

Age Changes and Suicidal Activity in Iran Over the Past Decade: A Systematic Review and Meta-Analysis

OMEGA—Journal of Death and Dying

0(0) 1–26

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DOI: 10.1177/0030222820966934

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Abstract

This review study fills an important gap by aiming to determine the age changes in attempted and completed suicide in Iran during the past decade. A systematic review

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of related articles in international and Iranian databases from January 2008 to January 2020 was first conducted and relevant studies were extracted based on established criteria. Results showed that the mean age of suicide in Iran is 29.8 (range 27.7 – 31.8) years old for men and 27.4 (range 25.8 – 28.9) for women ($P < 0.0001$). The youngest and oldest populations of completed suicide belong to eastern and central regions of the country respectively. Findings imply the critical importance of increasing awareness through educational programs and public health campaigns to increase awareness and reduce suicidal behavior in Iran.

Keywords

suicide, suicidal age, systematic review, meta-analysis, Iran

Suicide is a serious public health issue globally accounting for the 13th cause of death worldwide. It was the second cause of death in the 15–29 year age group in 2016 (Hedegaard, Curtin, & Warner, 2018). According to the latest World Health Organization (WHO) statistics, the incidence of suicide is 4.1 cases per 100,000 in Iran demonstrating its' significant impact (World Health Organization, 2018a).

Various reports indicate that age is an important factor that impacts suicide (Shah, 2007; Shah et al., 2016). Some studies have shown that suicide rates in people over age 65 years are significantly higher than among young people accounting for 800,000 deaths annually (Shah et al., 2016). The WHO identified that suicide in the elderly population has high prevalence worldwide (World Health Organization, 2018b) with estimates for men and women over 75 years old 37.50 and 15.37 per 100,000, respectively (World Health Organization, 2019). Several factors including mental and physical disorders, functional disorders, and stressful life events contribute to these differences in suicide rates (Canetto, 2017). However, researchers report that the risk for suicidal attempts in the 21 to 34 year old age group, are more prevalent than those over the age of 65 years (Castellví et al., 2017; Olfson et al., 2017). Some related factors can collaborate in increasing the rate of suicide in these population including major depressive disorder [MDD], gender differences (Goldston et al., 2009; Miranda-Mendizabal et al., 2019). Also a study in Taiwan identified that single motherhood, lower paternal educational level and higher birth order were independently associated with increased risk of suicide in young adults (Chen et al., 2013).

To date, there have been important studies that have evaluated the prevalence of suicide in Iran (Daliri et al., 2017, 2018; Hassanian-Moghaddam & Zamani, 2017; MosaFarkhany et al., 2013; Rostami et al., 2016). However, age changes in Iranian suicide rates have not been evaluated according to the databases available over the past decade. However, other associated factors with

attempted or completed suicide rates that have been identified such as marital problems, economic constraints, and sex differences during these years suggest the importance of evaluating age changes over time (Kiadaliri et al., 2014; Nazarzadeh et al., 2013). Given the implications associated with age-related differences associated with mental health issues that may contribute to attempted or completed suicide, ongoing studies are needed to assess suicide rate changes in Iran. This information can be used to target resources and for public health prevention campaigns. Therefore, this review fills an important gap by aiming to determine changes in age associated with attempted or completed suicide in Iran during the past decade.

Methods

The purpose of the systematic review and meta-analysis was to determine age and changes in incidence of attempted or completed suicide in Iran by reviewing and analyzing the studies completed across the past decade (2009–2019).

Search Strategy and Studies Criteria

Utilizing PRISMA guidelines (Liberati et al., 2009), a systematic review was conducted in international databases (including Embase, PubMed, SCOPUS, Web of Science, and ProQuest) and Iranian databases (i.e. Scientific Information Database (SID), and Magiran) from January 2008 to January 2020. Barakatks, an Iranian database, was not used in the search due to access limitations. Mesh keywords including “suicide”, “self-poisoning”, “self-immolation”, “Iran” were searched using OR and AND operators in the international databases (based on search strategy defined in Table 1). All the extracted articles from the preliminary search are listed in Online Appendix 1.

Piloting of the Study Selection Process

Relevant articles were stored in the separate folders from each database. Published studies from dissertations, books, conference abstracts, qualitative and review articles were excluded. Any duplicate studies were also removed. Then, titles and abstracts of collected articles were independently reviewed by two researchers in accordance with the inclusion criteria. Studies that were not available in full text were obtained through correspondence with the author [Aghazadeh-Attari et al. (2019) was excluded due to lack of access to the full text/no author response]. Finally full texts were screened in accordance with inclusion criteria.

4 **Table 1.** Database Search Stages.

Databases	Search strategy	Preliminary searches	Piloting of the study selection process	Formal screening of search results against eligibility criteria
Embase	suicide OR self-immolation OR self-poisoning, AND ("iran"/exp OR iran) Filter: #1 AND ('cohort analysis'/de OR 'cross-sectional study'/de OR 'observational study'/de OR 'prospective study'/de OR 'trend study'/de) AND (2008:py OR 2009:py OR 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py) AND 'article'/it (suicide OR self-immolation OR self-poisoning) AND Iran Filter: #1 AND (Source type [Scholarly Journals] OR Document type [Article]) AND 'date: From 2008 to 2019'	142	8	2
ProQuest	(((((suicide) OR self-immolation) OR self-poisoning) AND Iran) AND ("2008"[Date - Publication] ; "2019"[Date - Publication]) Filter: #1 NOT (review OR clinical trial types)	2400	56	19
PubMed	TITLE=ABS-KEY (suicide OR self-immolation OR self-poisoning) AND (TITLE=ABS-KEY-AUTH (Iran) OR AFFILCOUNTRY (Iran)) AND (LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008)) AND (LIMIT-TO (DOCTYPE, "ar"))	530	24	3
Scopus	ALL=(suicide OR self-immolation OR self-poisoning) AND ALL=Iran Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 2008-2019. Indexes: SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH, ESCI. (suicide OR self-immolation OR self-poisoning) AND Iran Filter: #1 AND 'date: From 2008 to 2019' Filter: #1 AND 'date: From 2008 to 2019'	585	33	4
Web of Science		447	28	6
SID		393	49	12
Magiran		340	33	10

Inclusion and Exclusion Criteria

Studies that contained the following criteria were included: 1) published in Persian or English; 2) age of person attempting or completing suicide were presented as a mean and standard deviation; and 3) the rate of suicide were expressed as a percentage. Articles that were focused on suicidal ideation, suicidal desires, or suicide risk and also reported associated age in specific populations (including youth or elderly) were excluded. Also studies that used similar data were excluded.

Assessment the Quality of Studies

Two reviewers (AHG and YH) independently assessed the risk of bias of each of the included studies and discussed their assessments to achieve consensus. A score for quality, modified from the Newcastle-Ottawa scale, was used to appraise appropriateness of research design, recruitment strategy, response rate, sample representativeness, objectivity/reliability of outcome determination, power calculation provided, and appropriate statistical analyses (Modesti et al., 2016). Score disagreements were resolved by consensus and a final rating was assigned to each study. Studies that received scores under 7 on the quality assessment were subsequently removed.

Data Extraction

Information including first author, year of publication, type of study, study location, duration, population, education level of participants, suicide method, season of suicide (fall, winter, spring, summer), sample size (i.e. men and women separately), sample age (mean and SD) was extracted from each included article. For subgroup analysis based on geographic case distribution, the country of Iran was divided into four areas including: Northern, Western, Central and Eastern regions.

Meta-Analysis Procedure

Data analysis were performed using STATA software (Stata Corporation, College Station, TX, USA). Due to study heterogeneity, random effects models (Restricted maximum-likelihood) were used to combine suicide rates. I^2 index and Cochran's test were used to check the amount of heterogeneity between results. Zero percent of I^2 index indicates complete heterogeneity and larger sizes increases in homogeneity (25% low, 50% moderate, and 75% high) (Higgins et al., 2003). A drawing diagram was performed using Kernel Smoothing method, which shows the ideal linearity of the values.

Results

Quality Assessment of Studies

Figure 1 show that 56 out of 231 selected articles were included. As previously stated, the quality assessment of the studies were independently evaluated by two researchers using the Newcastle-Ottawa tool. Using these findings from the quality assessment, two articles were removed secondary to mutually agreed upon scores of less than 7. Internal agreement between the two evaluators was assessed and confirmed by an ICC test, .819 (95% CI=.691-.894) and Kappa (value=.206), $p=.006$ (see Online Appendix 2).

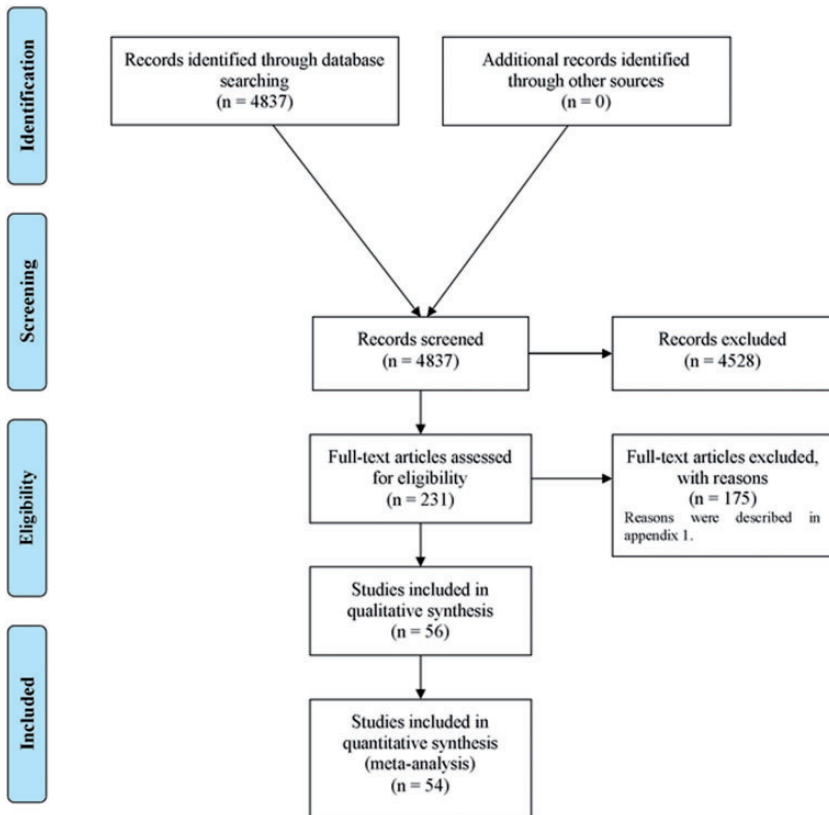


Figure 1. PRISMA Flow Diagram.

*Note. Because of four studies assessed the age of suicide in all the country, they were not included in this figure.

Features of Entered Studies

Table 2 provides information relative to the main features of the included 54 articles collected for the meta-analysis (Aghakhani et al., 2014; Ahmadi et al., 2014; Ahmadpanah et al., 2017; Alaghebandan et al., 2011; Ansari et al., 2017; Bakhsha et al., 2011; Bazayr et al., 2016; Behnampoor et al., 2017; Ghaffari et al., 2011; Ghaleiha et al., 2012; Ghanbari et al., 2016; Hashemian et al., 2017; Havassi et al., 2017; Heidari et al., 2017; Hossini et al., 2013; Izadi et al., 2018; Kashfi et al., 2016; Kashfi & Yazdankhah, 2015; Kazemi et al., 2016; Kheirabadi et al., 2012; Kordrostami et al., 2017; Mazaheri et al., 2019; Mehrpour et al., 2012; Mirahmadizadeh et al., 2019; Momeninejad et al., 2012; Moradi et al., 2012; Moradinazar et al., 2017; Najafi et al., 2014; Nazari Kangavari et al., 2017; Nazari et al., 2016; Nojomi et al., 2008; Piraei et al., 2014; Poorolajal et al., 2017; Pourazizi et al., 2014; Pourhossein et al., 2016; Rahimian Boogar, 2014; Rezaeian et al., 2012; Rezaie et al., 2011; Rostami et al., 2016; Sadeghi et al., 2015; Sayadrezai et al., 2009; Shabani et al., 2009; 2013; Shaker et al., 2017; Shakeri et al., 2014; Shakeri & Jafarizadeh, 2013; Sharif-Alhoseini et al., 2012; Shojaei et al., 2013; Shokrzadeh et al., 2016; Soltani et al., 2017; Taghaddosinejad et al., 2010; Tahery et al., 2018; Zarenezhad et al., 2015). Most of the studies were cross-sectional and retrospective and reflected a representative geographical distribution throughout Iran. The majority of the study populations had high school diploma level education or less. Only 3% of the participants had bachelor's degrees. Many individuals who attempted suicide were single, unemployed or housekeepers, and lived in rural areas. Methods used for attempting suicide varied with the majority including either self-burning and drug overdosing. Summer was the season when most attempted or completed suicides occurred, with other season occurrence more sporadic.

Meta-Analysis Report

Results showed that the overall mean age of suicide in Iran is 28.95 years old (27.03– 27.99) during the past decade ($Q = 6728.2$, $I\text{-Squared} = 99.3\%$, $P < 0.0001$). The youngest population of attempted suicides were from the province of Isfahan in the central region of the country with the mean age of 21.86 (21.6 – 22.0) years old (Ghaffari et al., 2011) while the oldest population was observed in Ilam with the mean age of 34.8 (32.4 – 37.2) years old (Bazayr et al., 2016). Based on Figure 2, the Eastern region of Iran has a lowest mean age of suicide at 24.7 (26.8 – 28.8) years old and the highest mean age of 28.3 (26.8 – 29–8) is from the central region.

In the subgroup analysis, the mean age for suicide cases for sex were pooled separately. The main limitation to the subgroup analysis was that only a few studies reported the mean age of suicide for men and women separately with most only reporting the overall age. The pooled value for age of suicide for men

Table 2. Characteristics of Studies Included in Analysis.

Authors (year)	Study type	Geographical place	Time period	Population	Education*	Suicide type*	Suicide season	Sample, n (%)	Age, mean (SD)
Ghaleiha et al. (2012)	Prospective study	Hamadan	2007–2008 (21 March–20 March)	General	High school	Self-Poisoning and drug abuse	Summer	Male: 736 (47) Female: 830 (53)	Male: 27.6 (11.53) Female: 24.83 (10.67)
Hashemian et al. (2017)	Analytical (cross sectional) study	Kermanshah	2004–2014	General	–	Hanging	Spring and summer	Male: 1,681 (60.1) Female: 1,118 (39.9)	32.36 (15.6)
Aghakhani et al. (2014)	Retrospective study	Tehran	2006–2011	General	Under-diploma	Self-immolation	Spring	Male: 132 (52.4) Female: 119 (47.20)	33 (14)
Ahmadi et al. (2014)	Retrospective study	Mazadaran and Golestan	2010–2011	Patients	Primary school	Self-burning	–	Male: 30 (29.7) Female: 71 (70.3)	31.8 (13.6)
Ahmadpanah et al. (2017)	Cross-sectional	Hamadan	2015–2016 (winter-summer)	Patients	Primary school	Self-Immolation	–	Male: 54 (68.34) Female: 25 (31.6)	29.09 (12.24)
Ghaffari et al. (2011)	Cross-sectional	Isfahan	2009–2010	Students	–	Drug abuse	–	Male: 135 (40) Female: 204 (60)	21.86 (2.03)
Ghanbari et al. (2016)	Case-crossover	Tehran	2013 (June-November)	General	Under-diploma	Alcohol abuse	–	Male: 101 (33.11) Female: 204 (66.89)	26.5 (7.3)
Heidari et al. (2017)	Cross-sectional	Kermanshah	2003–2014	General	Illiterate	Hanging	–	Male: 1196 (38.5) Female: 1507 (48.5)	Male: 33.58 (15.88) Female: 30.22 (14.76)
Izadi et al. (2018)	Observational	Iran	2006–2015	General	–	Hanging	–	Male: 24736 (70.08) Female: 10560 (29.92)	32.01 (14.88)
Kordrostami et al. (2017)	Cross-sectional analytical retrospective study	Tehran	2011–2015	General	High School Diploma	Self-Poisoning and drug abuse	Spring and autumn	Male: 462 (68.55) Female: 212 (31.45)	32.61 (13.7)
Mehrpour et al. (2012)	Retrospective	Birjand	2003–2011	General	Primary school	Self-burning (kerosene)	Summer	Male: 67 (37) Female: 114 (63)	26.97 (12.6)
Mirahmadizadeh et al. (2019)	Cross-sectional	Fars province	2011–2016	General	High School Diploma	Medication overdose	Summer	Male: 11796 (51/3) Female: 16756 (58.7)	26.8 (10.6)

(continued)

Table 2. Continued.

Authors (year)	Study type	Geographical place	Time period	Population	Education*	Suicide type*	Suicide season	Sample, n (%)	Age, mean (SD)
Moradinazar et al. (2017)	Integrated-analysis	Kermanshah	2015	General	Bachelor of science	Drug abuse	–	Male: 767 (42.8) Female: 1,023 (57.2)	Male: 24.4 (8.0) Female: 25.2 (11.0)
Najafi et al. (2014)	Cross-sectional study	Kermanshah	2010–2013	General	High School Diploma	Drug abuse	Spring and autumn	Male: 1279 (40.76) Female: 1859 (59.24)	30 (16)
Nazari Kangavari et al. (2017)	Descriptive-analytic	Ilam, Kermanshah, Lorestan, Kohgiluyeh and Boyer-Ahmad	2006–2016 (April–March)	General	–	Hanging	Summer	Male: 4259 (61) Female: 2745 (39)	32.05 (15.48)
Nojomi et al. (2008)	Cross-sectional study	Karaj	2002–2003 (July–April)	General	Under-diploma	–	–	Male: 237 (37.5) Female: 395 (62.5)	24.5 (9.05)
Sadeghi et al. (2015)	Cross-sectional study	Kermanshah	2014	Patients	High School Diploma	Self-burning	Summer	Male: 95 (38) Female: 156 (62)	29 (11.6)
Shabani et al. (2009)	Cross-sectional study	Tehran	2008–2009	Patients	Under-diploma	–	–	Male: 136 (77.5) Female: 40 (22.5)	33.6 (11.1)
Sharif-Alhoseini et al. (2012)	Cross-sectional study	Iran	2005–2008 (20 March–19 March)	General	–	–	–	Male: 55189 (47) Female: 62234 (53)	Male: 25 (11) Female: 23 (10)
Shojaei et al. (2013)	Longitudinal study	Iran	2006–2010	General	–	Hanging	Winter	Male: 11154 (70.5) Female: 4668 (29.5)	31.5 (14.6)
Taghaddosinejad et al. (2010)	Retrospective study	Tehran	2002–2007	Patients	Secondary school	Self-burning	Winter	Male: 134 (35.8) Female: 240 (64.2)	27.1 (15.4)
Alaghebandan et al. (2011)	A prospective population-based	Ilam	2005–2006	General	–	Self-burning (kerosene)	–	Male: 15 (29.41) Female: 36 (70.58)	29.8 (12.5)
Mazaheri et al. (2019)	Cross-sectional	Tehran	2017 (6 month)	Patients	High school	Drug abuse	–	Male: 67 (55.9) Female: 53 (54.1)	34.25 (10.22)

(continued)

Table 2. Continued.

Authors (year)	Study type	Geographical place	Time period	Population	Education*	Suicide type*	Suicide season	Sample, n (%)	Age, mean (SD)
Pourhossein et al. (2016)	Longitudinal prospective design	Fars	2009–2012	General	Under-diploma	Self-burning (Petroleum)	–	Male: 127 (32.6) Female: 261 (67.4)	29.3 (11.3)
Kheirabadi et al. (2012)	Cross-sectional	Isfahan	2009	General	Under-diploma	Drug abuse	–	Male: 279 (39.63) Female: 424 (60.37)	25.9 (9.7)
Momeninejad et al. (2012)	Descriptive-analytical	Yasuj	2008–2009	Patients	–	Drug abuse	–	Male: 60 (38) Female: 98 (62)	23.02 (10.69)
Pourazizi et al. (2014)	Cross-sectional	Semnan	2008–2009	General	High School Diploma	Drug abuse	Summer	Male: 449 (36.9) Female: 768 (63.1)	24.6 (8.4)
Shokrzadeh et al. (2016)	Descriptive-analytical	Gorgan	2008–2015	General	Under-diploma	Poisoning (sedative-hypnotic drugs)	Summer	Male: 198 (44.8) Female: 244 (55.2)	24.54 (8.14)
Behnamipoor et al. (2017)	comparative-descriptive-analytical	Zabol	2016	Patients	High School Diploma	Drug abuse	–	–	24.22 (4.08)
Nazari et al. (2016)	Cross-sectional	Khorramabad	2015 (March–September)	General	Elementary school	Drug abuse	–	Male: 17 (50) Female: 17 (50)	28.3 (9.73)
Rezaie et al. (2011)	Cross-sectional	Kermanshah	2006 (June–September)	Patients	Secondary school	Self-poisoning	–	Male: 67 (33.5) Female: 133 (66.5)	26.4 (9.5)
Rostami et al. (2016)	Cross-sectional	Kermanshah	2012–2013	General	Both Primary/secondary	Hanging	–	Male: 174 (65.7) Female: 91 (34.3)	31.3 (14)
Tahery et al. (2018)	Cross-sectional	Abadan	2014	Patients	High School Diploma	Drug abuse	Spring	Male: 101 (33.7) Female: 199 (66.3)	25.44 (7.50)
Ansari et al. (2017)	Cross-sectional	Rafsanjan	2006–2007	General	High School Diploma	Drug abuse	Summer	Male: 143 (53.2) Female: 126 (48.8)	22.55 (6.86)
Bazzyar et al. (2016)	Descriptive	Ilam	2011–2015	General	Illiterate	Self-burning	Spring	Male: 68 (28.8) Female: 168 (71.2)	34.85 (18.84)
Hossini et al. (2013)	Descriptive-analytical	Bojnurd	2006–2011	General	High School Diploma	Drug abuse	Spring	Male: 1052 (38.3) Female: 1696 (61.7)	23.44 (8.66)

(continued)

Table 2. Continued.

Authors (year)	Study type	Geographical place	Time period	Population	Education*	Suicide type*	Suicide season	Sample, n (%)	Age, mean (SD)
Kashfi and Yazdankhah (2015)	Descriptive-analytical	Shiraz	2006–2011	Patients	Secondary school	Self-burning	–	Male: 128 (29.3) Female: 309 (70.7)	28 (10.4)
Piraei et al. (2014)	Cross-sectional	Kohgiluyeh	2011–2012 (Sep–March)	General	Under-diploma	Drug abuse	Winter	Male: 78 (42.2) Female: 107 (57.8)	22.64 (8.41)
Pourhossein et al. (2016)	Cross-sectional	Sari	2009–2010	General	Under-diploma	Self-burning	Summer and autumn	Male: 59 (40.4) Female: 87 (59.6)	30.55 (12.65)
Rahimian Boogar (2014)	Cross-sectional	Tehran	2013 (March–Sep)	General	–	–	–	Male: 51 (33.1) Female: 103 (66.9)	28.73 (9.37)
Rezaeian et al. (2012)	Cross-sectional	Ilam	2005	General	High School	Self-immolation	Autumn	Male: 53 (60) Female: 35 (40)	29.2 (17)
Shakeri et al. (2014)	Cross-sectional	Fars	2007–2011 (April–March)	General	Primary school	Hanging	Summer	Male: 677 (72.5) Female: 257 (27.3)	29.81 (12.32)
Zarenezhad et al. (2015)	Cross-sectional	Fars	2003–2011	General	Secondary school	Self-immolation	Spring	Male: 1361 (75) Female: 454 (25)	30.37 (13.78)
Bakhsha et al. (2011)	Descriptive-analytical	Golestan	2003–2007	Patients	Under-diploma	Drug abuse	–	Male: 1896 (38.1) Female: 3081 (61.9)	22.91 (7.59)
Havassi et al. (2017)	Cross-sectional	Eyvan	2005–2011	General	High School Diploma	Drug abuse and self-immolation	Summer	Male: 395 (48.2) Female: 425 (51.8)	24.9 (9.7)
Kashfi et al. (2016)	Descriptive correlational	Shiraz	2011	Patients	–	Drug abuse	Winter	Male: 200 (36.7) Female: 345 (63.3)	25.91 (9.12)
Kazemi et al. (2016)	Retrospective study	Golestan	2013 (6 months)	General	High school	Drug abuse	Spring	Male: 689 (34.4) Female: 1312 (56.6)	24.44 (8.46)
Moradi et al. (2012)	Cross-sectional	Bahar	2007–2008 (Jan–Oct)	Patients	Secondary school	Drug abuse	–	Male: 53 (53.3) Female: 50 (46.7)	26.8 (1.13)
	Cross-sectional	Hamadan							22.54 (3.34)

(continued)

Table 2. Continued.

Authors (year)	Study type	Geographical place	Time period	Population	Education*	Suicide type*	Suicide season	Sample, n (%)	Age, mean (SD)
Poorolajal et al. (2017)			2016 (January–May)	University Students	Bachelor of science			Male: 26 (41.26) Female: 37 (58.74)	
Sayadrezai et al. (2009)	Descriptive, analytical and sectional	Ardebil	2003–2008	General	–	Drug abuse and toxin	–	Male: 24 (37.5) Female: 40 (62.5)	30.92 (15.14)
Shabani et al. (2013)	Prospective, naturalistic cohort	Tehran	2008–2011 (May–August)	Patients	High School Diploma	–	–	Male: 16 (48.5) Female: 17 (51.5)	33.4 (11)
Shaker et al. (2017)	Cross-sectional	Tehran	2007–2011	General	Under-diploma	Drug abuse	Winter	Male: 248 (51.3) Female: 235 (48.7)	28 (9.7)
Shakeri and Jafarizadeh (2013)	Cross-sectional	Fars	2007–2011	General	–	–	–	Male: 679 (72.5) Female: 255 (27.5)	29.81 (12.32)
Soltani et al. (2017)	Routine-data-based study	Tehran	2011–2016	General	–	Hanging	Summer	Male: 1338 (75.5) Female: 435 (24.5)	33.19 (13.11)

Note. *More prevalent type.

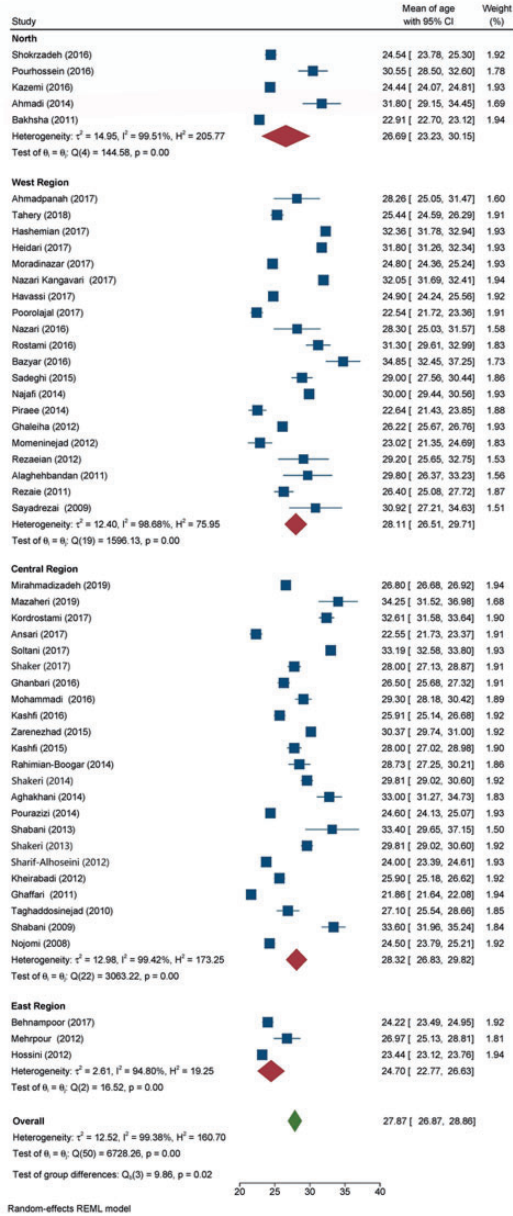


Figure 2. Age of Suicide Among Iranian Population Based on Geographical Place.

*Note. Because of some studies didn't report the mean of suicide based on sex, they were not included in this figure.

was obtained from 15 studies. The result of meta-analysis using random effects models (Restricted maximum-likelihood) in this group showed that males on average attempted or completed suicide at age 28.5 years (27.2–29.9) ($Q = 3118.1$, $I\text{-Squared} = 0.0\%$, $P < 0.0001$). Figure 3 shows that age among male cases ranged from 24.1 years old to 36.1 years.

For women, the pooled value for the mean age of suicide was also obtained from 15 studies. Due to heterogeneity we used random effects models (Restricted maximum-likelihood) for meta-analysis. The results showed that the mean age of suicide for women ranged from 22.3 years old to 32.1 years old. The pooled value was 27.4 (25.8–28.9) years old. ($Q = 829.1$, $I\text{-Squared} = 0.0\%$, $P < 0.0001$). These findings demonstrate that attempted or completed suicide among Iranian women occurred at younger ages than among Iranian men over the past decade.

Discussion

Youth is the largest population bloc in Iran. According to Mundi (2020) 87.14% of Iran's population of 84 million people are below 55 years with the median age 30.8 years. The systematic review of 15 studies showed that the pooled suicide age was a maximum of 36.1 and 30.1 years among men and women respectively. The age period between 21 and 40 years old is reported as a critical stage of life for men and women in Iran due to ongoing family and career responsibilities (Amoli et al., 2018). However, the dominant suicide age is different in various parts of Iran (Moqaddasi Amiri et al., 2015) likely due to the unique nature of problems and social tensions that are present among the various provinces.

International studies also suggest that suicidal patterns are more salient in young adult populations. For example, in the United States (U.S.) in 2017, suicide was the second leading of death among Americans between the ages of 10 to 34 years old. In China, suicide was more likely to occur in the younger population in patterns similar to what is reported in this study of the Iranian population (Sun et al., 2011). In Australia, the suicide rate of young women and men decreased significantly, but the suicide trend in the older population has increased between the period of 1964 to 2013. U.S. males are at higher risk for attempted suicide and although the rates of completed suicides among youth have decreased in recent years, the rates remain significant. Young Japanese men are also more in danger of suicide than females in a country where the rate of suicide among youth has increased (Snowdon et al., 2017). Another U.S. study that evaluated suicide rates from 2008–2017 identified that suicide attempts were increased in young adults (18–25 years old), with less consistent and weaker increases among adults ages 26 and over Twenge (Twenge et al., 2019). All of above studies identify that the risk of suicide in younger populations globally is high and that preventive strategies are needed to arrest this problem. Other global research has identified that suicide in aging populations is

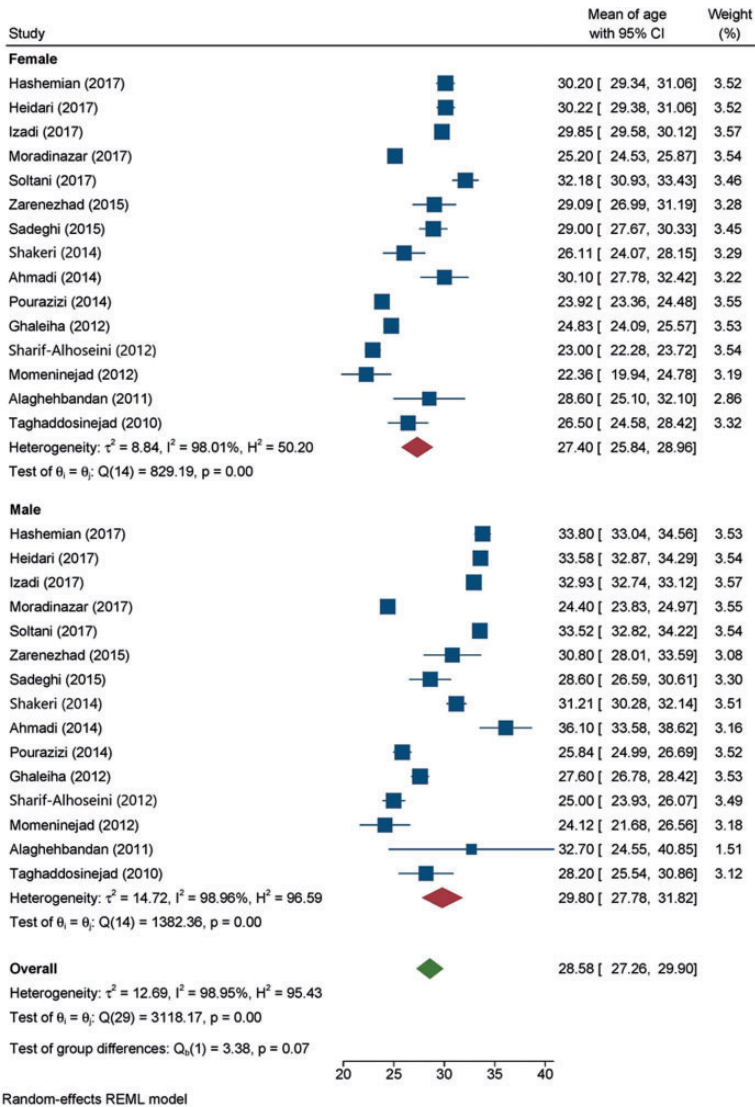


Figure 3. Age of Suicide Among Iranian Population Based on Sex.

also growing. For example, in Europe (28 countries), suicide rates in the age group older than 50 years was higher than in the younger population between the years 2011–2016 (European Statistics, 2016). Further, the mean age of suicide cases in the U.S. increased in men and women significantly between the years 2001–2017 (Centers for Disease Control & Prevention, 2018).

Suicide is a complex human behavior which is correlated with serious mental health disorders such as depression, personality disorders, bipolar depression, adjustment disorders, etc. particularly in younger populations (Moqaddasi Amiri et al., 2015). In the developing world, people are living longer with chronic life-limiting conditions and may want individual choice in regards to decisions surrounding death (Olsen et al., 2017). In this regard, suicide can also be associated with personal autonomy.

In addition to mental health issues, socioeconomic and environmental stressors are reported as external factors that affect individuals' decision to attempt and/or complete suicide (Partonen et al., 2004). For example, low economic status in synergy with local climate conditions can increase suicide attempts among some individuals (Ajdacic-Gross et al., 2003). The results of the current systematic review identified that summer was a more popular season for suicide attempts. In Iran, similar to other countries, summer is a holiday season which can also be a source of stress for low-income families. For vulnerable families with limited financial resources, the free time that children have when not in school can intensify pressures for families. Unequal access and limited participation in education and development activities not only imposes compulsory exclusion, but also contributes to isolation and boredom in youth while increasing family stressors (Stewart et al., 2018). Summer break may yield increased financial pressures, poorer mental health, and food insecurity for vulnerable families.

Findings from the current study demonstrate that Iranians who either attempted or completed suicide were more likely to have lower education levels. Education is recognized as a proxy reflecting life domains such as career achievement and quality of life (Pompili et al., 2013). Not completing a high school diploma or withdrawing from school before attaining any formal qualifications is a key factor associated with low educational attainment. Moreover, in modern Iranian society that has become increasingly driven by tight competition, the required skills in the labor market are significantly changing. A diploma level of education was enough to acquire satisfactory status in society a few decades ago but is no longer adequate to be qualified for many employment positions. Subsequently, lower education levels may coincide with unemployment or being employed in menial jobs that affect quality of life adversely. Among men who are often the sole providers in rural areas, low socioeconomic status may contribute to chronic stress that may become associated with onset of depression and even suicidal ideation. Recognizing suicide as a phenomenon that is not simply confined to personal mental health issues (Pompili et al., 2013), but also traced to adverse socio-economic status is essential.

The prevalence of suicide in rural areas of Iran that was identified in this study is consistent with Vijayakumar et al. (2008) study and World Health Organization (2008) data that has determined that living in rural areas in

developing Asian countries was a risk factor for suicide due to lack of social support, isolation and economic hardship. It is also recognized that individuals with less education and fewer financial resources may have less access to preventive mental health resources including crisis management.

Limitation and Recommendations

Given that only six databases were used in the study, the possibility exists that relevant publications were not identified. The keywords were only searched in Persian and English languages, thus carrying potential that some studies were omitted given the possibility that some articles that assess suicide in the Iranian population were published in other languages. Furthermore, given our initial review targeted article abstracts, it is plausible that attempted or completed suicide age-related information were included in the text of omitted articles. When evaluating observational studies, there is always a possibility that heterogeneity exists between studies (Modesti et al., 2016). Heterogeneity can become more problematic if a single summary measure is used (Colditz et al., 1995). Future research could include regression analysis to quantitatively assess the extent to which pooled estimates varied along with features. Language used to describe suicidal activity is also an important limitation when evaluating types of suicidal conduct (Silverman, 2006). Our study evaluated the age differences in association with attempted or completed suicide which are different phenomena even though closely related.

Implications

This study identifies many important points about factors that impact attempted or completed suicide in the Iranian population. It is recognized that public health trends can be changed and with interventions such as public awareness campaigns, rates of attempted or completed suicide can be reduced in the most affected age groups in our country (as it decreased in last years). Health personnel including interdisciplinary team members such as social workers can mobilize action such as implementing community workshops in public spaces such as schools. In areas affected by natural disasters or other crises such as economic or political, etc., it is essential that comprehensive resources are in place to holistically address and assist the population including mental health and other extrinsic support.

Conclusion

Findings from this systematic review imply that increasing awareness through educational programs and public health campaigns can be an actionable plan towards reducing attempted and completed suicide rates among Iranians.

The collaboration between educators as well as health policy experts in Iran is suggested as an important strategy to foster collective action. Further, it is essential that intervention programs aimed at prevention also consider important age-developmental differences in the creation of relevant content.

Ethics Approval

This study was obtained from a registered project (grant code: 4727) and approved by the Ethics Committee of Mazandaran University of Medical Sciences, Sari, Iran (Code: IR.MAZUMS.REC.1398.569). Also the protocol of this study was registered at PROSPERO (registration code: CRD42019136767).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Supplemental Material

Supplemental material for this article is available online.

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