34	0.8	8	0.7	11	0.9	6	0.6	9	0.8	
Graveyard	25	0.6	7	0.6	7	0.6	4	0.4	7	0.7	
Hospital	23	0.5	6	0.5	3	0.3	7	0.7	7	0.7	
<b>Instruments of suicides</b>											
Unknown	3464	76.9	956	78.2	920	76.8	792	78.0	796	74.7	NS
Rope	455	10.1	127	10.4	123	10.3	92	9.1	113	10.6	
Belt, cloth, necktie, dress	430	9.6	107	8.7	112	9.3	96	9.4	115	10.8	
Cable, wire, hose	81	1.8	15	1.2	25	2.1	23	2.3	18	1.7	
Sheet	44	1.0	12	1.0	11	0.9	8	0.8	13	1.2	
Gauze, scarf	28	0.6	6	0.5	7	0.6	5	0.5	10	0.9	
<b>TOTAL</b>	4502	100.0	1223	27.2	1198	26.6	1016	22.6	1065	23.7	
<b>NS:</b> Statistically no significant difference between the group of demographic characteristics and the group of seasonality (p<0.05). p value, [chi] <sup>2</sup> test between seasonality for all variables.											

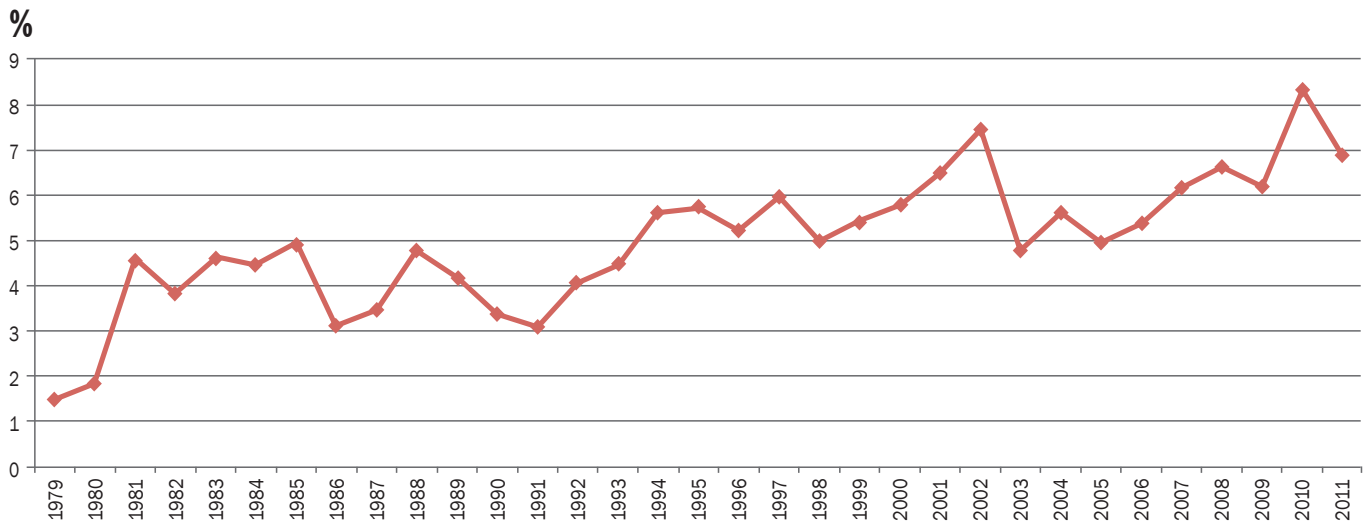


Figure: Distribution of hangings according to study years

Data were statistically analysed using SPSS 16.0 software (SPSS Inc. Technology, Chicago, IL, USA). The variables were described as mean and percent. For data analysis, statistical methods such as frequency and percentage were used. The equal seasonal distribution of the hangings was tested using the “goodness of the fit” test, where an assumption is made for equal distribution between seasons (i.e. 25%) and the observed and expected distributions are assessed.

The chi-square test was used to determine whether there were significant differences between cases’ seasonality by age, areas, and instruments.  $P < 0.05$  was considered significant.

## RESULTS

Of the 82871 autopsies from death certificates obtained from the Istanbul Council of Forensic Medicine in Turkey between 1979 and 2012, 4502 (5.4%) were used in our analyses after applying our exclusion criteria.

Differences in gender, age, location and instruments of suicides among seasonality suicide are shown in Table.

There were 3295 (73.2%) male and 1207 (26.8%) female suicide cases. The male/female ratio in the present study was 2.73 (male to female, 3:1). The average age of suicide victims was 37.8 years. In this study, the youngest case was 10 years old and the oldest was 96. The number of victims in the over 65 age group was the lowest.

The seasonal distribution of the hangings exhibited significant differences according to the result of the “goodness of the fit” test ( $p = 0.001$ ). Also, this difference was significant separately for both sexes (males  $p = 0.001$ , females  $p = 0.021$ ). This test assumes an equal distribution (i.e. 25%) between the

seasons and evaluates the differences between the observed and expected values. The results showed an inhomogeneous seasonal distribution.

It is not known where some of suicides (44.4%) occurred. In 31.6% of the cases, it occurred at home. This is followed by suicides in prison and lock-up (9.8%), open and built-up areas (5.8%), the workplace (4.5%), hotels and nursing home (1.2%), military areas (1.0%), psychiatry clinics (0.8%), graveyards (0.6%), and hospitals (0.5%). Of the cases, 455 (10.1%) hanged themselves with rope, 430 (9.6%) with a belt, cloth, necktie, or dress, 81 (1.8%) used cable, wire, or hose, 44 (1.0%) used a sheet, and 28 (0.6%) used a gauze or scarf. The instruments of suicide were unknown in 76.9% of cases.

In the present study, most deaths (1223, 27.2%) occurred in the spring, followed by summer (1198, 26.6%), winter (1065, 23.7%), and autumn (1016, 22.6%). The hangings peaked in seasonal spring and summer among the total population.

There are no statistically significant seasonal variations of suicide by hanging for age, areas, and instruments ( $p > 0.05$ ).

The total frequency of hanging in men was higher in spring (27.9%) than in other seasons (23.8% in winter, 22.5% in autumn, and 25.9% in summer). However, the frequency of hanging in women was higher in summer (28.6%) than in other seasons (22.9% in autumn, 23.4% in winter, and 25.2% in spring). The age range of 19-64 constituted 81.7% of the hanging cases that occurred in winter, 80.8% in summer, 81.7% in autumn and 80.8% in spring. Compared with areas and instruments of suicide and seasonally affected suicide by hanging, the results correspond with previous data.

The distribution of hangings according to study →

years is shown in Figure. Despite the fluctuation in hangings-to-autopsy rates within years, there was a consistent increase in the number of hangings over the years.

## DISCUSSION

Hanging was the most common method of suicide for both genders and for most age groups in Turkey.<sup>22</sup> Wu et al. included a total of 17 Asian countries/regions in the review.<sup>7</sup> Hanging was the most common method in nine out of the 17 countries/regions reviewed (Bahrain, Iran, Japan, South Korea, the Philippines, Saudi Arabia, Taiwan, Thailand, and Turkey). In 16 European countries investigated by Värnik, hanging was also a common method of suicide.<sup>23</sup>

In this study, men chose hanging more than women. The positive association of males and the incidence of hanging are well known, and therefore this data should not be surprising.<sup>5, 24-26</sup> Males differ from females by increased suicide rates, particularly by hanging.<sup>27</sup> In South Korea, men were more likely than women to commit suicide by hanging/suffocation.<sup>28</sup> Salmerón et al. suggested that suicide rates for hanging decreased, although the rates increased, in the male 35-44 age group.<sup>29</sup>

In our study, the male/female ratio was 2.7, which is compatible with many studies. For example, Wu et al. suggested that China had the lowest suicide gender ratio (0.88 in 1999) and Thailand (3.2 in 2002) had the highest gender ratios, compatible with Western figures.<sup>7</sup> Japan (2.7 in 2009) and Taiwan (2.1 in 2010) were in the middle of their study. The average ratio of males to females was 1.58/1 between 1996 and 2005.<sup>22</sup> The male/female rate ratio of suicides is estimated to be highest in the European region (4.0).<sup>30</sup>

The present study revealed that most victims were in the 19-64 age group (81.2%) and the number of victims in the over-65 age group were the lowest. Mohanty et al. developed the largest number of victims, which were found in the 21-30 age group.<sup>1</sup> An Arabian study found the 20-49 age group had the greatest number of hanging suicides while the lowest number of cases was in the over 60 and over 70 age group.<sup>24</sup> The major risk factor for suicides was found to be illness (29.6%) for both genders and especially for those older than middle age.<sup>22</sup>

In this study, most victims committed suicide at home. However, they committed suicide in different locations too, such as prisons, open and built-up areas and workplaces. The victim's home is the most

frequent location, but hangings also occur outside.<sup>31-33</sup>

Generally, similar to this study, post-hanging decapitation is typically associated with a relatively thin ligature of poor elasticity (e.g., nylon rope, electric cable, wire).<sup>34-36</sup>

Most studies have found that suicide rates tend to peak during the spring and summer.<sup>3,8,14,37,38</sup> The spring-summer increase is widely discussed in the literature.<sup>1,4,6,12,24,27,39,40</sup> Suicides increase in the spring and summer and the highest suicide rates were observed in the warmest months.<sup>22,29</sup>

Several studies have shown that violent suicides such as hanging depict seasonality with peaks in spring and summer.<sup>41,42</sup> Chew and McCleary comprehensively compared the seasonal variation of suicides across 28 nations and found well-replicated seasonal spring peaks from the various nations regardless of the location of the countries.<sup>43</sup> Flisher et al. reported a minor spring or summer peak and a trough in autumn in South Africa. Some studies conducted in temperate areas such as Brazil and Italy observed a peak of suicide in late spring and early summer.<sup>44-46</sup> In this study, A seasonal spring and summer peak emerged in the total population.

Hiltunen et al. reported the association between increased suicide mortality and the period with the longest day length (which was between May and July) i.e., late spring/early summer.<sup>47</sup> Similarly, studies in Australia are concordant with studies conducted in the Northern Hemisphere in Europe and Asia, identifying a seasonal spring suicide peak.<sup>48-54</sup> Nonetheless, Shojaei et al. suggested that hanging was the most frequently used method in all seasons.<sup>12</sup>

It has been suggested that seasonal vulnerability is biologically determined and associated with the circannual rhythms of central serotonin neurotransmission. Anhedonia is related to low brain serotonin levels and is a predictor of suicide and is marked by a combination of hopelessness with aggressive and impulsive behaviour.<sup>55</sup>

The difference in seasonal distributions of suicides between men and women did not show a statistical significance.<sup>15</sup> In this study, there were no statistically significant seasonal variations of suicidal hanging for age. When the literature was examined, the mean age of individuals having committed suicide was 31.5 years. This value did not change significantly in different seasons.<sup>12</sup>

Kalediene et al. determined that a more detailed analysis of the monthly frequencies of hanging throughout the period 1993-2002 showed a distinct →

peak in June among men and in July among women.<sup>15</sup> Meanwhile, Zhang et al. found that males (compared with females) were more likely to kill themselves in spring.<sup>40</sup> Data on this topic in our study is supported by the findings from mentioned studies.

### Strength and Limitations

The long time series and existing studying associations of suicidal hanging with gender, age, location, and instruments of suicide are our study's strength. To our knowledge, this is the first nationwide analysis of suicide from hanging.

This study has several limitations, however. Firstly, we used data from death certificates, which can be affected by errors. Pierce and Denison assessed place-of-residence errors on death certificates in only two Texas counties and found a 14% error rate in recording county of residence for deaths.<sup>56</sup> Secondly, the limitation of our study did not determine the relationship between the season of the year and the victim's level of education, occupation and economic status, which were reported by previous studies in this field. Additionally, at very high rates where some of suicides (44.4%) occurred and instruments of suicide (76.9%) were unknown limitation of our study constitutes.

Despite these limitations, this study contributes to the literature on the influence of seasonality on suicide by hanging. As far as is known, it is the first survey of the determining influence of seasonality on victims of suicide by hanging in Turkey.

### CONCLUSION

The main objective of the present study was to

explore the association between suicide by hanging in the Turkish population and the season of the year. According to the results from the present study, the highest number of suicides by hanging occurred in warm seasons (spring and summer), while the lowest number was observed in cold seasons (winter and autumn). Finally, the pattern of seasonal variation in suicides in Turkey displays similarities with other countries.

Most of the victims were male. The male/female ratio in the present study was 2.73 (male to female, 3:1). Most cases were 19-64 years old. A seasonal spring and summer peak emerged in the total population. The seasonal distribution of the hangings showed a significant difference in both sexes as evidenced by the "goodness of the fit" test. There were no statistically significant seasonal variations of suicidal hanging for age, location and instrument. This result appears to support a sociological explanation of suicide seasonality.

Our results suggest that medico-legal investigation may help determine a specific suicide prevention programme regarding climate change and meteorological conditions as potential risk factors of suicidal hanging. Moreover, the findings of this study may be helpful in developing in-depth research surveys.

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\* The authors declare that there are no conflicts of interest.



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