Journal of Forensic Research and Analysis
ISSN 2577-7262 | Open Access

RESEARCH ARTICLE

Volume 2 - Issue 1 | DOI: http://dx.doi.org/10.16966/2577-7262.106

Suicide Methods by Gender and Age in Turkey

Mustafa Demir*

Assistant Professor of Criminal Justice, State University of New York at Plattsburgh, USA

***Corresponding author:** Mustafa Demir, Assistant Professor of Criminal Justice, State University of New York at Plattsburgh, USA, Tel: 518-564-3305; **E-mail:** mdemi002@plattsburgh.edu

Received: 23 Oct, 2017 | **Accepted:** 05 Feb, 2018 | **Published:** 09 Feb, 2018

Citation: Demir M (2018) Suicide Methods by Gender and Age in Turkey. J Forensic Res Anal 2(1): dx.doi.org/10.16966/2577-7262.106

Abstract

Objective: The purpose of the study is to investigate the trend in suicide methods rates by gender among age groups over time and whether suicide methods rates significantly differ in age groups between males and females in Turkey.

Method: Secondary data on suicide from 2007 to 2015 were obtained from the Turkish Statistical Institute. The number of suicide cases was 24,936. Numerical (correlation test) and graphical methods (line charts) were used to show the trends in suicide methods rates by gender among age groups. A dependent sample t-test was conducted to determine whether suicide methods rates significantly differed by gender in age groups.

Results: Among all age groups, the most common suicide methods were hanging and firearm for males and hanging and jumping for females except for females aged 15-24 years. Similar to males, hanging and firearm also were the most common suicide methods for females aged 15-24 years. Statistically significant changes in suicide methods rates by age group and gender are as follows: Among males aged 15-24 years, hanging, jumping, and firearm increased; among females in that age group, jumping increased, while cutting/burning decreased. Among males aged 25-44 years, cutting/burning increased; among females in that age group, jumping increased, while firearm decreased. The results of the dependent sample t-test showed that except for intoxication among those aged 15-24 years and 25-44 years, a statistically significant difference in suicide methods rates existed between males and females in all age groups. Except for intoxication and jumping among persons aged 15-24 years, males used other suicide methods more than females in all age groups.

Conclusions: Gender differences in suicide methods exist in all age groups.

Keywords: Suicide method; Age; Gender; Firearm; Hanging; Cutting/Burning; Intoxication and Jumping

Introduction

Suicide, defined as killing oneself knowingly and consciously [1,2], is one of the leading causes of death across the world [3]. In 2015, about 800,000 people committed suicide worldwide [4]. It is important to note that the global suicide rate per 100,000 people is 10.7 [5]. Although the suicide rate in Turkey (around 4 per 100,000 people) is lower than the global suicide rate [6], suicide is considered to be a serious public health issue that needs to be addressed. To address this serious public health issue, this study examines the trend in suicide methods rates by gender across age groups over time and whether suicide methods rates significantly differ in age groups between males and females in Turkey.

Previous studies have found that suicide is more prevalent among males [7-17], and older people [7,11,14,18-24]. The lethality of chosen suicide methods is considered as the key factor for higher suicide rates among males [25-28] and for older people [16,26,29-33]. Previous studies have suggested that opportunity plays an important role in suicide [34] and the choice of suicide method depends on availability, accessibility, cultural acceptability of the suicide method, and technical ability of the user [1]. Thus, suicide methods may differ geographically by age and gender [35]. For example, firearms and hanging require technical skills as well as courage to use, which prevents females from choosing these highly lethal methods [9,26,34,36]. In addition, not everyone has access to guns [34]. Compared to females, males are more likely to have easier access to firearms [26]. It has been proposed that females prefer intoxication and drowning [25] because they are more concerned about their appearance and do not want their body or face to be severely injured [28,36]. Compared to females, males choose more lethal suicide methods because they have strong intentionality and higher impulsivity of suicidal acts [26]. Compared younger people, older people are more likely to prefer highly lethal suicide methods because they tend to have the technical skills and knowledge of how to use them.

Suicide methods differ by age, and gender. A number of studies about suicide method by gender conducted in the United States [24], New Zealand [29], Serbia [37], Japan [38],

and Turkey [39], and suicide method by age conducted in the United States (US) [18], Iran [27], Canada [40], Israel [41], and South Korea and Japan [42] found that males, younger, and older people prefer the more lethal suicide methods such as hanging and firearms, while females use less brutal methods such as poisoning and jumping. Regardless of the western or nonwestern countries, males, older, and younger people prefer the most lethal methods to commit suicide. This suggests that they may have easily access to firearms and means for hanging, and have strong intentionality to commit suicide.

Suicide methods may also differ by gender across age groups. A study conducted in Austria found that the most common suicide method used by elderly males was hanging, followed by firearms; elderly females most often used hanging, followed by poisoning [43]. The results of another study using WHO mortality data for South Korea, Japan, Australia, and the United States showed that suicide methods across age groups including 20-29, 50-59, and over 70 differed between males and females [44]. Specifically, in Japan, the use of hanging was the most preferred method for both genders across all age groups. Unlike Japan, in the United States, the use of firearm was common among males across all age groups. Similar to Japan, the most preferred method was hanging among those aged 20-29 years for both gender in South Korea and Australia, and females in the United States; among those aged 50-59 years for both gender in South Korea and males in Australia; among those aged over 70 years for both gender in Australia [44]. Poisoning was more frequent among those aged 50-59 years for females in the United States and Australia, and among those aged over 70 years for females in the United States and for both gender in South Korea [44]. Suicide by firearm is higher in the United States because the possession and sale of firearms are legally permitted, which allows people easier access to them [44]. However, unlike the United States, suicide by hanging is higher in South Korea and Japan because the possession and sale of firearms are legally prohibited [44]. The studies suggest that overall, the most preferred suicide methods are hanging, firearm, and poisoning for older males, hanging and poisoning for older females, hanging for younger females, and poisoning for younger males.

Trends in suicide methods also may differ by age and gender over time. Previous studies found that in the age group of 20-29 years in South Korea, hanging increased steadily among both genders (especially among young females), while intoxication decreased for both genders in the recent years [44]. In addition, two studies conducted in the United States showed that suicide methods changed over time, shifting from firearms toward hanging and poisoning [18,45]. Another study conducted in Turkey found that jumping, firearms, and cutting/burning increased among males while just jumping increased among females over time [39]. Overall, the studies have suggested that hanging, jumping, and poisoning, and firearms for older people in particular have become popular suicide methods in the recent years.

Similar to the other countries, suicide methods by age and gender and trends in suicide methods over time may also differ in Turkey. Although some studies about gender differences in suicide methods in Turkey do exist [39,46], research using statistical analysis to examine whether suicide methods differ by age and gender is lacking. Furthermore, trends in suicide methods by age and gender over time also should be tested empirically. Analysis of such trends may help to identify the popularity of certain suicide methods for each gender and age group and to develop specific suicide prevention interventions [47]. To fill the gap in the literature in the context of Turkey, the current study investigated suicide methods rates by age and gender and trends in suicide methods rates by age and gender over time. The study was designed to address the following research questions and hypotheses:

1. Is there any change in trends in suicide methods by age and gender over time?

Hypothesis 1: Suicide methods including hanging, firearm, and jumping become prevalent among males while hanging and jumping become popular among females over time.

2. Are there significant gender differences in suicide methods in each age group?

Hypothesis 2: Compared to females, males use suicide methods including hanging, firearm, and jumping significantly more than females in all age groups.

The findings of the study may have a significant impact on the development of suicide preventive policies.

Methods

Data

The data on suicide between 2007 and 2015 were derived from the Turkish Statistical Institute (TUIK) website, which collects official statistics from the other governmental agencies [48]. All suicide or undetermined deaths are referred to medical examiners in Turkey, and there is no regional difference.

The data for the analysis was created following a couple of steps. First, for each year from 2007 to 2015, the number of suicide cases, the number of suicide cases by age, gender, and method [6], and population data for each age group [49] were obtained from the TUIK. Afterward, the data were merged.

Second, the original suicide methods and age groups were regrouped. Table 1 shows the frequencies of original suicide methods and age groups. The ten suicide methods in the original data were reduced to five categories, with groups of methods combined into three categories: intoxication ("taking chemicals" and "natural gas"), cutting/burning ("sharp instrument" and "burning"), jumping ("throwing from a high place," "drowning (jumping into water)," and "throwing off a train or another motorized vehicle"). The categories including "throwing from a high place," drowning (jumping into water), and "throwing off a train or another motorized vehicle" were

regrouped under the category of "jumping" because all of them had the same suicide method characteristic: jumping into ground, water, or in front of a vehicle. The category of "other" was excluded because of the small number of suicide cases. The five new categories of suicide method were hanging, intoxication, firearm, jumping, cutting/burning. Similarly, the original 14 age groups were collapsed into four groups (15-24, 25-44, 45-64, 65+). The "<15" age group was excluded two reasons: The number of suicide cases committed by persons younger than 15 was low (just 3.3%) and, most important, the "<15" age group included persons aged 1 to 15 even though suicide cannot be committed by children (e.g., a three-year-old child). The data did not allow to partition the data for those aged <15 years. Thus, including the "<15" age group would have affected the validity of the measurement (Table 1).

Third, the data were combined together for each year based on the new age category and suicide method. The number of suicide cases between 2007 and 2015 resulted in 24,936 after excluding the data for those aged <15 years and the suicide method category of "other".

Finally, the suicide rate was standardized to control for the effects of population differences in specific groups. Specifically, the direct standardization method was used to calculate gender age specific suicide rate for each year rather than a more general crude suicide rate [50]. The gender age specific suicide rate was calculated by dividing the number of suicides for male and female for each age group by the corresponding population in that gender and age group and then multiplying by 100,000. Then, the gender age specific method suicide rate (i.e., males aged 15-24 hanging suicide rate, females aged 15-24 hanging suicide rate) was calculated by dividing the number of suicide cases for that gender specific suicide method by the corresponding total number of gender age specific suicide cases and then multiplying by gender age specific suicide rate. The above mentioned calculations were made for each year separately. Then, gender specific method suicide rates (male and female specific method suicide rate) for each age group were put side by side per year for the analysis. The level of measurements of the obtained gender specific method suicide rate for each age group was continuous.

Table 2 shows the new created variables on "gender age specific method suicide rate" for the analysis.

Analytical strategy

Data analysis was conducted using Stata 14.2 software. For descriptive analysis, the categorical variables including gender, age groups, and suicide methods were used. For all other analysis, the new created variables on "gender age specific method suicide rate" (Table 2) were used. The analyses consisted of several stages: First, descriptive statistics about gender, age, and suicide methods were provided. Second, The Shapiro-Wilk W test was used to determine whether the data for each variable was normally distributed. If the results of Shapiro-Wilk W test are statistically significant, then the data are not normally distributed. Third, correlation (Spearman's rank correlation for non-normally distributed data and Pearson's correlation for normally distributed data) analysis between the examined years and the gender specific method suicide rates for each age group(e.g., correlation between the years and males aged 15-24 hanging rate; correlation between the years and females aged 15-24 hanging rate) and graphical methods (line charts) were used to examine the trends in gender specific

Table 1: Table of Frequencies of Original Age Groups and Suicide Methods

Age Group	f	Suicide Methods	f
<15	867	Hanging	13,234
15-19	3280	Taking chemicals	1,897
20-24	3176	Natural gas	93
25-29	2906	Throwing off a train or another motorized vehicle	118
30-34	2595	Throwing from a high place	2,627
35-39	2211	Drowning (jumping into water)	510
40-44	2111	Firearm	6,855
45-49	1997	Burning	89
50-54	1816	Sharp instrument	360
55-59	1486	Other	780
60-64	1080		
65-69	872		
70-74	689		
75+	1477		

Note: *N*=26,563

Table 2: The New Created Variables on Gender Age Specific Method Suicide Rate

Males Aged 15-24 Hanging Rate	Females Aged 15-24 Hanging Rate
Males Aged 15-24 Intoxication Rate	Females Aged 15-24 Intoxication Rate
Males Aged 15-24 Jumping Rate	Females Aged 15-24 Jumping Rate
Males Aged 15-24 Firearm Rate	Females Aged 15-24 Firearm Rate
Males Aged 15-24 Cutting/ Burning Rate	Females Aged 15-24 Cutting/ Burning Rate
Males Aged 25-44 Hanging Rate	Females Aged 25-44 Hanging Rate
Males Aged 25-44 Intoxication Rate	Females Aged 25-44 Intoxication Rate
Males Aged 25-44 Jumping Rate	Females Aged 25-44 Jumping Rate
Males Aged 25-44 Firearm Rate	Females Aged 25-44 Firearm Rate
Males Aged 25-44 Cutting/ Burning Rate	Females Aged 25-44 Cutting/ Burning Rate
Males Aged 45-64 Hanging Rate	Females Aged 45-64 Hanging Rate
Males Aged 45-64 Intoxication Rate	Females Aged 45-64 Intoxication Rate
Males Aged 45-64 Jumping Rate	Females Aged 45-64 Jumping Rate
Males Aged 45-64 Firearm Rate	Females Aged 45-64 Firearm Rate
Males Aged 45-64 Cutting/ Burning Rate	Females Aged 45-64 Cutting/ Burning Rate
Males Aged 65+ Hanging Rate	Females Aged 65+ Hanging Rate
Males Aged 65+ Intoxication Rate	Females Aged 65+ Intoxication Rate
Males Aged 65+ Jumping Rate	Females Aged 65+ Jumping Rate
Males Aged 65+ Firearm Rate	Females Aged 65+ Firearm Rate
Males Aged 65+ Cutting/Burning Rate	Females Aged 65+ Cutting/Burning Rate

suicide method rate for each age group. Finally, dependent sample t-test was conducted to determine whether there was a statistically significant difference between male specific method suicide rate and female specific method suicide rate for each age group [51]. In addition, the male-to-female ratio was reported to examine how much difference there was between males and females in terms of suicide method rate in each age group. Results were classified as significant at a level of 0.05. All results are available in the tables and figures. However, when the results were reported, the results for hanging, firearm, and jumping were focused.

Results

Descriptive statistics

Descriptive statistics are shown in table 3. The results indicate that 24,936 people more than 15 years old committed suicide by using the above mentioned five suicide methods between 2007 and 2015 in Turkey. The majority of them were males and between 25 and 44 years old. The most preferred suicide methods were hanging, firearm, and jumping respectively (Table 3).

Table 3: Descriptive Statistics

Variables	Attributes	%
Gender	Male	72.3
	Female	27.7
Age Group	15-24	25.1
	25-44	38.2
	45-64	24.9
	65+	11.8
Suicide Method	Hanging	51.1
	Firearm	26.7
	Jumping	12.8
	Intoxication	7.8
	Cutting/Burning	1.8

Note: *N*=24,936

Trends in suicide method rate by gender for each age group

Figure 1 shows the trends in suicide method rate by gender for each age group from 2007- 2015. Table 4 shows the results of the normality test, while Table 5 shows the correlation coefficients of gender age specific method suicide rates and years. Intoxication among females aged 15-24 and 25-44 years, cutting/burning among females aged 15-24 years and cutting/burning among females aged 65 years and older were not normally distributed. Thus, Spearman's correlation (rho) was reported for these groups. For other groups, Pearson's correlation (r) was reported because the data were normally distributed (Figure 1, Tables 4 and 5).

During the nine-year period, among males in all ages, the most preferred suicide methods were hanging, firearm, and jumping respectively. Among females in all age groups, the most common suicide methods were hanging and jumping respectively except for females aged 15-24 years. For females aged 15-24 years, similar to males, hanging and firearm were the most common suicide methods.

Among males aged 15-24 years, hanging (r=0.73, p=.025), jumping (r=0.85, p=.004), and firearm (r=0.70, p=.036) increased significantly over time. Among females aged 15-24 years, the increase in jumping (r=0.89, p=.002) and the decrease in cutting/burning (rho=-0.88, p=.002) were statistically significant.

Table 4: Results of Normality Test

		Shapiro-Wilk W test for normal data							
		Male				Female			
Age Group	Suicide Methods	W	V	z	p	W	V	z	p
15-24	Hanging	0.86	2.13	1.37	0.085	0.97	0.39	-1.42	0.922
	Intoxication	0.93	1.08	0.14	0.446	0.78	3.25	2.27	**0.012**
	Jumping	0.94	0.89	-0.19	0.575	0.97	0.44	-1.25	0.894
	Firearm	0.85	2.26	1.50	0.067	0.97	0.50	-1.07	0.859
	Cutting/Burning	0.77	3.36	2.34	**0.010**	0.72	4.12	2.82	**0.002**
25-44	Hanging	0.92	1.18	0.28	0.389	0.91	1.35	0.51	0.305
	Intoxication	0.87	1.97	1.22	0.111	0.78	3.23	2.26	**0.012**
	Jumping	0.92	1.18	0.29	0.387	0.94	0.91	-0.16	0.564
	Firearm	0.94	0.93	-0.11	0.545	0.95	0.71	-0.56	0.711
	Cutting/Burning	0.88	1.74	0.98	0.163	0.87	1.91	1.16	0.123
45-64	Hanging	0.95	0.74	-0.48	0.684	0.96	0.60	-0.80	0.789
	Intoxication	0.97	0.50	-1.08	0.859	0.89	1.64	0.87	0.193
	Jumping	0.95	0.72	-0.53	0.702	0.97	0.46	-1.18	0.882
	Firearm	0.93	1.06	0.09	0.464	0.97	0.47	-1.15	0.876
	Cutting/Burning	0.94	0.89	-0.20	0.579	0.91	1.38	0.56	0.289
65+	Hanging	0.96	0.60	-0.80	0.787	0.94	0.82	-0.32	0.626
	Intoxication	0.89	1.66	0.89	0.186	0.97	0.47	-1.16	0.876
	Jumping	0.94	0.88	-0.21	0.582	0.83	2.43	1.64	0.050
	Firearm	0.90	1.49	0.70	0.242	0.90	1.46	0.66	0.254
	Cutting/Burning	0.96	0.63	-0.73	0.767	0.68	4.69	3.14	**0.001**

Note. Ho: Normally distributed

Table 5: Correlation Coefficients of Gender Age Specific Method Suicide Rates and Years

		Year			
		Male		Female	
Age Group	Suicide Method	*r / rho*	*p*-value	*r / rho*	*p*-value
15-24	Hanging	0.73	**0.025**	-0.65	0.057
	Intoxication	-0.33	0.381	-0.58*	0.099
	Jumping	0.85	**0.004**	0.89	**0.002**
	Firearm	0.7	**0.036**	-0.08	0.844
	Cutting/Burning	0.65*	0.058	-0.88*	**0.002**
25-44	Hanging	0.39	0.302	-0.30	0.429
	Intoxication	-0.51	0.160	-0.55*	0.125
	Jumping	0.67	0.051	0.82	**0.007**
	Firearm	0.59	0.096	-0.71	**0.034**
	Cutting/Burning	0.76	**0.017**	-0.39	0.293
45-64	Hanging	0.10	0.806	-0.42	0.264
	Intoxication	-0.03	0.929	-0.02	0.954
	Jumping	0.68	**0.045**	0.03	0.929
	Firearm	0.35	0.360	-0.23	0.551
	Cutting/Burning	0.22	0.568	0.58	0.103
65+	Hanging	-0.56	0.116	-0.11	0.785
	Intoxication	-0.23	0.553	0.52	0.154
	Jumping	-0.20	0.605	0.65	0.060
	Firearm	-0.03	0.929	0.30	0.436
	Cutting/Burning	0.16	0.690	-0.12*	0.761

Note: *Spearman's correlation (*rho*) was reported. Significant values at p<0.05.

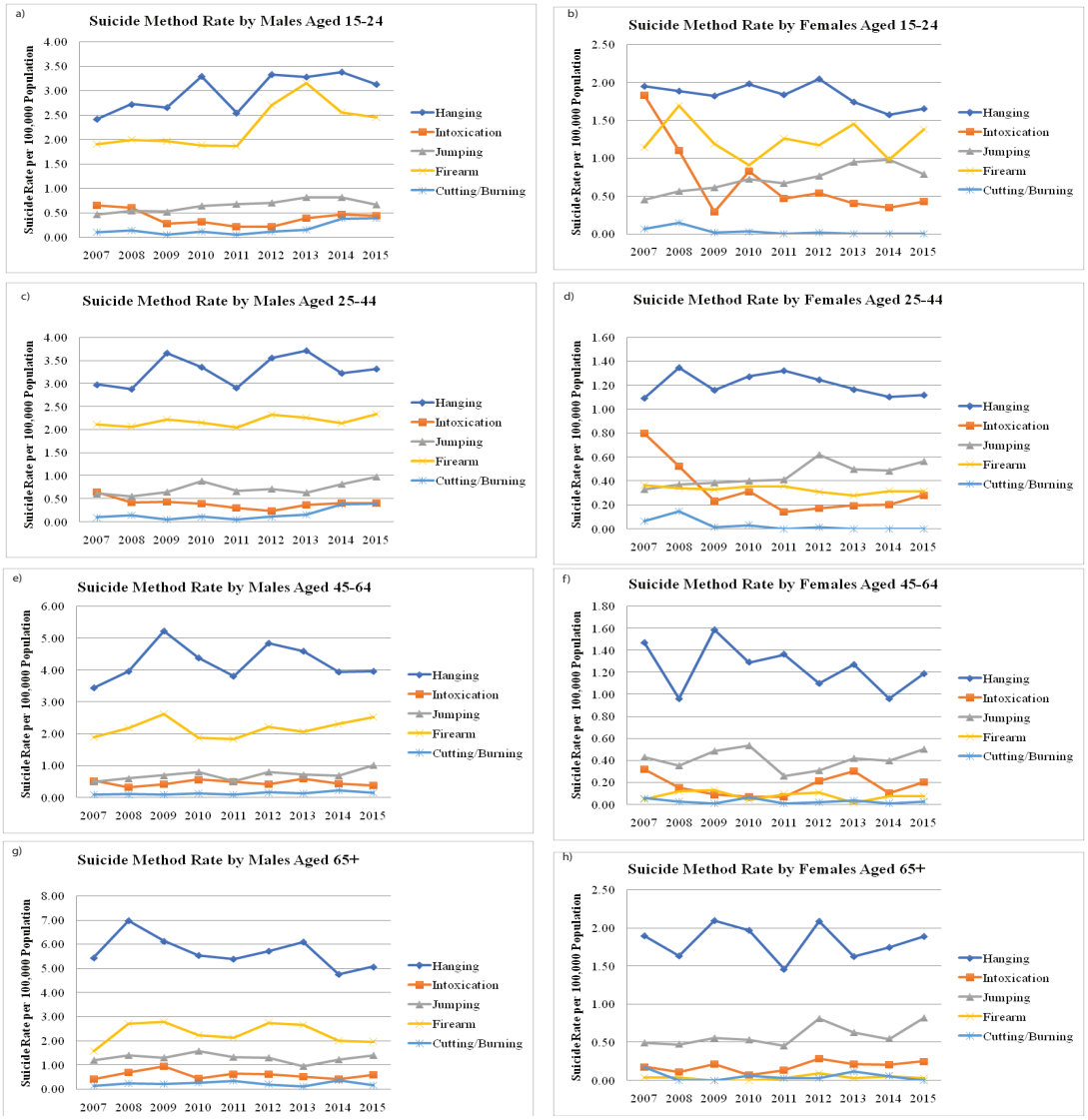

Figure 1: Trends in Suicide Methods Rates by Gender among Age Groups between 2007 and 2015

Among males aged 25-44 years, there was a statistically significant increase in cutting/burning (r=0.76, p=.017). Among females aged 25-44 years, the increase in jumping (r=0.82, p=.007) and the decrease in firearm (r=-0.71, p=.034) were statistically significant. Among males aged 45-64 years, except for the increase in jumping (r=0.68, p=.045), the changes in other methods were not statistically significant. Among females aged 45-64 years, none of the changes in suicide methods were statistically significant.

Among both males and females aged 65 years and older, there was no statistically significant change in suicide methods.

Gender differences in suicide method rate by age groups

Table 6 shows the results of the dependent sample t-test. Figure 2 shows suicide method rates by gender for each age group.

The results show that except for intoxication among those aged 15-24 years and 25-44 years, all other suicide methods rates differed significantly by all age groups between males and females. Except for intoxication and jumping for those aged 15-24 years, the suicide methods rates for males for all age groups was higher than the rates for females. Intoxication and jumping for females aged 15-24 years were greater than for males in the same age group.

Table 6 also shows the results of the male-to-female ratio in terms of suicide methods rates by age group. The largest difference between males and females was with cutting/burning, firearm, and hanging respectively among those aged 15-24 years, and with firearm, cutting/burning, and hanging respectively among those aged 25-44 years and 45-64 years, firearm, cutting/burning, and intoxication respectively among those aged 65 years and older. Overall, the male-to-female ratio for four of the five suicide methods rates increased with increasing age; the ratio for cutting/burning, which decreased with increasing age, was the exception.

Table 6: Results of Dependent Sample t-test

	Male			Female			
Age	Suicide Methods	M	*SD*	M	*SD*	*t* (8)	Male: Female Ratio
15-24	Hanging	2.97	0.38	1.83	0.16	7.6**	1.6
	Intoxication	0.40	0.16	0.70	0.50	-2.20	0.6
	Jumping	0.65	0.12	0.72	0.17	-3.6**	0.9
	Firearm	2.28	0.46	1.24	0.24	6.5**	1.8
	Cutting/Burning	0.16	0.13	0.03	0.05	2.6*	5.3
25-44	Hanging	3.29	0.32	1.20	0.10	17.1***	2.7
	Intoxication	0.40	0.11	0.32	0.21	1.90	1.3
	Jumping	0.72	0.14	0.45	0.10	6.3**	1.6
	Firearm	2.18	0.10	0.33	0.03	44.3***	6.6
	Cutting/Burning	0.12	0.04	0.03	0.02	5.5**	4.5
45-64	Hanging	4.24	0.56	1.24	0.22	16.1***	3.4
	Intoxication	0.46	0.08	0.17	0.10	7.8**	2.7
	Jumping	0.69	0.16	0.41	0.09	6.3**	1.7
	Firearm	2.16	0.28	0.08	0.04	23.7***	27.4
	Cutting/Burning	0.13	0.05	0.03	0.02	7.2**	4.1
65+	Hanging	5.67	0.66	1.82	0.22	16.3***	3.1
	Intoxication	0.58	0.17	0.18	0.07	7.0**	3.2
	Jumping	1.30	0.18	0.59	0.14	9.2***	2.2
	Firearm	2.31	0.43	0.03	0.03	15.9***	66.7
	Cutting/Burning	0.23	0.08	0.05	0.06	4.3*	4.3

Note: *p<.05, **p<.01, ***p<.001. Bold indicates significance. M: Mean of Suicide Rate; SD: Standard Deviation.

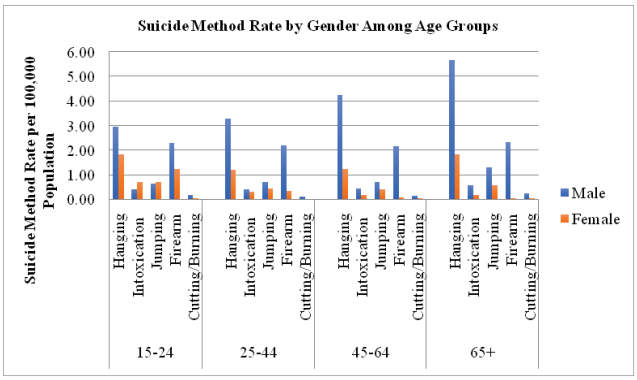

Figure 2: Suicide Method Rate by Gender among Age Groups

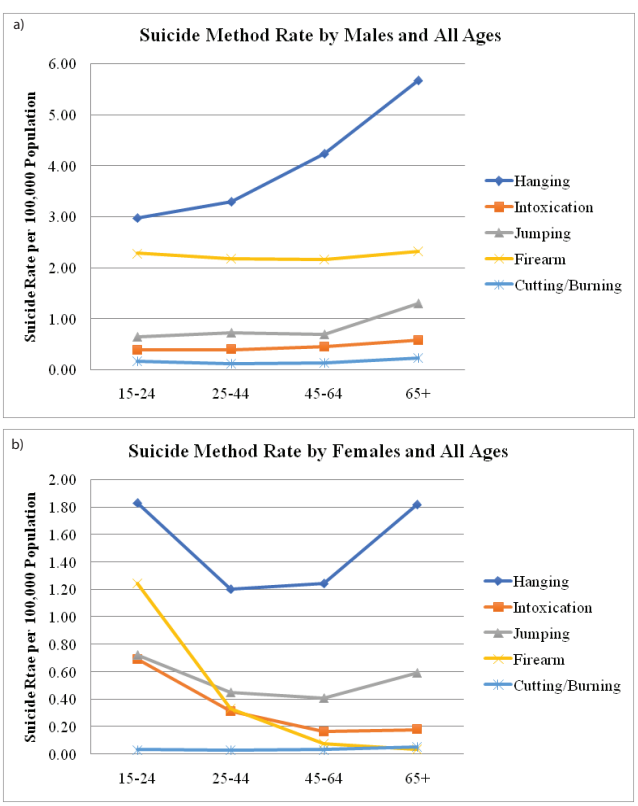

Figure 3: Suicide Method Rate by Gender among Age Groups

Figure 3 shows the suicide methods rates by gender for all age groups. Overall, hanging and firearm were the most preferred methods for males in all age groups. Hanging and jumping were used by older males' more than younger males. Except for those aged 15-24 years, hanging and jumping were the common methods among females in all age groups. Younger females

preferred hanging and firearm most, while older females used hanging and jumping most to commit suicide.

Discussion and Conclusions

The study examined the gender differences in suicide methods rates by age group. The trends in suicide methods rates by gender for age groups suggested that during the nine year period, the most preferred suicide methods were hanging and firearm among males in all age groups and among females aged 15-24 years, and hanging and jumping among females those in other all age groups. The popular trend in suicide methods increased among males were hanging, jumping, and firearm for those aged 15-24 years, cutting/burning for those aged 25-44 years, and jumping for those aged 45-64 years. Among females, the popularity of jumping for those aged 15-24 years and 25-44 years increased significantly while the popularity of suicide methods including cutting/burning for those aged 15-24 years and firearm for those aged 25-44 years significantly decreased over time. There was no statistically significant change in trend in other suicide methods rates for males and females in other age groups. The results confirmed the hypothesis that suicide methods including hanging, jumping, and firearm become prevalent among males while hanging and jumping become popular among females over time. These findings are consistent with previous research, which found that in the age group of 20-29 years in South Korea, the proportion of hanging increased steadily for both genders, while the proportion of poisonings decreased for both genders [44]. In addition, the results of the dependent sample t-test showed that except for intoxication among those aged 15-24 years and 25-44 years, there was a statistically significant difference between males and females among all age groups. The suicide method rates for males were higher than that for females in all age groups except for intoxication and jumping for those aged 15-24 years. The male-to-female ratio suggested that the largest difference between males and females was observed with cutting/burning and firearm respectively among those aged 15-24 years, and with firearm and cutting/burning respectively among those in other age groups. Compared to other age groups, the most preferred methods were hanging and jumping for older males and hanging for older females, firearm for younger males, and hanging, firearm, jumping, and intoxication respectively for younger females. The results confirmed the second hypothesis that compared to females, males use suicide methods including hanging, firearm, and jumping significantly more than females in all age groups. These findings are consistent with previous studies conducted in Austria [43], South Korea, Japan, and Australia; however, the findings are inconsistent with a study conducted in the United States [44]. Overall, the results suggest that specific suicide methods are popular for specific gender in specific age groups because opportunity is a key factor to determine the choice of suicide method [34], which depends on availability and accessibility of the suicide method, and technical ability of the user [1]. Hanging was used mostly by both genders in all age groups because males and females may hang them easily, and can access any means for hanging. However, the second common suicide method is firearm among males and jumping among females in all age groups because males are more likely to have easier access to firearm and skills to use it compared to females in Turkey. Jumping does not require any skills. In addition, compared to females, males tend to choose more brutal methods such as firearm, cutting/burning because they have strong intentionality and higher impulsivity of suicidal acts [26].

The findings of the current study have important policy implications. The lethality of the chosen suicide method is the key factor in predicting the outcome of suicidal acts [31,16]. This knowledge about lethality can be used to reduce opportunities for suicidal acts and thereby help decrease the suicide rate [52-55]. For example, stricter gun-control policies, particularly for young people, may lower suicide rates by firearm [56-58]. Suicide by jumping may be decreased by installing fences on high buildings and bridges [59-62] and along railroad tracks and roads where suicides often occur [63]. Suicide by hanging may be reduced by removing opportunities, such as hooks, from homes [64].

The current study, however, has some limitations. The data were agency data, which may contain errors. In addition, the data may have underestimated the number of suicide cases because suicides often go underreported. The study also did not focus on the factors that may affect the use of a particular suicide method.

Future studies should examine suicide methods by causes of suicide and causes of suicide among gender and age group to understand other aspects of suicide. In addition, an international comparative study on suicide methods by gender and age group should be conducted. Finally, future studies should consider additional factors that may affect the choice of suicide methods.

To conclude, there are gender differences in suicide methods by age groups and trends in gender specific suicide methods by age groups vary over time.

References

1. Crosby AE, Ortega L, Melanson C (2011) Self-directed Violence Surveillance: Uniform Definitions and Recommended Data Elements. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Georgia.
2. Shneidman E (1977) Definition of suicide. Rowman & Littlefield Publishers, University of California at Los Angeles, USA.
3. World Health Organization (2018) Suicide fact sheet.
4. Global Health Observatory (GHO) data (2015) Suicide rates. World Health Organization.
5. Global Health Observatory data repository (2017) Suicide rates, crude Data by WHO region. World Health Organization.
6. Turkish Statistical Institute (2017) Duties and authorities. Turkey.

7. Bertolote JM, Fleischmann A (2002) A global perspective in the epidemiology of suicide. Suicidologi 7: 6-8.

8. Centers for Disease Control and Prevention (2016) Fatal Injury Reports, National, Regional and State, 1981-2016. Web-based injury statistics query and reporting system (WISQARS).

9. Cibis A, Mergl R, Bramesfeld A, Althaus D, Niklewski G, et al. (2012) Preference of lethal methods is not the only cause for higher suicide rates in males. J Affect Disord 136: 9-16.

10. DeJong TM, Overholser JC, Stockmeier CA (2010) Apples to oranges?: A direct comparison between suicide attempters and suicide completers. J Affect Disord 124: 90-97.

11. Durkheim E (1897) Suicide: A study in sociology. The Free Press, New York.

12. Giner L, Blasco-Fontecilla H, Mercedes Perez-Rodriguez M, Garcia-Nieto R, Giner J, et al. (2013) Personality disorders and health problems distinguish suicide attempters from completers in a direct comparison. J Affect Disord 151: 474-483.

13. Joo SH, Wang SM, Kim TW, Seo HJ, Jeong JH, et al. (2016) Factors associated with suicide completion: A comparison between suicide attempters and completers. Asia Pac Psychiatry 8: 80-86.

14. Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R (2002) World report on violence and health. World Health Organization, Switzerland.

15. Oner S, Yenilmez C, Ayranci U, Gunay Y, Ozdamar K (2007) Sexual differences in the completed suicides in Turkey. Eur Psychiatry 22: 223-228.

16. Uribe IP, Blasco-Fontecilla H, Garcia-Pares G, Batalla MG, Capdevila ML, et al. (2013) Attempted and completed suicide: Not what we expected? J Affect Disord 150: 840-846.

17. Suicide Awareness Voices of Education (2013) Suicide facts.

18. Baker SP, Hu G, Wilcox HC, Baker TD (2013) Increase in suicide by hanging/suffocation in the U.S., 2000-2010. Am J Prev Med 44: 146-149.

19. Curtin SC, Warner M, Hedegaard H (2016) Suicide rates for females and males by race and ethnicity: United States, 1999 and 2014. Centers for Disease Control and Prevention, Georgia, USA.

20. Hyman J, Ireland R, Frost L, Cottrell L (2012) Suicide incidence and risk factors in an active duty US military population. Am J Public Health 102: S138-S146.

21. Segal DL, Needham TN (2007) An exploration of gender differences on the reasons for living inventory among older adults. Death Stud 31: 573-581.

22. Shah A (2007) The relationship between suicide rates and age: an analysis of multinational data from the World Health Organization. Int Psychogeriatr 19: 1141-1152.

23. Suicide Prevention Resource Center (2017) Suicide by age.

24. Suicide Prevention, Awareness, and Support (2005) US suicide Statistics.

25. Ajdacic-Gross V, Weiss MG, Ring M, Hepp U, Bopp M, et al. (2008) Methods of suicide: International suicide patterns derived from the WHO mortality database. Bulletin of the World Health Organization 86: 726-732.

26. Mergl R, Koburger N, Heinrichs K, Székely A, Toth MD, et al. (2015) What are reasons for the large Gender Differences in the Lethality of Suicidal Acts? An Epidemiological Analysis in four European Countries. PLoS One 10: e0129062.

27. Shojaei A, Moradi S, Alaeddini F, Khodadoost M, Barzegar A, et al. (2014) Association between suicide method, and gender, age, and education level in Iran over 2006-2010. Asia Pac Psychiatry 6: 18-22.

28. Varnik A, Kolves K, van der Feltz-Cornelis CM, Marusic A, Oskarsson H, et al. (2008) Suicide methods in Europe: a gender-specific analysis of countries participating in the "European Alliance Against Depression." J Epidemiol Community Health 62: 545-551.

29. Beautrais AL (2003) Suicide and serious suicide attempts in youth: A multiple-group comparison study. Am J Psychiatry 160: 1093-1099.

30. Card JJ (1974) Lethality of suicidal methods and suicide risk: Two distinct concepts. OMEGA-J Death Dying 5: 37-45.

31. Hawton K (2007) Restricting access to methods of suicide: Rationale and evaluation of this approach to suicide prevention. Crisis 28: 4-9.

32. Spicer RS, Miller TR (2000) Suicide acts in 8 states: Incidence and case fatality rates by demographics and method. Am J Public Health 90: 1885-1891.

33. Vyrostek SB, Annest JL, Ryan GW (2004) Surveillance for fatal and nonfatal injuries: United States, 2001. MMWR Surveill Summ 53: 1-57.

34. Clarke RV, Eck JE (2005) Crime Analysis for Problem Solvers in 60 Small Steps. US Department of Justice, Office of Community Oriented Policing Services.

35. Chen YY, Park NS, Lu TH (2009) Suicide methods used by women in Korea, Sweden, Taiwan and the United States. J Formos Med Assoc 108: 452-459.

36. Callanan VJ, Davis MS (2012) Gender differences in suicide methods. Soc Psychiatry Psychiatr Epidemiol 47: 857-869.

37. Dedic G (2014) Gender differences in suicide in Serbia within the period 2006-2010. Vojnosanit Pregl 71: 265-270.

38. Snyder ML (1994) Methods of suicide used by Irish and Japanese samples: A cross-cultural study from 1964 to 1979. Psychol Rep 74: 127-130.

39. Demir M (2017) Gender differences in suicide methods in Turkey. Forensic Res Criminol Int J 4: 001334.

40. Navaneelan T (2017) Suicide rates: An overview. In: Health at a Glance, Statistics Canada.

41. Katz B (2016) Methods of suicide in old age in Israel: Age and gender differences. Eur Psychiatry 33: S752-S753.

42. Park S, Lee HB, Lee SY, Lee GE, Ahn MH, et al. (2016) Trends in suicide methods and rates among older adults in South Korea: A comparison with Japan. Psychiatry Investig 13: 184-189.

43. Kapusta ND, Etzersdorfer E, Sonneck G (2007) Trends in suicide rates of the elderly in Austria, 1970-2004: An analysis of changes in terms of age groups, suicide methods and gender. Int J Geriatr Psychiatry 22: 438-444.

44. Hee Ahn M, Park S, Ha K, Choi SH, Hong JP (2012) Gender ratio comparisons of the suicide rates and methods in Korea, Japan, Australia, and the United States. J Affect Disord 142: 161-165.

45. Matthay EC, Galin J, Ahern J (2017) Changing patterns in rates and means of suicide in California, 2005 to 2013. Am J Public Health 107: 427-429.

46. Doğan N, Toprak D (2015) Trends in suicide mortality rates for Turkey from 1987 to 2011: A Joinpoint Regression Analysis. Arch Iran Med 18: 355-361.

47. Kreitman N (1976) The coal gas story: United Kingdom suicide rates, 1960-71. Br J Prev Soc Med 30: 86-93.

48. Turkish Statistical Institute (2015) Suicide statistics.

49. Turkish Statistical Institute (2015) Address based population registration system.

50. Anderson RN, Rosenberg HM (1998) Age standardization of death rates: Implementation of the year 2000 standard. Natl Vital Stat Rep 47: 1-16, 20.

51. De Winter JCF (2013) Using the student's t-test with extremely small sample sizes. Practical Assessment, Research & Evaluation 18: 1-12.

52. Clarke RV, Lester D (2013) Suicide: Closing the exits. Transaction Publishers, New Jersey, USA.

53. Marzuk PM, Leon AC, Tardiff K, Morgan EB, Stajic M, et al. (1992) The effect of access to lethal methods of injury on suicide rates. Arch Gen Psychiatry 49: 451-458.

54. Sarchiapone M, Mandelli L, Iosue M, Andrisano C, Roy A (2011) Controlling access to suicide means. Int J Environ Res Public Health 8: 4550-4562.

55. Winokur G, Black DW (1992) Suicide-what can be done? N Engl J Med 327: 490-491.

56. Lester D (1984) Gun control. Charles C Thomas, Illinois, USA.

57. Lester D (1993) Controlling crime facilitators: Evidence from research on homicide and suicide. Crime Prevention Studies 1: 35-54.

58. Lester D, Murrell ME (1982) The preventive effect of strict gun control laws on suicide and homicide. Suicide Life Threat Behav 12: 131-140.

59. Bennewith O, Nowers M, Gunnell D (2007) Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: Implications for prevention. Br J Psychiatry 190: 266-267.

60. O'Carroll PW, Silverman MM, Berman AL (1994) Community suicide prevention: The Effectiveness of Bridge Barriers. Suicide Life Threat Behav 24: 89-99.

61. Pelletier AR (2007) Preventing suicide by jumping: the effect of a bridge safety fence. Inj Prev 13: 57- 59.

62. Reisch T, Michel K (2005) Securing a suicide hot spot: effects of a safety net at the Bern Muenster Terrace. Suicide Life Threat Behav 35: 460-467.

63. Kerkhof A (2003) Railway suicide: who is responsible? Crisis 24: 47-48.

64. Lester D (1989) Can we prevent suicide? AMS Press, New York, USA.