Iran J Psychiatry 2023; 18: 2: 191-212

Review Article

Suicide Attempt and Suicide Death in Iran: A Systematic Review and Meta-Analysis Study

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Abstract

Objective: suicide attempts and suicide death fall within a category of psychological disorders that is under the influence of economic, social, and cultural factors. Awareness of the prevalence of this phenomenon is essential for the adoption of preventive policies. Accordingly, the current study was carried out in order to determine the prevalence of suicide attempts and suicide deaths via Meta-analysis in Iran.
Method: This study is a systematic review and meta-analysis of articles published between 2010 and 2021 to estimate the prevalence of suicide attempts and suicide deaths in Iran. Accordingly, databases including Web of Science, PubMed, Scopus, Cochrane Library, Science Direct, Google Scholar, SID, and Magiran were searched and all related articles were extracted by the statistical tests of random and fixed effects model, meta-regression, and funnel plot using the STATA software. These articles were then analyzed.
Results: A total of 20 studies were entered into the systematic review, with a total of 271,212 attempted suicides and 22,780 suicide deaths. Accordingly, the prevalence of suicide attempts in the whole population was 131.0 (CI 95%: 124.0 – 137.0) per 100,000 people (152 per 100,000 women and 128 per 100,000 men). Moreover, the prevalence of suicide death was 8.14 (CI 95% 7.8 – 8.5) per 100,000 people in the general population (5.0 per 100,000 women and 9.1 per 100,000 men).
Conclusion: According to these findings, Iran can be ranked among the countries with a low prevalence of suicide attempts and completed suicides (compared to the global average). Although the trend of completed suicides is declining, the trend of suicide attempts is increasing and has often affected young people.

Key words: *Iran; Meta-Analysis; Prevalence; Suicide Attempt; Suicide Death*

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Article Information:
Received Date: 2021/06/06, Revised Date: 2022/08/03, Accepted Date: 2022/10/08

According to the definition provided by the World Health Organization, suicide attempt is the action in which a person consciously hurts himself, without the interference of others (1). The incidence of suicide has been increasing in recent years in a way that it has raised not only national, but also global concerns (2). In the beginning of the third millennium, the Word Health Organization and the International Society for suicide prevention have named September 10th as World Suicide Prevention Day because of this alarming growth (3). Based to the report by the World Health Organization, annually, between 20 to 50 million people commit suicide, and one million of them die, and this figure is higher than the annual death from murder and war (4). The organization also estimates that there are 10 to 20 suicide attempts per every suicide, and these attempts more common among young people and women (5). The prevalence of suicide is estimated at 25 per 100,000 people in countries such as Switzerland, Germany, Japan, Austria, and Eastern Europe, which are called the suicide belt (6). The incidence rate of Completed suicide varies in different countries. The highest rate is related to Germany, Australia, Scandinavia, Japan, and Eastern Europe at 25 per 100,000 people, and the lowest to Italy, Spain, India, Egypt, and Ireland at 10 per 100,000 people (7).

Surveys have shown that in recent decades, the rate of suicide has increased in developing countries, especially in Eastern Mediterranean countries (8, 9). The latest reports announce that the rate of suicide in Iran is estimated at 6.8 percent, which is lower than the global rate and is ranked 58th among the countries around the world (10). Ilam, Hamedan, and Kermanshah provinces have the highest rates (11). Ilam province is a high-risk area, with 28.94 per 100,000 deaths occurring due to suicide (12). The highest rate of suicide in men belongs to the Hamedan province with 13.5 suicides per 100,000 people, and in women it belongs to the Ilam province with 15.5 and Kermanshah with 13.1 per 100,000 people (12). In Tehran, 20 people attempts suicide every day and almost 8 of these attempts lead to death (13-15). Suicide rate is affected by gender. It is higher among women, but most of them are unsuccessful. Men, however, have a more successful suicide rate (16). The suicide rate is relatively low in Iran; however, most cases are reported among the young population, resulting in an increase in the proportion of potentially lost years of life (17). Reasons for a suicide attempt are related to three areas: social issues, psychological issues, and physical problems (18). In the social field, we can refer to problems such as family issues, poverty, unemployment, marital status, prison history, and divorce. Also, emotional failure factors, psychological problems, education failure, drug use, and suicide history can be mentioned among the psychological issues, and in the physical field, we can refer to physical diseases, disability and incurable diseases (19). Attempting suicide imposes a lot of damage on the society due to its social, economic, and psychological consequences (20). Suicide is committed in a variety of ways around the world, including hanging, drug poising, self-immolation, and firearms (15). Based on the latest research by social science researchers, the rate of suicide in Iran has increased by 60% during the four years between 2015 to 2019 and, every year, the suicide rate increases by 15% in this country. Comparing the rate of suicide during the second 3 months of the year 2020 with its rate in the same period in the previous year reveals a significant increase in the number and changes in the nature and quality of these attempts (21).

The aim of this study was to investigate the prevalence of suicide attempts and suicide deaths in Iran between 2010 and 2021 and to determine its prevalence trend via a systematic review and meta-analysis.

Materials and Methods

This study was conducted to investigate the prevalence of attempted suicides and completed suicides from 2010 to the end of 2021, via a systematic review and meta-analysis, in Iran, which was performed according to the PRISMA checklist for systematic review and meta-analysis. Using the search method, two trained and independent researchers performed all stages of the research including selection of studies, article quality assessment, and data extraction.

Search strategy

In the initial search, all published English and Persian articles were extracted from the Web of Science, PubMed, Scopus, Science Direct, Cochrane Library, Google Scholar, SID, and Magiran databases. We searched for all the articles with the keywords suicide, completed suicide, suicide mortality, suicide death, suicide attempted, prevalence, and Iran in their title, abstract and main text, using AND and OR operators as such: Suicide OR Attempt Suicide OR Suicide Mortality OR completed Suicide OR Suicide death AND Prevalence AND Iran.

Inclusion and exclusion criteria

All published English and Persian articles on the prevalence of suicide and suicide attempt in Iran that reported the prevalence of suicide attempts and completed suicides, studied suicide in the whole population, and were of good quality were included in the study. The exclusion criteria included articles of poor quality, articles that evaluated suicide in specific population groups (people with certain illnesses such as mental illnesses), studies that did not report the prevalence of suicide attempts or completed suicides, studies that did not provide the data needed to estimate the prevalence, review studies, meta-analyses, clinical trials, and case reports or series were excluded.

Quality assessment

The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist was

used as the qualification survey for assessing the quality of the papers (22). This checklist contains 22 different parts and the score allocation for this checklist is based on the importance of each part. The least score for article qualification is 15 out of 33. In this study, a score of 20 or above was acceptable.

Screening and Data extraction

Screening of articles was done by two reviewers, independently, through reviewing the titles and abstracts of articles and considering the inclusion and exclusion criteria. Finally, the full text of the articles was independently reviewed by two reviewers. Data were extracted using a pre-prepared checklist that included the place of the study, time of the study, study population, the prevalence of suicide death, and suicide attempts.

Study selection

1683 studies were extracted by searching the databases. Initially, the articles were entered into the Endnote software. After an initial review, 284 articles were removed from the study because they were duplicates. Then, by reviewing the titles and abstracts of articles, 1186 articles were deleted due to irrelevance. After reviewing the full text of articles, 193 articles were deleted due to lack of prevalence reports. Finally, 20 articles met the inclusion criteria and entered the systematic review and meta-analysis process (Figure 1).

Statistical Analysis

In order to combine the results in heterogeneous studies, the random-effects model was used and, in homogeneous studies, the fixed effects model was used in the meta-analysis. I2 and Cochrane tests were used to investigate the heterogeneity of the data and the relationship between the year of the study and the prevalence of meta-regression. Emission bias was controlled by the Begg test and data analysis was performed using the STATA software, version 17.0.

Results

A total of 20 studies (23-42) were conducted between 2010 and 2021 in Iran and entered the meta-analysis. Among these studies, 14 were cross-sectional, five were longitudinal and one was ecological. Also, 14 studies received information related to suicidal behavior from Universities of medical sciences and Hospitals, five studies from the Iranian Legal Medicine Organization, and one study from the National Statistics Center. According to the findings of the study, 271,212 people had attempted suicide between 2010 and 2021, 22,780 of whom ended in a suicide death. The characteristic of the reviewed articles is presented in Table 1.

Prevalence of Suicide Attempts

In a meta-analysis of 125 studies, the prevalence rate of suicide attempts was extracted which was estimated at 131 per 100,000 people (CI95%: 124-137) in the general population (Table 2). Moreover, the prevalence of attempted suicide per 100,000 people was 152 (CI95%: 144-160) in women and 128 (CI95%: 122-135) in men (Figures 2 and 3). According to the findings of studies conducted on suicide attempts in the provinces of Iran, the highest and lowest prevalence rates of suicide attempts in the total population were related to Ilam (2012), with 276 attempts per 100,000 people, and Tehran (2012), with 11.4 attempts per 100,000 people (30, 39). Also, the highest and lowest prevalence rates of suicide attempts in men were related to Malekan city (2016), with 302.9 attempts per 100,000 people, and Larestan and Gerash cities (2012), with 37.3 attempts per 100,000 people, respectively (23, 38), and in women, the highest and lowest rates are related to the Ilam city (2012), with 272.2 attempts, and Larestan and Gerash cities (2012), with 62.91 attempts per 100,000 people (Table 1) (30, 38). Regarding the proportion of suicide attempts based on age, the highest proportion of attempted suicide belonged to the age group of 15-24 years (50%) and then to the age group of 25-34 years (27.4%) (Table 3).

Prevalence of completed Suicides

Analyzing the 170 prevalence rates of completed suicide, reported in eligible studies, through meta-analysis, revealed that the rate of completed suicide was 8.14 in the general population (CI95%: 7.8-8.5), 5.0 among women (CI95%: 4.0-6.0) and 9.0 among men (CI95%: 8.0-9.0) per 100,000 people (Table 2). Based on the findings of studies conducted on completed suicides in different provinces of Iran, the highest prevalence of completed suicide in the general population was related to Gonabad and Bajestan (2011), with 130.0 cases, and the lowest to Tehran (2010), with 0.2 cases per 100,000 people (29, 39). Moreover, after examining the prevalence of completed suicides by gender, it was found that the highest rate in men belonged to Ilam (2011) with 24.0 and the lowest rate belonged to Larestan and Gerash (2012) with 1.46 cases per 100,000 people (30, 38) (33, 39) and, in women, the highest rate belonged to Ilam (2014) with estimated 16.2 cases and the lowest rate belonged to Sirjan (2018) with 0.6 cases per 100,000 people (24, 30) (Table 1). The highest proportion of suicide deaths occurred in the age group of 15-24 years (41.6%) and then in the age group of 25-34 years (22.8%) (Table 3).

Meta-regression was used to investigate the relationship between the year of the study and the prevalence of suicide attempts. Meta-regression based on the gradient of the chart showed an increased prevalence of suicide attempts with the increase in the year of the study, but it was not statistically significant (P = 0.62). It is noteworthy that according to the meta-regression diagram, most of the studies were conducted from 2010 to 2012 (Figure 4). The symmetry of the diagram in the funnel plot indicated no publication bias (Figure 5). Also, publication bias was not statistically significant based on the Egger test (P = 0.12).

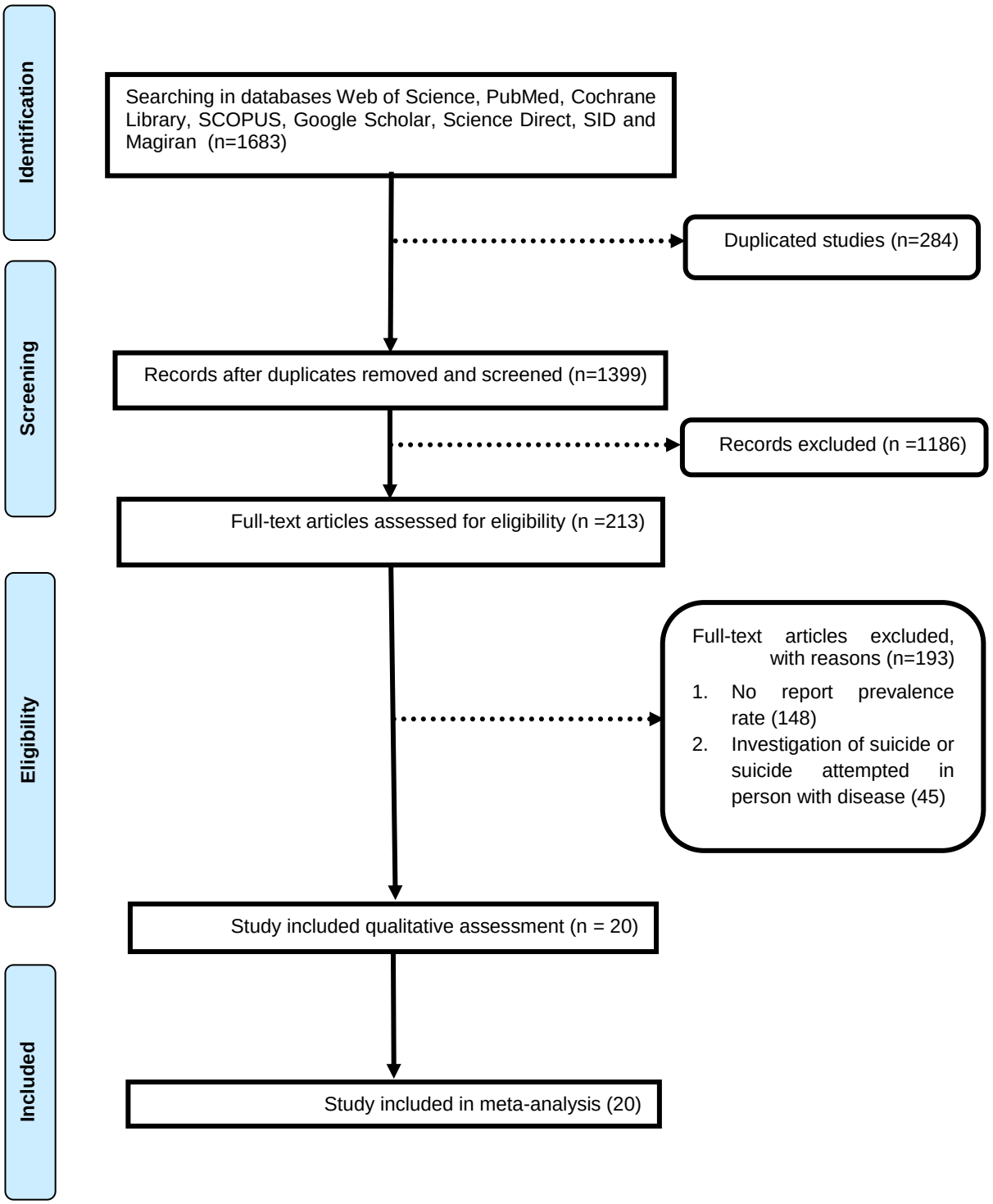

Figure 1. Results of PRISMA Flow of the Literature Review Search

Table 1. General Characteristics of the Studied Articles

Author	Place of study	Publication year	Year of study	Type of study	Age (year)	Sample Size	Prevalence per 100,000 persons						Quality Score
							Attempted suicide			Suicide death			
							total	men	women	total	men	women	
			2014			110,521				10.28	19.84	5.81	
			2015			110,738	185.0	246.9	136.9	7.34	14.16	3.80	
Fakhari A (23)	Malekan	2021	2016	longitudinal	10-80	110,914	226.0	302.9	166.0	5.41	10.43	3.73	26 (Moderate)
			2017			111,121	169.0	217.9	130.7	4.46	8.60	1.85	
			2018			111,319	157.0	209.6	116.2	1.75	3.38	1.83	
Balvardi M (24)	Sirjan	2021	2018	Cross-Sectional	10-67	648,373	118.4	120.6	116.3	1.56	3.08	0.60	26 (Moderate)
			2011			4,067,398	86.3						
			2012			4,117,419	88.9						
			2013			4,167,631	121.8						
Mirahmadizadeh A (25)	Fars	2020	2014	Cross-Sectional	10-98	4,218,451	114.70						31 (High)
			2015			4,270,231	114.60						
			2016			4,322,131	134.50						
			2016			4,322,131							
			2012			557,599							
			2013			559,996							
Mohamadian F (26)	Ilam	2019	2014	longitudinal	10-80	562,403							31 (High)
			2015			564,821							
			2016			567,249							

Hassanipour S (27)	NajafAbad	2019	2012	Cross-Sectional	10-80	318,158	130.20	93.0	169.7	4.56	3.79	5.36	28 (High)
			2013			318,826	175.50	123.9	230.3	4.45	7.40	1.31	
			2014			319,121	114.40	74.8	156.2	5.24	5.39	5.08	
			2015			319,731	97.10	65.7	130.0	6.91	12.32	1.23	
			2016			320,288	156.50	105.1	209.0	6.04	9.38	2.58	
Ebrahimi Kebria S (28)	Lorestan	2019	2015	longitudinal	5-80	1,737,677				11.97	13.13	10.23	28 (High)
Alami A (29)	Gonabad and Bajestan	2019	2010	historical cohort	13-84	85,358				122.30			28 (High)
			2011			102,207				130.04			
			2012			103,716				98.22			
			2013			104,664				110.01			
			2014			105,534				104.13			
Veisani Y(34)	Ilam	2018	2011	Cross-Sectional	10-80	551,880	199.50	177.9	221.1	20.10	24.00	16.20	33 (High)
			2012			560,335	251.10	232.0	272.2	16.10	18.10	14.20	
			2013			563,998	221.10	199.1	243.1	14.90	18.60	11.20	
			2014			569,262	197.80	168.0	227.6	18.10	20.50	15.70	
			2015			577,299	204.40	201.1	207.7	14.20	16.10	12.70	
			2016			582,334	158.50	172.2	144.9	11.10	14.90	7.30	
Rostami CH (72)	Khuzestan	2017	2011	Cross-Sectional	10-80	3,084,800	60.64	40.3	88.6	2.78	2.51	3.15	31 (High)
			2012			3,123,200	109.08	82.4	136.2	3.26	3.76	2.75	
			2013			3,161,600	73.66	46.6	73.7	3.08	3.02	2.95	
			2014			3,200,000	167.50	137.1	198.5	6.18			
Khadem Rezaiyan M (32)	Khorasan Razavi	2017	2015	Cross-Sectional	5-80	4,199,588	97.20						28 (High)

Nazari Kangavari H (33)	Ilam	2017	2010-2016	Cross-Sectional	5-114	564,705			31 (High)
	Kermanshah		2010-2016			1,948,520			
	Kohgiluyeh and Boyer-Ahmad		2010-2016			669,767		8.60	
	Lorestan		2010-2016			1,761,864		11.80	
Veisani Y (30)	Ilam	2016	2010	Cross-Sectional	16-85	533,623	180.00	33.90	33 (High)
			2011			557,599	212.00	16.80	
			2012			581,575	276.00	22.00	
			2013			606,582	224.00	13.50	
			2014			632,665	190.00	7.30	
Rostami M (35)	Kermanshah	2016	2013	Ecological	10-80	1,948,529		13.60	31 (High)
Poorolajal J (36)	Kermanshah	2015	2010	Cross-Sectional	10-90	1,932,058	130.20	12.40	33 (High)
			2011			1,945,227	130.40	13.80	
Kiadaliri A (37)	Ilam	2014	2010	Cross-Sectional	10-90	555,929		19.53	31 (High)
	Kermanshah		2010			1,892,100		13.74	
	Lorestan		2010			1,736,946		10.64	
	Hamedan		2010			1,700,960		9.59	
	Gilan		2010			2,428,553		6.52	
	Ardebil		2010			1,235,234		6.22	
	East Azerbaijan		2010			3,646,459		5.58	
	Zanjan		2010			973,739		5.53	
	Kohgyluyeh and Boyerahmad		2010			651,577		5.25	
	Khuzestan		2010			4,372,242		5.11	

	West Azerbaijan	2010			2,944,224		4.72	
	Kordestan	2010			1,453,503		4.69	
	Golestan	2010			1,651,708		4.49	
	Qazvin	2010			1,177,582		4.25	
	North Khorasan	2010			824,979		4.24	
	Fars	2010			4,431,684		4.16	
	Chaharmahal Bakhtiari	2010			875,207		4.00	
	Qom	2010			1,087,011		3.75	
	Mazandaran	2010			2,979,189		3.66	
	Isfahan	2010			4,680,831		3.64	
	Kerman	2010			2,799,417		3.10	
	Bushehr	2010			914,710		3.02	
	South Khorasan	2010			656,469		3.02	
	Tehran	2010			14,106,297		2.92	
	Yazd	2010			1,028,152		3.68	
	Markazi	2010			1,371,514		2.38	
	Sistan and Baluchestan	2010			2,569,107		2.23	
	Hormozgan	2010			1,481,031		2.21	
	Razavi Khorasan	2010			5,765,706		2.66	
	Semnan	2010					2.60	
Gorgi Z(38)	Larestan and Gerash	2010	Cross-Sectional	10-80	265,486	65.38	1.13	28 (high)
		2011			285,714	63.72	2.80	

			2012			297,619	50.11			
	Semnan		2010			606,982	186.70			
	Ilam		2010			555,929	206.90	17.70		
	Hamedan		2010			1,700,960	180.60	8.20		
	Isfahan		2010			4,680,831	158.20	2.30		
	North Khorasan		2010			824,979	154.80	3.10		
	Zanjan		2010			973,739	120.80	4.30		
	East Azarbaijan		2010			3,646,459	115.50	3.40		
	Kordestan		2010			1,453,503	130.90	2.80		
	South Khorasan		2010			656,469	99.00	4.00		
	Guilan		2010			2,428,553	86.50	6.20		
Hajebi A(39)	Kerman	2016	2010	Cross-Sectional	10-80	2,799,417	140.10	6.20		33 (High)
	Ardabil		2010			1,235,234	108.30	2.00		
	Yazd		2010			1,028,152	96.20	2.00		
	Fars		2010			4,431,684	82.90	3.00		
	Bushehr		2010			914,710	80.10	2.40		
	West Azarbaijan		2010			2,944,224	240.80	1.50		
	Razavi Khorasan		2010			5,765,706	56.00	1.40		
	Qazvin		2010			1,177,582	15.50	0.40		
	Markazi		2010			1,371,514	57.30	1.10		
	Charmahal Bakhtiari		2010			875,207	68.30	5.20		
	Khozestan		2010			4,372,242	62.20	2.40		

Mazandaran	2010	2,979,189	166.40	5.40
Hormozgan	2010	1,481,031	54.70	2.30
Tehran	2010	14,106,297	18.40	0.20
Golestan	2010	1,651,708	119.30	1.50
Kermanshah	2010	1,892,100	16.20	0.70
Lorestna	2010	1,736,946	61.90	2.40
Sistan and Baloochestan	2010	2,569,107	15.30	0.80
Kohkiloyeh and Boyerahmad	2010	651,577	17.80	8.40
Qom	2010	1,087,011	50.30	0.90
Semnan	2011	606,982	160.60	1.90
Ilam	2011	555,929	248.90	12.90
Hamedan	2011	1,700,960	145.60	8.10
Isfahan	2011	4,680,831	162.70	2.20
North Khorasan	2011	824,979	137.40	4.00
Zanjan	2011	973,739	128.20	4.80
East Azarbaijan	2011	3,646,459	109.50	3.00
Kordestan	2011	1,453,503	143.10	3.30
South Khorasan	2011	656,469	87.50	2.00
Guilan	2011	2,428,553	70.10	2.50
Kerman	2011	2,799,417	226.40	3.60
Ardabil	2011	1,235,234	44.10	0.30
Yazd	2011	1028,152	107.50	1.30

Fars	2011	4,431,684	140.30	4.40
Bushehr	2011	914,710	71.40	2.70
West Azarbaijan	2011	2,944,224	230.90	2.90
Razavi Khorasan	2011	5,765,706	57.60	1.50
Qazvin	2011	1,177,582	20.00	0.20
Markazi	2011	1,371,514	69.90	1.90
Charmahal Bakhtiari	2011	875,207	58.20	3.00
Khozestan	2011	4,372,242	59.30	3.10
Mazandaran	2011	2,979,189	144.40	3.00
Hormozgan	2011	1,481,031	45.40	2.30
Tehran	2011	14,106,297	51.00	0.80
Golestan	2011	1,651,708	218.30	4.20
Kermanshah	2011	1,892,100	20.60	0.40
Lorestna	2011	1,736,946	40.60	2.20
Sistan and Baloochestan	2011	2,569,107	19.90	0.60
Kohkiloyeh and Boyerahmad	2011	651,577	23.40	6.10
Qom	2011	1,087,011	118.30	2.30
Semnan	2012	606,982	139.40	0.80
Ilam	2012	555,929	.00	0.00
Hamedan	2012	1,700,960	20.60	1.00
Isfahan	2012	4,680,831	159.40	2.40

North Khorasan	2012	824,979	135.40	2.00
Zanjan	2012	973,739	155.60	3.60
East Azarbaijan	2012	3,646,459	110.90	2.80
Kordestan	2012	1,453,503	129.10	3.10
South Khorasan	2012	656,469	82.00	2.30
Guilan	2012	2,428,553	126.80	4.00
Kerman	2012	2,799,417	169.20	3.10
Ardabil	2012	1,235,234	139.80	5.80
Yazd	2012	1,028,152	26.50	0.00
Fars	2012	4,431,684	122.30	3.70
Bushehr	2012	914,710	133.40	3.80
West Azarbaijan	2012	2,944,224	271.10	2.60
Razavi Khorasan	2012	5,765,706	76.40	1.60
Qazvin	2012	1,177,582	207.10	2.30
Markazi	2012	1,371,514	129.00	2.50
Charmahal Bakhtiari	2012	875,207	135.00	3.90
Khozestan	2012	4,372,242	121.40	3.10
Mazandaran	2012	2,979,189	126.60	1.00
Hormozgan	2012	1,481,031	30.00	0.90
Tehran	2012	14,106,297	11.40	0.40
Golestan	2012	1,651,708	228.90	4.30
Kermanshah	2012	1,892,100	16.30	0.50

	Lorestna		2012			1,736,946	0.00						
	Sistan and Baloochestan		2012			2,569,107	16.90			0.40			
	Kohkiloyeh and Boyerahmad		2012			651,577	32.90			6.40			
	Qom		2012			1,087,011	146.50						
Amiri M (40)	Mazandaran	2015	2010	longitudinal	10-80	3,073,943	89.08						26 (Moderate)
			2011			3,022,849	75.05						
Kashfi M (41)	Shiraz	2016	2011	Cross-Sectional	14-86	1,460,665	37.31			7.5	19.84	5.81	28 (High)
Nazarzadeh M (42)	Ilam	2016	2012	Cross-Sectional	10-80	557,599		246.9	136.9	10.28	14.16	3.80	28 (High)

Table 2. Prevalence Rate of Suicide Attempts and Suicide Deaths in Iran based on Random Effect Meta-Analysis

Variable	N*	n**	Prevalence# (CI95%)
Total attempted suicides	125	271,214	131.0 (124.0-137.0)
Suicides attempted in women	24	17,312	152 (144-160)
Suicides attempted in man	24	12,073	128 (122-135)
Total Suicide deaths	170	22,780	8.14 (7.8-8.5)
Suicide death in women	25	1,367	5.0 (4.0-6.0)
Suicide death in men	25	1,846	9.0 (8.0-9.0)

*N = number of suicide attempts and deaths in the sample, **n = sample size, # = per 1000000 people

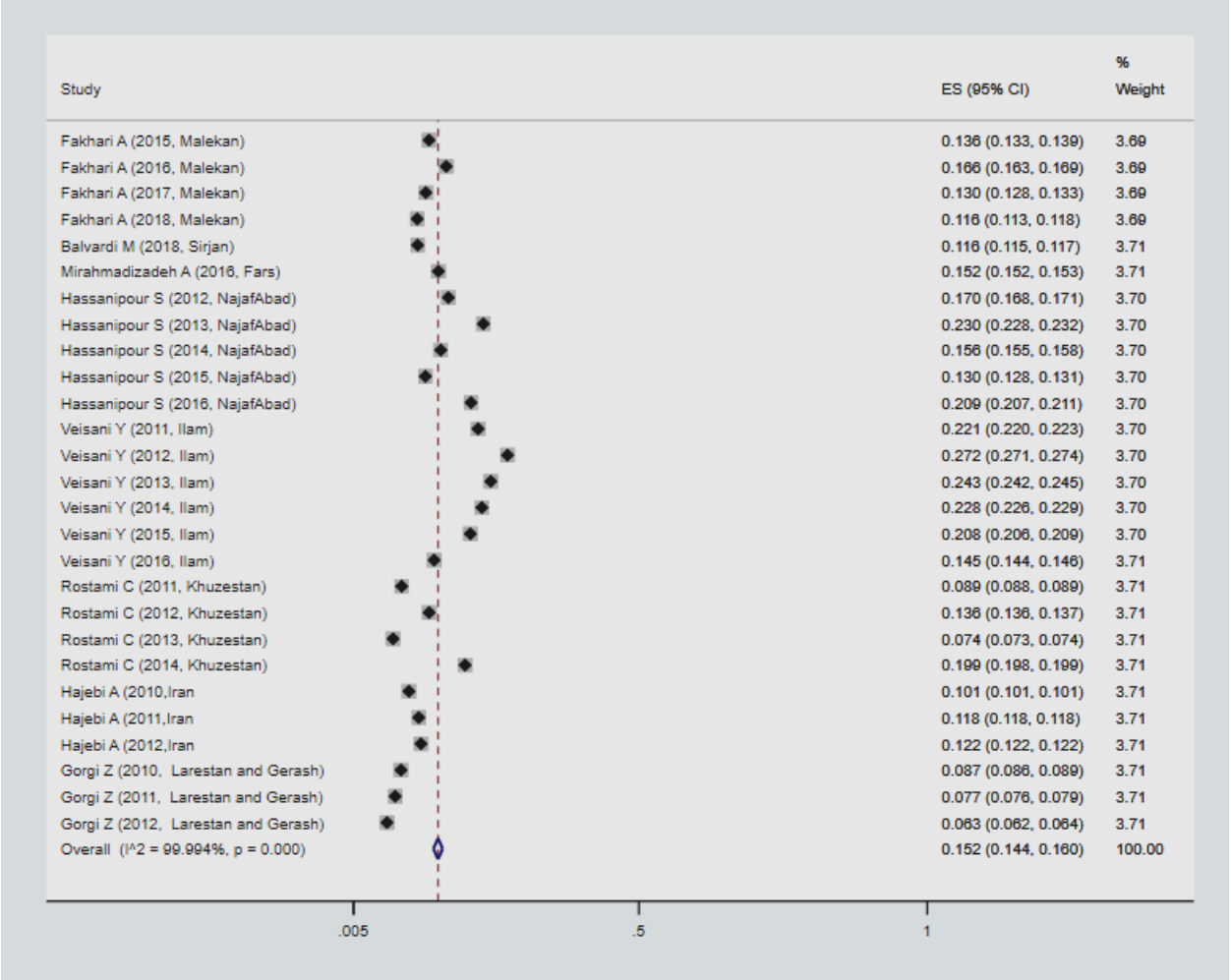

Figure 2. Forest Plots of the Prevalence of Suicide Attempts in Women's Population and 95% Confidence Interval based on a Random Effect Model in Meta-Analysis. The Midpoint of each Segment, the Segment Estimating the Prevalence Rate, and 95% Confidence Interval in each Study Are Shown. Diamond Mark of Prevalence Rate based on the Results of the Meta-Analysis is Presented.

Table 3. Suicide Attempts and Suicide Deaths in Different Age Ranges in Iran based on Random Effect Meta-Analysis

Variable	N*	n**	Proportion% (CI95%)
Suicide attempts			
Age <15	19	7,244	9.2 (8.1-10.2)
15-24	20	39,746	50 (47-53)
25-34	13	20,557	27.4 (25.5-29.7)
35-44	13	61,68	8.3 (7.7-8.9)
45-54	13	1,741	2.8 (2.2-3.2)
55-64	10	818	1.8 (1.4-2.2)
65 <	10	491	0.9 (0.7-1.1)

Suicide deaths			
Age <15	20	586	5.5 (4.3-6.6)
15-24	21	5,704	41.6 (38.8-44.4)
25-34	15	2,361	22.8 (21.2-24.5)
35-44	15	1,377	12.0 (10-14)
45-54	15	695	6.0 (7-8)
55-64	14	511	4.6 (3.8-5.4)
65 <	11	480	5.1 (4.2-6)

*N = number of suicide attempts and suicide deaths in the sample, **n = sample size

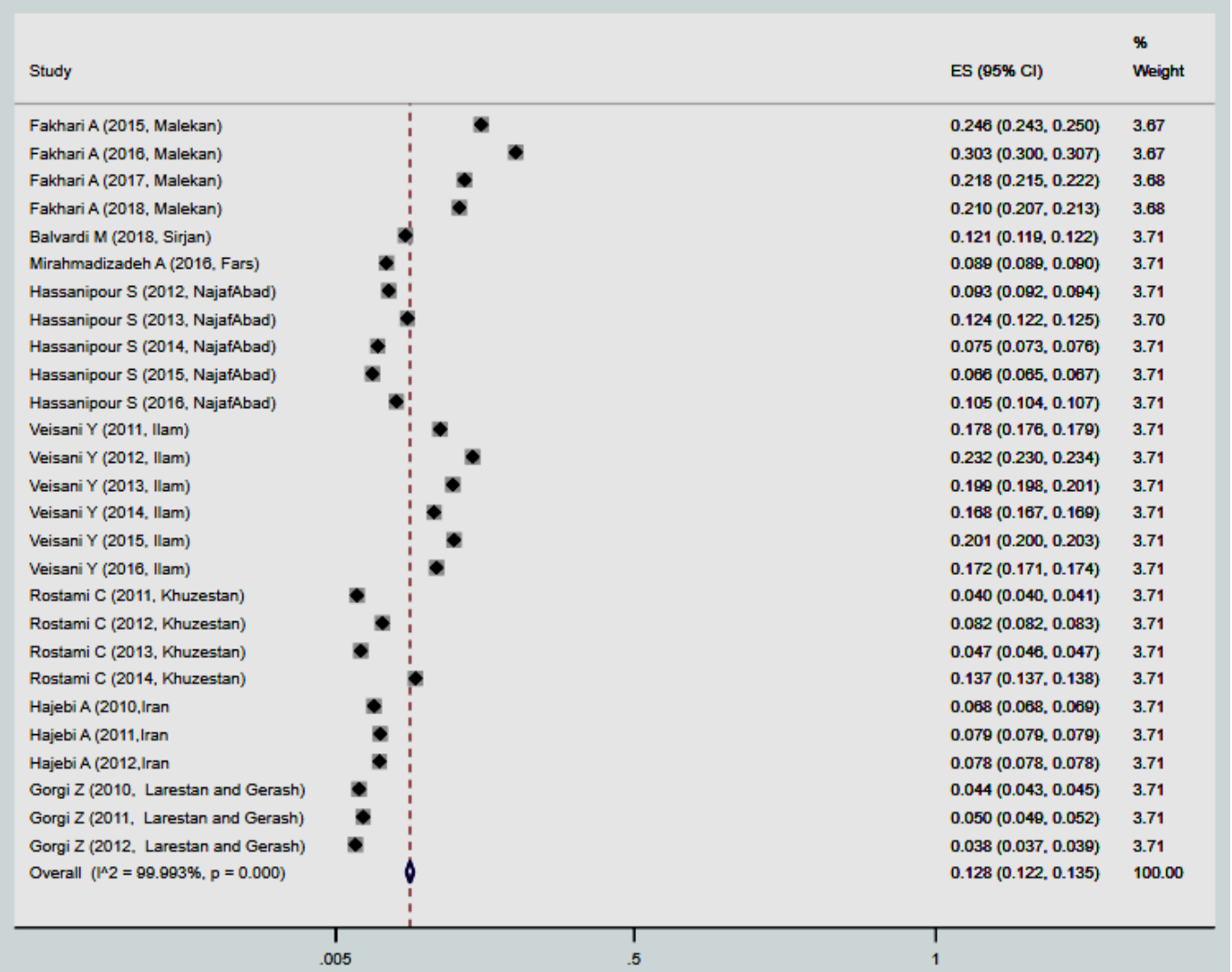

Figure 3. Forest Plots of the Prevalence of Suicide Attempts in Men's Population and 95% Confidence Interval based on a Random Effect Model in Meta-Analysis. The Midpoint of each Segment, the Segment Estimating the Prevalence Rate, and 95% Confidence Interval in each Study Are Shown. Diamond Mark of Prevalence Rate Is Presented based on the Results of the Meta-Analysis

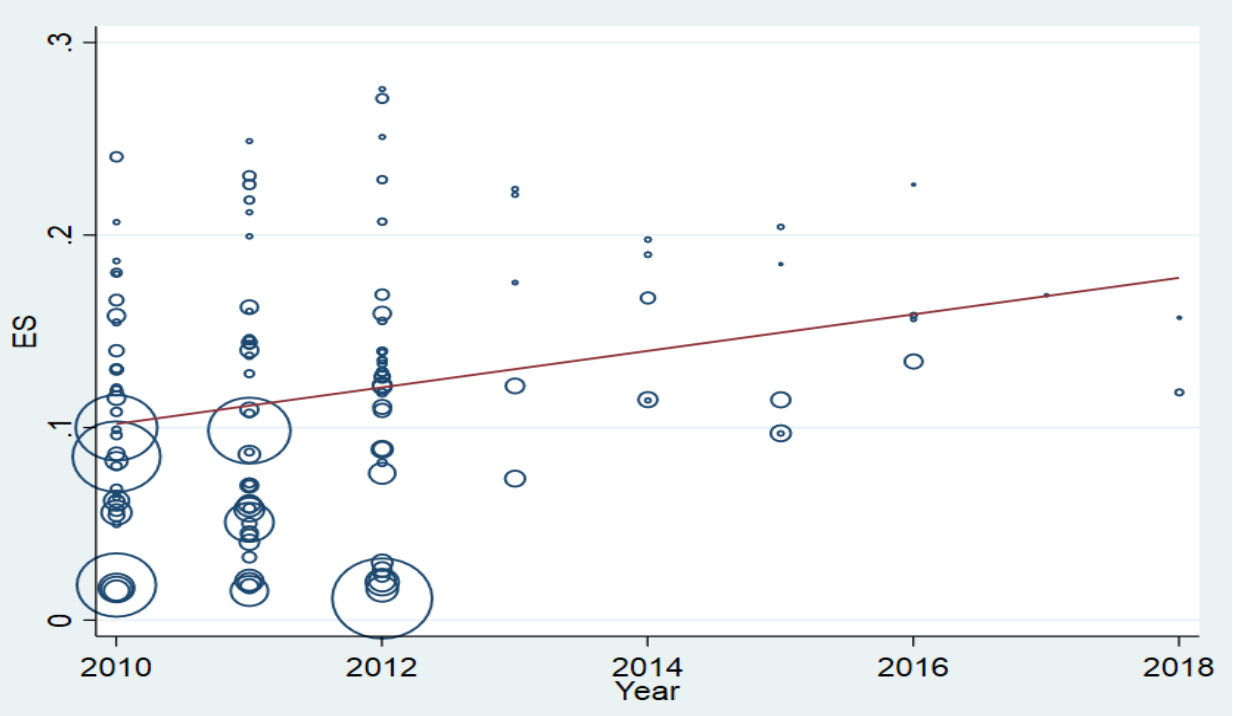

Figure 4. Meta Regression Chart of the Prevalence Rate of Suicide Attempts Based on the Study Year

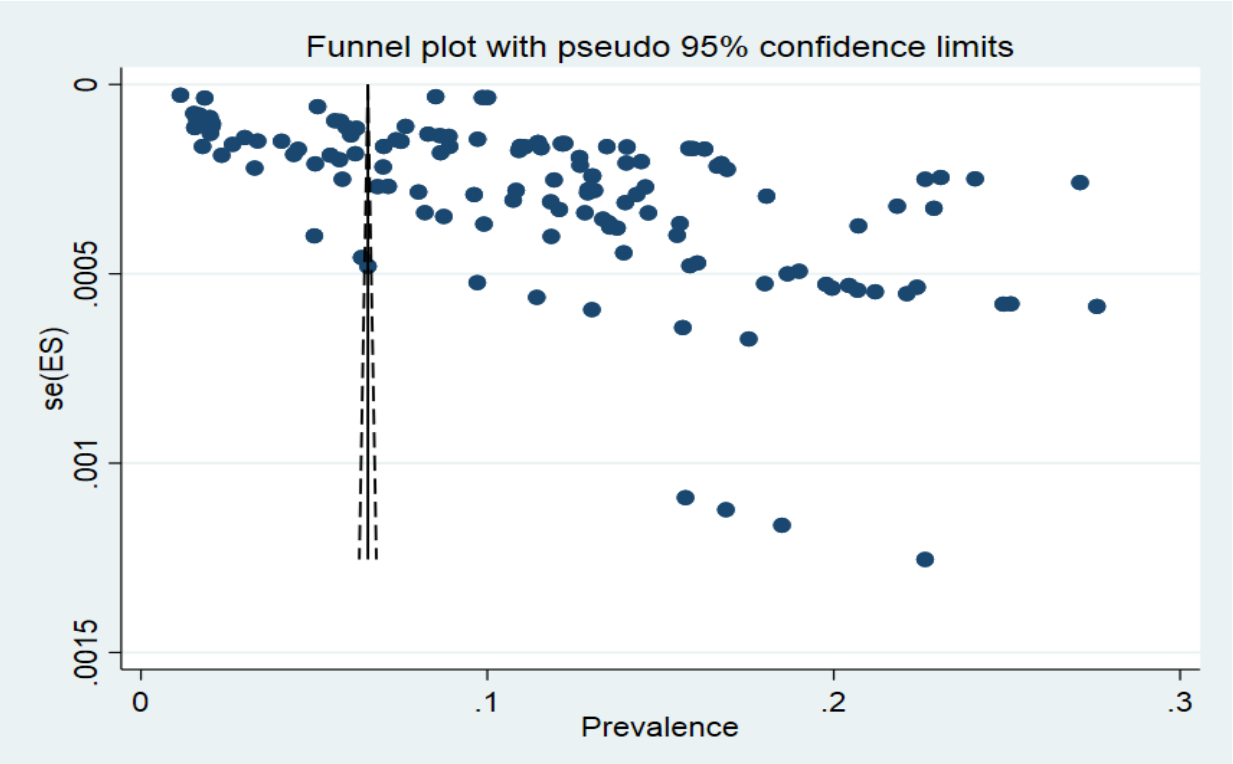

Figure 5. Funnel Chart of the Prevalence Rate in the Selected Studies

Discussion

This systematic review and meta-analysis aimed to determine the prevalence of suicide death and attempted suicide and to determine the difference in their prevalence in different genders and age groups. Accordingly, the prevalence of suicide attempts in the general population was estimated at 131 per 100,000 people. Also, it was estimated at 128 per 100,000 people in men, and at 152 per 100,000 people in women. Also, the highest proportion of suicide attempts occurred in the age group of 15 to 24 years. In the study by Borges *et al.* (2010), the prevalence of suicide attempts in the world was reported to be 300 per 100,000 people in developed countries and 400 per 100,000 people in developing countries (43). In the study by Turhan *et al.* (2011) in Turkey, the prevalence of suicide attempts in the whole population, among men and among women, were 38.14, 16.11 and 60.42 per 100,000 people, respectively (44). In the meta-analysis by Rostami *et al.*, which was performed on 33 studies between 2000 and 2010 in Iran, the prevalence of suicide attempts was estimated to be 65.91 per 100,000 individuals. According to studies, suicide attempts had a low prevalence in Iran in 2001. However, this rate increased until 2008, and then showed a decreasing trend until 2012. The prevalence of suicide attempts was 82.9 per 100,000 men and 115.79 per 100,000 women (45). In the study by Olfson et al. (2017) in the United States, 57.2% of suicide attempts belonged to women. They also found that, between 2012 and 2013, the prevalence of suicide attempts increased by 0.79% (46). In the study by Tsirigotis *et al.* (2011) in Poland, 77.5% of suicide attempts belonged to women. The most prevalent suicide methods in women were pharmacological drug abuse (46.7%) and exsanguination (29%) and the most prevalent method in men was hanging (43.77%). The methods used by women had less lethality (47).

In general, the prevalence of suicide attempts in Iran is lower than the world average; however, it has an increasing trend. Also, the prevalence of suicide attempts is higher among women and the younger age groups. According to the results of the studies, one of the main causes of suicide in developing countries is stressful social events. In Iran, the most important social causes are family, economic and educational problems. The high prevalence of suicide among women and young people is influenced by the traditional and modern values and norms of the family and society. In case of failure to make a balance between them, they may lead to conflict and violence. Women's weakness and powerlessness against the norms and traditions and their inequality to men in cases such as forced marriage, violence, social stigma, slander, divorce, sense of emptiness and powerlessness, and weakness against imposed conditions, cause women to tend to commit suicide to change the situation. Also, inappropriate living conditions, cultural and economic poverty, the feeling of powerlessness to access suitable facilities and living conditions, and the father's inattention to satisfy their needs may lead teenagers to suicide ideation and behavior. Suicide is a practice for liberation and protest against these beliefs, cultures and traditions. Among other factors affecting suicidal behavior are social issues such as poverty, unemployment, inequality, educational backwardness, and addiction, which affect young people more (48-51). Despair, lack of fear of suicide, loneliness, bad conditions, attracting the attention of others, changing the behavior of others, isolation, creating a feeling of regret in others, getting help from others, scaring others, solving problems of others, and solving mental problems as well as emotional and financial problems, hitting people around and making people feel guilty were among the factors related to committing suicide that were introduced in different studies. It is worth mentioning that the history of committing suicide and taking a momentary decision were also relevant factors, and this indicates that mental health interventions are a decisive factor in reducing suicide attempts (52). Studies have shown that repeated suicide attempts are more common in people who have a history of suicide attempts, and the health services provided after suicide attempts and the length of stay in the hospital are related to repeated suicide attempts. So, with the increase in services and duration of hospitalization and therapeutic interventions, suicide attempts were reduced. This shows that these people need to receive services and attention in this field (52). Finally, in Iran, special attention needs to be paid to suicide prevention approaches, such as support organizations for women and teenagers; improvement of economic support and poverty alleviation; and availability of mental health services and education.

In this study, the prevalence of complete suicide was estimated at 8.14 in the total population, 5.0 in women and 9.0 in men per 100,000 people. Also, according to the findings of the systematic review, the rate of completed suicide was higher among men than women. In the study by Varnik *et al.* (2012), the prevalence of completed suicide in the world population was 11.6 per 100,000 people, with the highest rate in Southeast Asia (15.6 per 100,000 populations) and the lowest rate in the Eastern Mediterranean region (5.6 per 100,000 populations). Also, this rate was 14.9 per 100,000 for men and 8.2 per 100,000 for women. Also, the highest prevalence of suicide in the world population belonged to Europe (23.1 per 100,000 people) and Southeast Asia (12.3 per 100,000 people), and the lowest rate was in the Eastern Mediterranean region (5.8 per 100,000 people) and Americas region (3.4 per 100,000 people). The ratio of males' suicide to females' suicide in the world was estimated to be 1.8, with the highest in Europe (4.0) and the lowest in Eastern Mediterranean (1.1) (53). In the study by Abbas *et al.* in Iraq, the prevalence of completed suicides in the general population, among men and among women were reported as 1.09, 1.21, and 0.9 per 100,000 people in 2015, respectively; and 1.31,

1.54, and 1.07 per 100,000 people in 2016, respectively. Also in 2015 and 2016, 55.9% and 59.4%, respectively, of completed suicides were committed by men (54). In a study by Naghavi *et al.* (2019), the worldwide prevalence of completed suicide in 2016 was 11.1 in the total population, 15.6 in men, and 7 in women per 100,000. The prevalence of completed suicide in the general population, among men and among women in East Asia was 8.7, 10.9, and 6.6, respectively, in Southeast Asia these figures were 6.9, 10.3, and 3.6; in Central Asia these were 12.5, 21.1, and 4.8; and in Central Europe these were 13, 22.6 and 4.2. Also, the prevalence of completed suicide in all regions of the world was higher in men than women and completed suicide in the abovementioned regions had a decreasing or constant trend. In this study, Turkey, Azerbaijan, and Pakistan were among the regions with a completed suicide prevalence of <5; Iran, Iraq, Armenia, and Turkmenistan were among the regions with a completed suicide prevalence of between 5-10; and Afghanistan was among the regions with a suicide prevalence of 10-15 per 100,000 people (55). In a review study by Ghoreyshi *et al.* (2005), the prevalence of suicide death in Iran was 9.4%, and in the study by Shojaei *et al.*, suicide death was reported at 4.7 per 100,000 people nationwide (56, 57). Also in the systematic review study by Farkhani *et al.* (2013) in Iran, this rate was 10.95 per 100,000 people, and in the study by Daliri *et al.* (2016), which was done as a meta-analysis, it was 8%, with a rate of 7.4% among women and 11.1 among men (58, 59). In general, compared to the results of other studies conducted in the world, the prevalence of completed suicides is lower in Iran compared to other countries, and Iran can be placed in the group of areas with a low suicide rate. Also, according to the conducted studies, there is a decrease in the prevalence of suicide in Iran, and our study also confirms this finding (30, 31). The high prevalence of suicide in men is influenced by the theory that feeling is a cultural and social thing; in such a way that cultural patterns affect the people of a society and people develop those feelings that they think they should express in the society. In the Iranian culture, men's gender roles, including being strong, having authority and power as well as the dominant gender concepts, including women's emotionality towards men, affect men's experiences and cause men to express their problems and emotions less. As a result, it affects their choice of suicide method and they choose more deadly methods for this purpose (60). According to the results of studies, men have mostly used methods of hanging and firearms for suicide, which are more lethal and lead to death in most cases. Although women also use the method of self-immolation, which is highly lethal, they often use less lethal methods, such as drug poisoning, which is mostly done hysterically in order to be noticed (61). Finally, the men and women who attempt suicide are exposed to death, and death occurs in a proportion of these people. If these cases are in younger age groups, it leads to an increase in lost years of life. Fortunately, the results of studies show a reduction in the rate of suicide death in Iran, which can be attributed to psychological interventions, social support, rapid medical interventions, as well as suicide prevention measures. But these interventions need to be strengthened to reduce the prevalence of this phenomenon to a minimum.

Based on the findings of the systematic review of studies conducted in Iran, about half of the cases of suicide attempts and suicide deaths occur in the age group of 15-24 years. In the study by Abbas *et al.* in Iraq (2018), the highest prevalence of suicide deaths per 100,000 people was in the age group of 15–19 years 3.85 cases, followed by 2.84 cases in the age group of 20–24 years and 1.99 cases in the age group of 25–29 years (54). In the global study by Varnik *et al.* (2012), the highest prevalence of suicide in men was among the age group of more than 80 year olds (60.1), then among 70-79 year olds (42.2), and then among 69-60 year olds (28.2). In women, the highest prevalence rates belonged to age groups of over 80 year olds (27.8), then to 70-79 year olds (18.7) and then to 69-60 year olds (12.4). However, in the age groups of 15-29 and 30-44 years among the 6 regions of the world (WHO classification), the highest prevalence belonged to the Southeast Asia Region and the Eastern Mediterranean region, which shows that completed suicide occurs more frequently in younger ages in these regions (53). In a review study by Radhakrishnan *et al.* in India (2012), the highest prevalence of suicide occurred in the age group of 15-29 years (38 per 100,000 population) and then in the age group of 30-44 years (34 per 100,000 population) (62). In the study by Shain *et al.* in the United States (2016), suicide was the second leading cause of death in the age group of 15-19 years (63). According to Wang *et al.* (2014), 44% of suicides in China occurred in people over 60 years of age (64). In the study by Olfson *et al.* (2017) in the United States, 49.98% of suicide attempts occurred in the age group of 21-34 years and 30.4% in the age group of 35-49 years (46).

Studies on factors related to suicidal behavior in adolescents and young people reveal various factors that may contribute to such behavior including age, gender, race and ethnicity, family and social support, life skills, family problems, history of suicide in the family, the internet, Group media, mental disorders, unfortunate life events, and drug and alcohol use (65). According to findings of studies, the prevalence rate of suicide is lower among young people and increases in middle adolescence and over the age of 15, because mood disorders and substance abuse are increasing among teenagers and young people. In terms of gender, the studies stated that the cause of suicide in teenage and young boys was a tendency to risky behaviors, alcohol abuse, violence, and the tendency to extrovert behaviors such as lack of attention, hyperactivity, and rebelliousness, and in girls, anxiety, depression, stress, and introverted feelings led to suicide. The ruling

customs of different ethnicities and races in terms of the power of choice, decision-making and freedom of action of young people affects their behavior in the field of suicide (66-68). Another factor related to suicide in young people is family and social support. Studies have shown that the existence of positive relationships between fathers, mothers, and children affects the behavior of young people and adolescents, and most of the young people who committed suicide described the family environment as stressful, unsupportive, quarrelsome, and emotionally cold. Weak life skills, such as weak social and problem-solving skills and self-awareness, affect suicidal behavior (66-68). A family history of suicide causes an increase in suicide attempts; the risk of suicide increases in male teenagers due to the father's suicide, and in female teenagers, it increases due to the mother's suicide. Psychological factors such as anxiety, stress, and depression; personality disorders such as irritability, impulsivity, Psychosis, and schizophrenia; and stressful events such as relationship failure, parental divorce, death of a friend, death of parents, academic failure, domestic violence, physical illness, financial problems, educational and academic stress, history of self-harm, physical abuse and sexual abuse in childhood affect the behavior of suicide in teenagers and young people (67, 69-71). In general, suicide attempts and completed suicides are more prevalent among the younger age groups in Iran. Studies in other countries also reveal that suicide attempts and deaths are more common in these ages. However, the occurrence of this phenomenon among the younger age groups leads to an increase in the number of lost years of life. Based on this, appropriate interventions should be made in different fields regarding mental, social, economic, and educational health to prevent suicide in these ages.

Limitation

Limitations of the present study included: 1- The existence of heterogeneity in studies 2- Not investigating the prevalence of suicide in all provinces 3- The low quality of some studies 4- The probability of underreporting in studies 5- Collection of information from various information sources (forensic medicine, Universities of medical sciences and hospitals).

Conclusion

According to the findings, Iran can be ranked among the countries with a low prevalence of suicide attempts and completed suicides (compared to the global average). Although the trend of completed suicide is declining, the trend of suicide attempts is increasing and has often affected young people. In general, it is necessary to make appropriate social, economic and psychological interventions and pay special attention to the youth to prevent this action in the society.

Acknowledgment

We would like to express our sincere thanks to all the researchers whose articles were used in this research and to the vice chancellor for Research and Technology of the Shahroud University of Medical Sciences who assisted us in conducting this research.

Conflict of Interest

None.

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