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Systematic Review

The Pooled Prevalence of Attributed Factors of Suicide in Iran: A Systematic Review and Meta-analysis

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Abstract

Background: Suicide poses a critical global public health concern, and distinguishing between suicides and suicide attempts underscores the need for targeted interventions. This investigation aimed to determine the pooled prevalence of factors contributing to suicide in Iran, including socio-economic, demographic, and geographical factors.

Methods: A systematic search was conducted across Web of Science, Scopus, PubMed, SID, Magiran, Elmnet, ISC, Irandoc, and Noormags databases up to July 2023. We included primary observational studies of acceptable quality that examined the prevalence of factors contributing to suicide in Iranian regions. The findings were screened for eligibility and quality, followed by a review of selected articles, from which data were extracted and analyzed.

Results: Out of 1646 initial articles, 68 were selected for review and 54 for meta-analysis. The pooled prevalence rates of contributing factors were calculated as follows: male gender (64.3, 95% CI: 62.6–66.0%), age over 25 (57.9%, 95% CI: 51.0–64.5%), under diploma education (73.4%, 95% CI: 62.1–82.3%), employment issues (66.4%, 95% CI: 59.7–72.5%), urban living (61.7%, 95% CI: 53.8–69.1%), past medical history (8.5%, 95% CI: 4.9–14.2%), past psychiatric history (20.7%, 95% CI: 15.5–27.1%), past suicidal attempt (12.2%, 95% CI: 8.5–17.0%), substance abuse history (28.4%, 95% CI: 20.1–38.3%), spring season (29.8%, 95% CI: 26.7–33%), and hanging method (46.1%, 95% CI: 41.6–50.6%). Significant regional differences were observed in the prevalence of gender, age, and suicide methods between western and non-western areas.

Conclusion: This study describes key factors of suicides in Iran. Despite higher rates among those over 25, many young individuals are affected. Urban living and low educational attainment are significant factors. Moreover, notable regional differences were observed in gender, age, and suicide methods between western and non-western areas. These findings highlight the need for additional research related to record-keeping challenges and can guide Iranian health policymakers in developing strategies for screening and treating vulnerable individuals.

Keywords: Iran, Risk factors, Suicide

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Introduction

Suicide remains a critical public health concern with profound implications globally, ranking as the fourth leading cause of death among individuals aged 15 to 19 of both sexes. Most suicidal deaths occur in low- and middle-income countries (LMICs), according to the World Health Organization (WHO) data from 2019.[1,2] In that year, roughly 760 000 suicides were recorded, corresponding to an age-standardized mortality rate of 9.0 per 100 000 individuals for both sexes on a global scale.[3] Also, studies have revealed a concerning trend in recent decades, with an escalation in suicide rates observed in developing countries, particularly in those located in the Eastern Mediterranean region.[4,5] The WHO highlights that earlier suicide attempts and emotional difficulties, including mental health disorders, are key contributors to the risk of suicide. Other resources identify factors such as family relationships, religious faith, and social influences as significant risk elements. This risk is further compounded by a range of multifaceted drivers, including demographic settings, low socio-economic status, substance abuse, and familial issues. In other words, the complex phenomenon of suicide is shaped by extensive clinical and psychosocial contexts, making it crucial to examine suicide within the context of each country.[6-12]

Several studies suggest distinguishable characteristics between individuals who complete suicide and those who attempt it, challenging interventions that solely focus on suicide attempts.[13-18] Moreover, limited research is available on suicide groups. In Iran, this issue is particularly burdensome, with a 20-year statistical analysis revealing a mortality rate of 8.14 per 100 000 people, imposing significant costs on healthcare.[19] The haunting reality of 200 years of life lost per 100 000 individuals due to suicidal behaviors and self-inflicted violence, serves as a stark reminder of the profound impact. However, this may only represent the tip of the iceberg, as relevant statistics are underreported due to inadequacies in the registry system, ineffective surveillance, and cultural and social-induced stigma and stereotype barriers.[20,21]

Recent studies conducted by social science researchers reveal a concerning trend in Iran, where the suicide rate

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increased by 60% from 2015 to 2019, with an annual rise of 15%.[19] Moreover, a comprehensive study that employed joinpoint regression analysis on data from 2003 to 2014 uncovered demographic changes in suicide patterns, indicating a steady increase among older men and educated women throughout the decade.[22] This indicates a changing and intensifying trend of suicides over the past decade, reflecting shifts in the characteristics of the individuals involved. Underlying factors and the risk of suicide death diverge across different geographic regions of Iran, related to residents' age, gender, intellectual status, social level, and education. For instance, Ilam, a western region of Iran, exhibits the highest suicide mortality rates among both males (24 per hundred thousand individuals) and females (16.2 per hundred thousand individuals), with self-immolation and hanging being more conventional methods in the west.[19,23,24] Recognizing the considerable causes of suicide is crucial for health managers to have sufficient information for making decisions regarding effective suicide prevention strategies,[25,26] as highlighted by several previous review studies on suicide incidence and hazards in Iran.[19,27-31]

Assessing available articles revealed inconsistencies in the presentation and interpretation of reports. To our knowledge, no comprehensive systematic review and meta-analysis study has explored the factors contributing to the occurrence of suicide in Iran. Our systematic approach not only consolidates current knowledge but also aids in identifying gaps in the literature, guiding future research endeavors. Therefore, given that the prevalence of suicide in Iran is influenced by various factors, as mentioned above, we aimed to determine the pooled prevalence of factors contributing to suicide in Iran, including socio-economic, demographic, and geographical variables, with a particular focus on the high-rate western regions.

Materials and Methods

Study Design

In this study, we explore the prevalence of suicides in diverse geographical regions (west, non-west, and the entire country) through a comprehensive systematic review and pooled-prevalence meta-analysis. Our investigation incorporates various population characteristics, and we adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) recommendations to ensure the rigor and transparency of our research methodology.

Search Strategy and Data Sources

Until July 2023, an exhaustive systematic search was carried out across English-language materials related to our study aim "determining the pooled prevalence of factors contributing to suicide in Iran". In the first step, a rapid search was conducted in PubMed, Scopus, and SID to ensure that no registered systematic review fully aligned with the aim of our study. No articles were found. The next part includes a comprehensive search of English databases such as Web of Science, Scopus, and PubMed, and Google Scholar, as well as Persian databases like SID, Magiran, Elmnet, ISC, Irandoc, and Noormags. No language restrictions were applied during the search. The titles, abstracts, and keywords of articles were examined using a combination of English and Persian keywords and operators, as provided in Supplementary file 1 . The 'AND' operator was applied to link groups of words that represented distinct ideas, while the 'OR' operator was used to connect synonyms.

Study Selection

Initially, we included all acceptable-quality primary observational studies that explored the factors contributing to the occurrence of suicide in Iranian populations. After eliminating duplicates, two independent researchers (P.R. and F.A.F.) screened the titles and abstracts of the articles to determine compatibility with the specified eligibility criteria. Subsequently, the authors reviewed the full texts of the selected articles. In cases of disagreement regarding the inclusion of a study during the screening phase, the final decision was deferred to the third author (S.G).

Inclusion Criteria

The PCO components utilized in the search process were as follows: "P" (Population) denotes individuals who commit suicide, "C" (context) is Iran, and "O" (Outcome) denotes the prevalence of the suicide**.** Gray literature and guidelines were also reviewed. All of the articles were supposed to be peer-reviewed. The original studies included in this search are cross-sectional, case-control, cohort, or ecological.

Exclusion Criteria

Articles that did not provide information about the prevalence of (completed) suicide in Iranian populations were excluded. Additionally, studies lacking socio-economic, geographic, or demographic factors were also omitted. For studies where the full text was not publicly available, requests were made to the corresponding author to obtain the full article. If no response was received after two attempts, the study was not included. Furthermore, reviews and editorials were excluded.

Quality Assessment

For the comprehensive evaluation of the selected full-text studies, we employed the 22 items outlined in the STROBE checklist, focusing on study size, bias, statistical methods, and other methodological criteria. Each item was assigned one of three distinct values to quantify the article's score: '0' denoting complete absence, '2' indicating complete presence, and '1' representing partial presence or inapplicability. The final score for each study was computed by summing these values, leading to their categorization into three groups: 39–44 (good - low risk of bias and compatibility with most criteria), 33–38

(moderate - moderate risk of bias, and compatibility with some criteria), and less than 33 (poor - high risk of bias and compatibility with few described criteria).

The selection of the final full text papers included moderate and good articles, while poor-quality ones were excluded. Similar to the screening phase, two independent authors (P.R. and F.A.F.) conducted the quality assessment process in a single-step approach with the third author (S.G.) responsible for resolving any disagreements. The overall kappa score for the ratings was also calculated to be 0.857, indicating a high level of agreement.

Data Extracting

Following a thorough examination of the selected articles, two independent authors (P.R. and F.A.F.) utilized a predefined data extraction form to collect the necessary information, while any discrepancies were reviewed by the third author (S.G.). This checklist, developed in Microsoft Excel 2021, encompassed the following items: Geographical Region (west, non-west, whole country), province, first author, study duration, study type, study sample size, source of study, and the characteristics of the suicides studied, followed by the prevalence and the trend of suicides reported. The last two columns represented the quantitative and qualitative STROBE scores for each of the records.

The mentioned characteristics comprised sex, age, education, occupation, marital status, and habitat, past medical/psychological history, past suicidal attempts, method of suicide, season, and reason of suicide. In our study, the provinces of Kurdistan, Kermanshah, Ilam, Lorestan, Hamadan, Khuzestan, and West Azerbaijan were considered part of western Iran, while the remaining provinces were classified as non-western. Studies that provided information on at least one item of the mentioned characteristics, were included in the meta-analysis.

Statistical Analysis

Statistical analyses were conducted using the Comprehensive Meta-Analysis software, version 3.7 (Biostat Inc., Englewood, NJ, USA). Given the anticipated heterogeneity of true effect sizes, the random-effects model was employed. In a meta-analysis of prevalence studies, significant heterogeneity among the included studies is expected. Consequently, the I2 value may not be informative, and thus, it was omitted from this analysis.[32,33]

Subgroup and subset analyses were performed to compare regional differences in contributing factors and to assess variations within different aspects of each factor. Publication bias was evaluated using Begg's and Egger's tests; a significance level of $P<0.05$ was considered indicative of statistically significant publication bias.[34] In cases where the results of Egger's and Begg's tests were inconclusive, the trim-and-fill method was employed to identify potential missing studies.[35,36] Forest plots have been used to visually represent the pooled estimation of prevalence for each attributable factor, with the logit transformation applied to stabilize the variances of the prevalence rates before pooling.

Results

A total of 1646 initial records were identified from databases, with 1,232 duplicates subsequently removed. The screening process encompassed the evaluation of titles, abstracts, and full text in the first and second phases, resulting in the selection of 68 relevant full-text studies for eligibility assessment. Guided by the STROBE checklist, all 68 articles met the eligibility criteria and were considered suitable for inclusion in the review (see Figure 1 for details).

Methodological Quality

In terms of methodological quality, the STROBE checklist was employed to evaluate the records. Of these, 36 articles were deemed of moderate quality, while the remaining 32 were classified as good-quality studies. Consequently, all these studies were considered eligible for the final evaluations.

Description of Studies

A comprehensive summary of the final records is presented as "Extraction Table Summary" in the Supplementary file 2.[20-22,37-102] Among these studies, 18 focused on western regions, 32 on non-western regions, and 18 examined suicides across the entire country. These records investigated Iranian populations between 1990 and 2022, and the cross-sectional design was adopted by 51 of them.

Prevalence Meta-analysis

Out of the total 68 records, only 54 contained sufficient data to proceed to the meta-analysis step. The potential contributing factors for suicides, as well as suicide methods, were quantitatively evaluated in the entire study population and among different geographical subgroups in Iran. These factors included sex (male vs. female), age (with a cut-off determined at 25 years), education (under diploma vs. diploma & higher), marital status (married vs. single/divorced/others), habitat (urban vs. rural), past medical history (with vs. without), past psychiatric history (with vs. without), substance abuse history (with vs. without), past suicidal attempts (with vs. without), and seasons (spring vs. summer vs. autumn vs. winter). Additionally, we examined the three most common methods of suicide within our study population: hanging, self-immolation, and drugs/toxins/substances.

It is worth noting that due to limitations in the original data regarding the age of suicide victims, we only evaluated this factor using a cut-off age of 25. Furthermore, some of the articles share the same data source. Although all of these articles have been provided in the "Extraction Table", these duplications were considered in the pooling process of our meta-analysis.

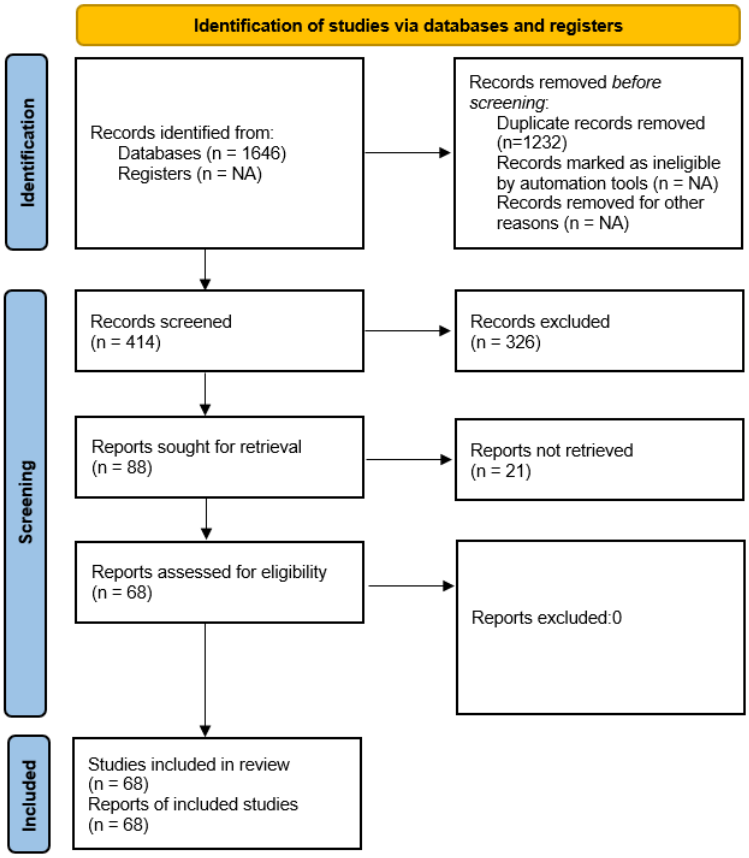


Figure 1. PRISMA-2020 Flow Diagram for the Article Screening Process

Publication Bias and Forest Plots

As detailed in the methods section, we employed Egger's and Begg's tests to evaluate publication biases in our analyses. The associated *P*-values are presented in Table 1. Except for education, age (< 25 vs. > 25), and past suicidal attempts, all the values corresponding to Egger's and Begg's tests indicate no significant publication biases. Regarding these three factors, we applied the trim-and-fill method to identify any potential missing studies; however, no probable missing studies were identified. Moreover, the forest plots visualizing the pooled estimation of the attributable factors are presented in Figure 2.

Prevalence of Potential Contributing Factors in the Entire Study Population

The prevalence of potential contributing factors in the pooled population, as presented in Table 1, reveals several notable findings. Firstly, the data indicate a significantly higher rate of suicides among men compared to women. Additionally, the majority of victims in this study were aged over 25 years. Analysis of educational levels demonstrated that a significant portion of the population had attained education below the diploma level. Marital status, however, did not show a significant association with suicides. Nevertheless, the data revealed that unemployed individuals, self-employed individuals, and housewives were more likely to commit suicide compared to other occupational groups. Notably, urbanization emerged as a contributing factor, with higher rates of suicides observed among individuals residing in urban areas. Remarkably, the analysis suggests that the majority of cases did not have any previous medical or psychiatric conditions, nor did they have a history of previous suicide attempts. Furthermore, substance abuse was not frequently reported among the cases examined. In terms of seasonal variations, the data demonstrated that suicides were more prevalent during the spring and summer months. Among the various methods studied, hanging was found to be the most common among the pooled population, followed by the use of drugs/toxins/substances, and self-immolation.

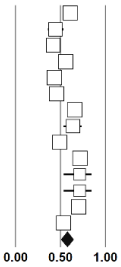
Prevalence of Potential Contributing Factors Among Regional Subgroups

The prevalence of potential contributing factors among regional subgroups in Iran (western vs. non-western vs. the whole country) is presented in Table 2. The results indicate that while men in both western and non-western provinces had significantly higher rates of suicides than women, the number of female victims in western areas exceeded that in non-western regions. Moreover, studies investigated the victims' age have shown that individuals aged over 25 in non-western areas, and under 25 in western areas, were significantly different compared to the other regional subgroups. Another noteworthy finding is related to the method of self-immolation. The results indicate that self-immolation rates in western areas

Age (>25)

First Author	Year	Event rate	Lower limit	Upper limit
Taghaddosinejad	2009	0.612	0.562	0.660
Nazarzadeh	2016	0.446	0.363	0.532
Azizpoor	2016	0.420	0.348	0.496
Hajebi	2016	0.561	0.550	0.573
Azizpoor*	2017	0.436	0.403	0.469
Rostami*	2017	0.459	0.412	0.507
Veisani*	2018	0.660	0.619	0.699
Hassanipour	2018	0.644	0.538	0.737
Rashidi	2020	0.493	0.425	0.561
Ghodsi	2020	0.719	0.716	0.723
Azizi	2021	0.719	0.542	0.847
Fakhari	2021	0.719	0.542	0.847
Farahbakhsh	2021	0.705	0.683	0.726
Veisani**	2022	0.537	0.491	0.583
		0.579	0.510	0.645

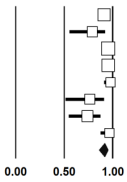
Event rate and 95% CI



No PMHx

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.911	0.853	0.948	15.14	
Poor Azizi	2014	0.789	0.554	0.919	10.81	
Hajebi	2016	0.955	0.949	0.959	17.60	
Raeisi	2017	0.953	0.925	0.971	15.65	
Hassanipour	2018	0.977	0.913	0.994	8.71	
Alami	2019	0.765	0.514	0.909	10.67	
Delam	2020	0.741	0.547	0.871	12.75	
Koohestani	2021	0.967	0.876	0.992	8.67	
		0.915	0.858	0.951		

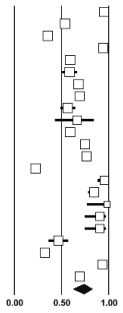
Event rate and 95% CI



Education (under diploma)

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.952	0.903	0.977	4.24	
Taghaddosinejad	2009	0.537	0.487	0.587	4.62	
Amiri	2012	0.352	0.310	0.397	4.63	
Shojaei	2013	0.944	0.940	0.948	4.65	
Zare Nejad	2015	0.592	0.569	0.615	4.65	
Nazarzadeh	2016	0.585	0.498	0.666	4.56	
Veisani	2016	0.681	0.641	0.719	4.63	
Rostami	2016	0.691	0.670	0.712	4.65	
Azizpoor	2016	0.567	0.488	0.642	4.58	
Sakhavati	2016	0.667	0.429	0.842	3.99	
Azizpoor*	2017	0.592	0.559	0.624	4.64	
Heidari	2017	0.750	0.735	0.765	4.65	
Raeisi	2017	0.767	0.719	0.809	4.61	
Kordrostami	2017	0.224	0.194	0.257	4.63	
Hassanipour	2018	0.954	0.884	0.983	3.97	
Rashidi	2020	0.846	0.784	0.892	4.53	
Delam	2020	0.982	0.770	0.999	1.98	
Azizi	2021	0.906	0.746	0.969	3.74	
Fakhari	2021	0.906	0.746	0.969	3.74	
Mojahedi	2021	0.465	0.363	0.571	4.52	
Veisani**	2022	0.326	0.284	0.371	4.63	
Forouzesh	2022	0.937	0.906	0.958	4.51	
Pouradeli	2023	0.693	0.656	0.728	4.64	
		0.734	0.621	0.823		

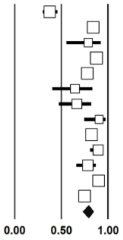
Event rate and 95% CI



No PPHx

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.377	0.302	0.458	8.83	
Amiri	2012	0.842	0.806	0.873	9.15	
Poor Azizi	2014	0.789	0.554	0.919	4.92	
Hajebi	2016	0.876	0.867	0.883	9.57	
Raeisi	2017	0.778	0.731	0.819	9.14	
Alami	2019	0.647	0.404	0.832	5.42	
Delam	2020	0.667	0.473	0.817	6.40	
Fakhari	2021	0.906	0.746	0.969	4.56	
Farahbakhsh	2021	0.823	0.804	0.840	9.50	
Mojahedi	2021	0.895	0.811	0.945	7.00	
Koohestani	2021	0.783	0.662	0.870	7.42	
Forouzesh	2022	0.900	0.864	0.927	8.77	
Pouradeli	2023	0.750	0.711	0.784	9.33	
		0.793	0.729	0.845		

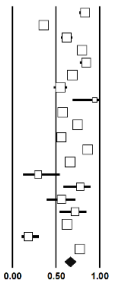
Event rate and 95% CI



Employment (Unemployed/Self-employed/Housewife)

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.836	0.766	0.887	5.14	
Taghaddosinejad	2009	0.358	0.311	0.408	5.66	
Amiri	2012	0.624	0.560	0.684	5.56	
Zare Nejad	2015	0.798	0.779	0.817	5.78	
Nazarzadeh	2016	0.846	0.774	0.899	5.03	
Veisani	2016	0.689	0.649	0.726	5.70	
Azizpoor	2016	0.550	0.475	0.624	5.48	
Sakhavati	2016	0.944	0.693	0.992	1.51	
Hajebi	2016	0.579	0.567	0.590	5.83	
Azizi Poor	2017	0.745	0.713	0.774	5.73	
Raeisi	2017	0.561	0.504	0.616	5.63	
Soltani	2017	0.864	0.847	0.879	5.76	
Kordrostami	2017	0.663	0.627	0.698	5.73	
Alami	2019	0.294	0.128	0.542	3.31	
Delam	2020	0.778	0.586	0.897	3.70	
Azizi	2021	0.563	0.390	0.721	4.35	
Fakhari	2021	0.719	0.542	0.847	4.12	
Farahbakhsh	2021	0.625	0.603	0.648	5.80	
Koohestani	2021	0.183	0.105	0.302	4.49	
Pouradeli	2023	0.773	0.739	0.803	5.70	
		0.664	0.597	0.725		

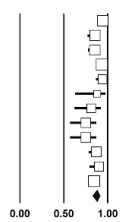
Event rate and 95% CI



No PSA

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Amiri	2012	0.945	0.920	0.963	10.00	
Ranjbar	2013	0.856	0.774	0.911	9.19	
Nazarzadeh	2016	0.854	0.782	0.905	9.54	
Hajebi	2016	0.936	0.929	0.941	11.09	
Hassanipour	2018	0.943	0.869	0.976	7.04	
Alami	2019	0.882	0.632	0.970	4.36	
Delam	2020	0.815	0.625	0.921	6.66	
Azizi	2021	0.750	0.574	0.870	7.65	
Fakhari	2021	0.750	0.574	0.870	7.65	
Mojahedi	2021	0.872	0.784	0.928	8.67	
Koohestani	2021	0.900	0.795	0.954	7.39	
Pouradeli	2023	0.846	0.814	0.873	10.76	
		0.878	0.830	0.915		

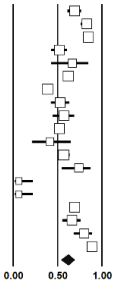
Event rate and 95% CI



Habitat (urban)

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.692	0.612	0.761	5.84	
Taghaddosinejad	2009	0.831	0.762	0.883	5.65	
Rostami	2016	0.849	0.832	0.864	6.20	
Azizpoor	2016	0.517	0.427	0.606	5.81	
Sakhavati	2016	0.667	0.429	0.842	4.00	
Hajebi	2016	0.619	0.607	0.630	6.25	
Azizi Poor	2017	0.388	0.356	0.420	6.19	
Hassanipour	2018	0.529	0.424	0.631	5.67	
Mokhtari*	2019	0.571	0.447	0.687	5.46	
Mokhtari	2019	0.520	0.461	0.578	6.06	
Alami	2019	0.412	0.210	0.648	4.04	
Rashidi	2020	0.567	0.498	0.634	5.98	
Delam	2020	0.741	0.547	0.871	4.36	
Azizi	2021	0.063	0.016	0.218	2.84	
Fakhari	2021	0.063	0.016	0.218	2.84	
Farahbakhsh	2021	0.692	0.670	0.713	6.22	
Mojahedi	2021	0.663	0.553	0.757	5.56	
Koohestani	2021	0.800	0.680	0.883	5.07	
Veisani**	2022	0.885	0.852	0.912	5.96	
		0.617	0.538	0.691		

Event rate and 95% CI



No Substance Hx

First Author	Year	Event rate	Lower limit	Upper limit	Weight (Random) Relative weight	Relative weight
Ghaleiha	2009	0.295	0.226	0.373	10.33	
Amiri	2012	0.947	0.923	0.965	10.11	
Ranjbar	2013	0.654	0.558	0.739	10.14	
Zare Nejad	2015	0.629	0.606	0.652	10.98	
Raeisi	2017	0.746	0.698	0.790	10.69	
Soltani	2017	0.728	0.707	0.748	10.97	
Azizi	2021	0.500	0.333	0.667	8.76	
Fakhari	2021	0.500	0.333	0.667	8.76	
Koohestani	2021	0.800	0.680	0.883	9.07	
Forouzesh	2022	0.923	0.890	0.947	10.19	
		0.716	0.617	0.799		

Event rate and 95% CI

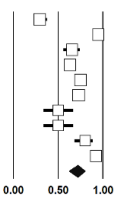


Figure 2. Continued

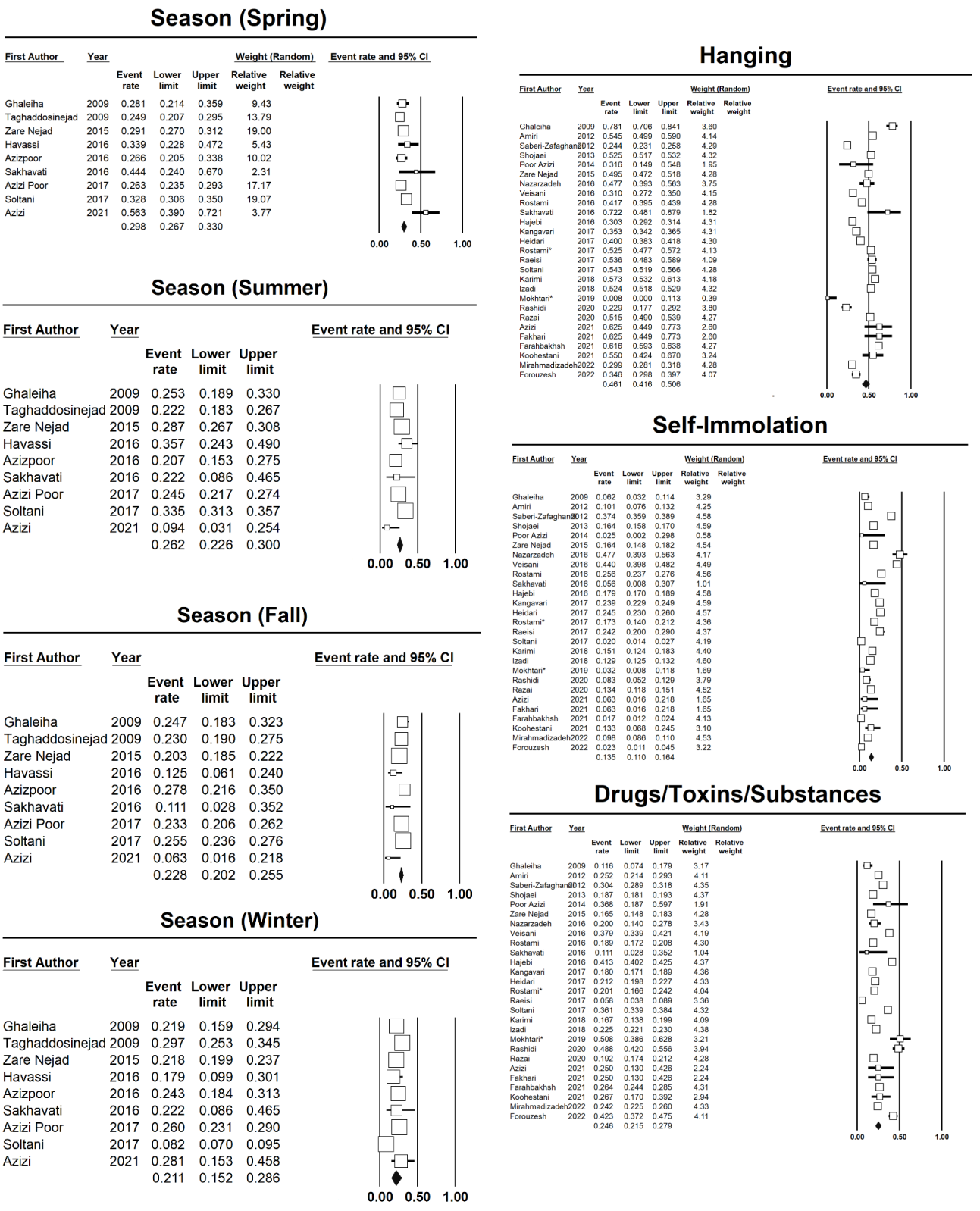


Figure 2. Forest Plots of the Attributable Factors of Suicide

were significantly higher than in non-western areas or the overall country population. None of the other potential factors showed significant differences among the regional subgroups.

Discussion

The present study is a meta-analysis on the prevalence and factors influencing suicide in Iran, with particular attention to the western regions, known for their disproportionately high rates. Our findings reveal the

Table 1. Subset Analysis (All Studies) & Publication Bias Tests Values

Attributed Factors	Point Estimate (95% CI)	No of Studies	Interaction *P* Value	Begg's/Egger's Test *P* Value
Sex				
Male	64.3 (62.6–66.0)	54	0.000	0.714/ 0.053
Female	35.7 (34.0–37.4)			
Age				
>25	57.9 (51.0-64.5)	14	0.002	0.352/ 0.021
<25	42.1 (35.5–49.0)			
Education				
Under Diploma	73.4 (62.1–82.3)	23	0.000	0.041/ 0.243
Diploma & Higher	26.6 (17.7–37.9)			
Marital Status				
Married	48.5 (45.9–51.0)	33	0.096	0.136/ 0.804
Single/Divorced/Others	51.5 (49.0–54.1)			
Employment				
Unemployed/Self-employed/Housewife	66.4 (59.7–72.5)	20	0.000	0.673/ 0.411
Others	33.6 (27.5–40.3)			
Habitat				
Urban	61.7 (53.8–69.1)	19	0.000	0.700/ 0.982
Rural	38.3 (30.9–46.2)			
Past medical history (PMHx)				
PMHx	8.5 (4.9–14.2)	8	0.000	0.710/ 0.095
No PMHx	91.5 (85.8–95.1)			
Past psychiatric history (PPHx)				
PPHx	20.7 (15.5–27.1)	13	0.000	0.669/ 0.134
No PPHx	79.3 (72.9–84.5)			
Past suicidal attempt (PSA)				
PSA	12.2 (8.5-17.0)	12	0.000	0.783/ 0.039
No PSA	87.8 (83.0–91.5)			
Substance abuse history (Substance Hx)				
Substance Hx	28.4 (20.1–38.3)	10	0.000	0.928/ 0.651
No Substance Hx	71.6 (61.7–79.9)			
Season		9	0.005	
Spring	29.8 (26.7–33.0)			0.251/ 0.703
Summer	26.2 (22.6–30.0)			1.000/ 0.126
Fall	22.8 (20.2–25.5)			0.348/ 0.318
Winter	21.1 (15.2–28.6)			0.175/ 0.877
Method		27	0.000	
Hanging	46.1 (41.6–50.6)			0.851/ 0.321
Self-Immolation	13.5 (11.0–16.4)			0.416/ 0.860
Drugs/toxins/substances	24.6 (21.5–27.9)			0.491/ 0.690

key points through the included studies published from 2003 to 2023. The estimated pooled number of suicides in the included studies was approximately 250 980. The age group most affected was above 25 years. Although the overall number of suicide deaths was higher among men, especially non-western men in the country, it was observed that western women, particularly through self-immolation, had a higher rate of suicide compared to women from other backgrounds. Factors such as low education level, unemployment, freelancing, and housekeeping as occupations, specific suicide methods like hanging and employing drugs/toxins/substances, urban living, and the seasons of summer and spring were identified as contributors to the suicide cases.

This investigation primarily aimed to investigate the overall occurrence of suicide within Iran's population and to explore variations in suicide rates between the western regions and other parts of the country. Eighteen out of the 58 studies focused on the western provinces. Additionally, the articles that investigated all the provinces of Iran

Table 2. Subgroup Analysis (West vs. Non-West vs. Whole Country Studies)

Attributed Factors	Regional Subgroup (CI 95%)	No of Studies	Interaction *P*-value
Sex	Male West: 59.3 (55.7–62.8) Non-West: 68.3 (64.0–72.2) Total: 66.2 (63.5–68.7) Female West: 40.7 (37.2–44.3) Non-West: 31.7 (27.8–36.0) Total: 33.8 (31.3–36.5)	54	0.001
Education	Under Diploma West: 67.5 (57.8–75.9) Non-West: 72.9 (60.0–82.8) Diploma & Higher West: 32.5 (24.1–42.2) Non-West: 27.1 (17.2–40.0)	23	0.478
Age	>25 West: 51.2 (44.2–58.2) Non-West: 66.5 (59.9–72.6) Total: 64.4 (47.9–78.2) <25 West: 48.8 (41.8–55.8) Non-West: 33.5 (27.4–40.1) Total: 35.6 (21.8–52.1)	14	0.006
Marital Status	Single/Divorced/Others West: 52.5 (48.8–56.2) Non-West: 48.5 (42.8–54.2) Total: 56.3 (49.8–62.7) Married West: 47.5 (43.8–51.2) Non-West: 51.5 (45.8–57.2) Total: 43.7 (37.3–50.2)	33	0.204
Employment	Unemployed/Self-employed/ Housewife West: 70.7 (63.2–77.2) Non-West: 64.3 (53.3–74.0) Others West: 29.3 (22.8–36.8) Non-West: 35.7 (49.8–62.7)	20	0.316
Habitat	Urban West: 58.9 (36.0–78.5) Non-West: 62.2 (53.2–70.4) Rural West: 41.1 (21.5–64.0) Non-West: 37.8 (29.6–46.8)	19	0.790
Past medical history (PMHx)	NA	NA	NA
Past suicidal attempt (PSA)	No PSA West: 87.5 (72.4–94.9) Non-West: 85.9 (82.3–88.8) PSA: West: 12.5 (5.1–27.6) Non-West: 14.1 (11.2–17.7)	12	0.786
Past PSYCHIATRIC History (PPHx)	No PPHx West: 64.3 (17.6–93.9) Non-West: 81.0 (76.4–85.0) PPHx West: 35.7 (6.1–82.4) Non-West: 19.0 (15.0–23.6)	13	0.433
Substance abuse history (Substance Hx)	No Substance Hx West: 66.3 (13.0–96.3) Non-West: 73.7 (65.8–80.3) Substance Hx West: 33.7 (3.7–87.0) Non-West: 26.3 (19.7–34.2)	10	0.790
Season	Spring West: 30.9 (24.9–37.7) Non-West: 29.8 (26.1–33.7) Summer West: 24.3 (19.9–29.4) Non-West: 28.1 (23.5–33.3)	9	0.762 0.276
	Fall West: 22.4 (17.8–27.8) Non-West: 22.6 (19.1–26.5) Winter West: 25.0 (22.7–27.5) Non-West: 18.6 (9.7-32.7)		0.949 0.333
Method	Hanging West: 45.0 (39.7–50.5) Non-West: 48.8 (40.4–57.4) Total: 41.5 (32.0–51.7) Self-Immolation West: 20.8 (16.7–25.5) Non-West: 6.7 (4.0–11.0) Total: 18.4 (12.5–26.2) Drugs/Toxins/Substances West: 23.8 (19.5–28.6) Non-West: 24.8 (19.5–31.0) Total: 25.7 (18.9–33.9)	27	0.546 0.000 0.906

predominantly highlighted the statistics of Ilam and Kermanshah provinces. Consequently, we conducted an analysis to comprehend the disparity in contributing factors that play a role in causing suicide in these areas compared to others.

A significant disparity exists in the rate of suicides among different genders in the included studies, with men experiencing the highest rates. In general, the suicide rate among men was nearly twice as high as that among women, consistent with findings from various studies.[22,41,47,54,56,58,63,64,83,85,89,90,93-97,101] Research conducted in Europe and America, with a specific focus on gender impact, has revealed estimated male-to-female ratios ranging from 3 to 4 times higher. There seem to be unidentified and intricate factors underlying this phenomenon. Some theories justify this by considering gendered perspectives, where harmful methods employed are often associated with masculinity. Moreover, it is possible that women's tendencies to seek help and their readiness to discuss emotional issues contribute to earlier recognition, treatment, and timely assistance.[103-107]

We identified variations in suicide rates based on both gender and region in Iran. Both western and non-western men showed higher rates of suicide than women, but this difference was less pronounced among the western men and women. However, in four studies conducted exclusively in western provinces (four in Ilam and one in Kermanshah), there were more instances of suicide among women than men. Previous studies have attributed the high burden of suicide among women in western provinces to several factors, including limited socio-economic independence, social coercion pressure, and increased family insecurity that women face in these provinces. Furthermore, self-immolation is prevalent among women in these areas due to cultural factors.[40,42,45,48,102]

A study by Daliri et al found that the western provinces had the highest rates of female suicides. They attributed this to the region's climatic conditions, characterized

by mountains and cold temperatures, providing an additional layer of insight into the complex interplay of factors influencing suicide rates among women in western provinces.[31]

In the context of suicides, the findings of 14 studies reveal a significant trend among individuals above the age of 25, constituting more than 57% of cases. These results align with various studies conducted in Iran consistently highlighting a higher prevalence of suicides among individuals above 25.[20,44,56,57,70,82,85,86] Similar patterns are reflected in relevant suicide data and statistics from sources such as the CDC and Statists Research Department. According to the CDC, in both 2021 and 2022 in the United States, the age group with the highest number of suicide deaths was 25–44 years.[108] In England and Wales, the highest suicide rate in 2021 was observed among individuals aged 50 to 54 and 45 to 49 years, respectively.[109]

While the age group of 15 to 24 years exhibited the highest proportion of attempts in Iran, European countries, and the US, the rate of suicides was higher among individuals aged above 25 years, and the average age of individuals who died by suicide in Iran was 34 years.[110] Studies have cited various reasons for these differences. Psychological disorders, primarily major depressive disorder, and gender differences have been implicated as contributing factors for the higher prevalence of suicide attempts among individuals under 30. On the other hand, mental and physical health conditions, functional impairments, and significant life stressors have been identified as potential factors responsible for the higher rates of suicides among older individuals.[30,111-114]

While our study demonstrated that the rates of suicides continue to be higher among individuals over 25 years old, it is crucial to acknowledge that 42.1% of the cases involved individuals under the age of 25, representing a significant proportion. According to the CDC in United States, in 2020, suicide ranked as the second leading cause of death among individuals aged 10 to 14, and the third leading cause of death among those aged 15 to 24. This concerning trend has been on the rise in recent years, emphasizing the need for proactive measures to be taken in addressing this age group to prevent further escalation.[115]

Drawing on the impact of socio-economic status on suicide risk, it is assumed that literacy and suicide share an inverse relationship. The rise in suicide rates in the US could be linked to a higher proportion of people with a high school education or below.[116,117] Our research aligns with this phenomenon, as approximately 73% of the studies indicate a higher occurrence of suicides among individuals with an education level below a high school diploma.[20,22,38,40,42,46,50,51,54,57,61,64,65,70,73,81,96,102] Previous reviews conducted in Iran also acknowledge that having low educational attainment and experiencing academic failure are significant risk factors for suicide.[30,118] In three of our included studies, we observed that individuals with lower educational levels tend to resort to more lethal methods, such as self-immolation, firearm use, and hanging.[40,50,96] It appears that individuals with unemployment, low income, and insufficient knowledge about their physical and mental well-being following limited educational opportunities, tend to have a less favorable quality of life. However, the relationship between education, occupation, marital status, and their impact on suicide is highly intricate, and these factors may interact and offset each other—a complex interplay commonly referred to as "intersectionality".[20,30,57,119-121]

When examining the impact of low education levels, findings should be interpreted with caution. A study investigating the influence of the pandemic on suicide rates revealed a noteworthy shift. Since 2020, educated individuals have shown an increase in suicide rates attributed to heightened awareness and fear of the disease.[73] Therefore, given that the majority of our studies pertain to years preceding the pandemic, it is advisable to conduct additional research in the post-pandemic era. This is particularly relevant considering the current economic challenges and the heightened prevalence of despair among the educated population. Such studies would allow for an exploration of the evolving effects of suicide rates in the wake of the pandemic.

The analysis identified insufficient statistical evidence to substantiate a significant association between marital status and suicide, drawing on the collective evidence from the included studies. This finding is against the hypothesis that marriage is protective against suicide as found by Durkheim in 1897[122] and as reported in more recent works. Consistent with our results, Fässberg et al[123] reported that marital status has the most inconsistent relationship with suicide among social factors. Moreover, a study conducted in Jordan also showed no statistically significant association between marital status and suicide.[124]

However, according to our meta-analysis, there was no significant difference between the relative frequency of married and non-married victims.[38,40,41,43,51,64,70,79,86,90,102] While factors such as study design, sample size, and the heterogeneity of included studies may contribute to this non-significant finding, geographical and cultural factors also play a role in shaping the profile of suicide. Notably, the protective effect of marriage is culture-specific.[125]

In our meta-analysis, we found that over 65% of the evaluated suicide cases were individuals who were unemployed, underemployed or lacked a stable source of income. These findings are consistent with conclusions drawn from multiple studies.[20,37,38,40,42,56,57,61,64,65,73,80,83,86,102] Unemployment and inadequate employment opportunities are major formidable obstacles in Iran that predominantly affect the youth population. These difficulties can result in feelings of disillusionment and oppression, ultimately creating conditions conducive to suicide.[38,126] It has been also reported that housewives and unemployed people in Iran may be more susceptible to suicide due to having fewer preoccupations and more idle time for overthinking about suicide plans.[65,127]

Globally, numerous studies have highlighted the correlation between unemployment or underemployment and a higher probability of suicide. These studies have demonstrated that there is a correlation between unemployment and a higher likelihood of suicidality and suicide mortality.[128] During periods of economic recession and high unemployment rates, both society as a whole and individuals face an elevated risk of engaging in suicidal behavior and committing suicides. Lack of employment or insufficient work opportunities often lead to financial difficulties, including debt and financial strain, which in turn contribute to an increased likelihood of suicide at an individual level.[129-134]

The analysis of living environments revealed that, overall, residing in urban areas in Iran entails a greater likelihood of experiencing suicides.[38,43,50,51,56,59,60,64,65,70,79,84,86] This pattern is evident in numerous studies conducted in countries such as England and America.[135,136] The elevated levels of stress in urban settings can be attributed to the heightened rates of suicide.[84] Nonetheless, certain studies have indicated that the absence of social support in rural communities also constitutes a risk factor.[30,137]

Our further investigations, when assessing geographical regions, showed that the overall suicide rates among western and non-western regions in Iran do not have a clear correlation with the place of residence. Studies conducted on this matter have conflicting opinions, to the extent that contradictory findings have also been observed in other countries.[136, 138] The disparity in suicide rates based on where people live was linked to urban individuals having access to drugs and rural individuals having access to firearms in a study.[46,50,102] However, it is crucial to consider the multilayered nature of rural and urban life and thoroughly analyze the social, physical, and residential environments involved. Moreover, factors like rural-to-urban migration and environmental changes make it difficult to accurately assess this matter.

The findings showed that less than 10% of the people who died by suicide had a diagnosed medical condition when they took their own lives. This finding is supported by numerous research studies conducted in Iran.[38,54,70,78,84,86] Several diseases, such as AIDS, epilepsy, cancer, spinal cord injuries, and diabetes, have been reported to be associated with a higher risk of both attempted and fatal suicides in Iran.[75,139] While most studies indicate that these diseases pose significant risks for suicides, it is important to note that low reported medical comorbidities in our studies could be attributed to limitations within Iran's registry systems and the existing stigma attached to these diseases.[86]

According to various studies conducted around the world, poor physical health increases the likelihood of suicide. Many illnesses, such as brain injuries, epilepsy, and sleep problems, were linked to suicide or suicide attempts. Moreover, the risk of suicide grew significantly with the number of physical health problems. Therefore, it is essential to implement primary, secondary, and tertiary prevention measures to lower suicide rates related to physical health issues.[140-142] However, our findings are consistent with other studies that show that less than 20% of all suicides involved physical health conditions. But this percentage rose to more than 50% for older people who died by suicide, suggesting that this age group needs more healthcare interventions to reduce the chance of suicide.[143,144]

Our pooled-prevalence meta-analysis revealed that 20.7% of individuals who died by suicide in Iran had a diagnosed psychiatric condition, consistent with findings from previous studies.[20,37,54,56,73,78,79,81,84,86] Globally, mental illness is widely acknowledged as the most influential risk factor for suicide, alongside recent adverse life events and a history of self-harm. Individuals with a mental disorder are nearly eight times more likely to die by suicide compared to those without, and all types of mental disorders significantly predict suicide, with estimated adjusted relative risks ranging from 4.11 for dysthymia to 7.64 for major depressive disorder.[145-147]

In our study, we observed that only 20.7% of cases in the Iranian population had a diagnosed mental illness. However, the Centers for Disease Control and Prevention (CDC) estimates that 46% of people who die by suicide in the United States had a known mental health condition,[148,149] and of those who died by suicide in the USA, half had been diagnosed with at least one mental health condition in the year preceding their death.[150] Several factors contribute to this difference between Iran and the United States, such as the pervasive presence of stigma,[151] lack of awareness,[152,153] structural and policy-related issues,[154] cultural barriers, and limited financial resources.[155] It is evident that individuals in countries like Iran have low rates of seeking help from formal mental health services for suicidal ideation, fearing of stigma associated with labels such as loss of faith or madness. This stigma acts as a deterrent for seeking appropriate healthcare and social support services.[156] In addition to the factors previously discussed, this discrepancy could also arise from challenges in accurately diagnosing mental illnesses and limitations within Iran's registration system, particularly in conducting comprehensive psychiatric evaluations for all individuals involved.[75,86] Therefore, policymakers should seek solutions to address these issues for the future. One such initiative is the improvement of psychological health insurance coverage in Iran to 70%, effective since October 2023, as reported by Iran's Ministry of Health.

Based on our meta-analysis, only 12.2% of suicide cases had a history of prior attempts, indicating that the majority resulted in fatality on their initial attempt. This aligns with numerous studies in Iran.[37,40,70,79,84,86] There is a substantial body of research conducted in Iran, as well as in the US and European countries, that highlights the importance of previous suicide attempts as a strong risk factor for suicide.[37,57,157,158] It has also been indicated that individuals with previous attempts may have a higher fatality rate when attempting suicide.[40,86]

However, our analysis revealed a notable proportion of

suicide victims who had never attempted suicide before their final act. While this 12.2% figure may be influenced by Iran's registry system limitations in identifying suicide history due to privacy concerns, it is essential not only to consider individuals with prior attempts but also to address other factors influencing a person's choice to carry out their first and tragically final act.[86]

Our findings reveal that 28.4% of suicide cases in Iran had a documented history of alcohol, opioid, and other substance abuse, as determined through autopsy tests. This discovery is supported by numerous studies conducted in Iran.[54,61,76,80,84] The addiction history most frequently reported in our studies included smoking, opioid use, and alcohol consumption, all of which were linked to an increased risk of suicide.[20,54] Moreover, addiction to these substances, along with psychological problems and family disputes, was reported as the most important motivation for committing suicide in Iran.[61,159] While all substances contribute to an increased risk of suicidal behavior, alcohol and opioids were the most commonly identified substances in suicide victims (22% and 20% respectively), surpassing rates of cocaine and marijuana.[160-164] In the United States, according to the CDC, 20% of suicide cases were associated with opioid use, and approximately 22% of the victims had illegal blood alcohol content. Similar studies conducted in Canada also reported figures of 25% for alcohol intake and 27-50% for any substance abuse. These findings collectively help explain the 30% prevalence of substance abuse among those who died by suicide in Iran.[165-167] Unfortunately, drawing a distinction between the histories of substance abuse and having a substance in the victim's blood after the suicide was not completely feasible due to reporting limitations.

Our study findings indicate that the majority of suicides occurred during the spring and summer seasons, with approximately 30% specifically in the spring. These results align with findings from previous studies conducted in Iran, providing further confirmation.[38,46,61,65,80,83,101,102,168] Seasonality patterns have always intrigued researchers regarding their association with suicide in other countries. Extensive studies have provided evidence supporting the notion that a notable seasonal effect exists on suicide rates, with the highest risk observed during the spring season.[169,170] Moreover, research indicates that suicide attempts are more frequent during spring and summer, exhibiting 1.2–1.7 times higher rates compared to winter. It has been suggested that seasonal variation may play a role in the modulation of suicide behavior by endogenous and/or environmental factors such as the longer duration of sunshine during these particular seasons, as opposed to autumn and winter, based on the positive correlation between the number of sunshine hours and number of serotonin-related actions including suicide.[171-173]

Based on our regional subgroup analysis, there is no notable difference between western and non-western areas, in terms of the seasonality effect on suicides. However, it is worth noting that the patterns may differ based on factors such as the chosen method of suicide in specific regions. For instance, reports indicate that in the eastern and southern areas of Iran, self-immolation tends to occur more frequently during the summer and winter, while hanging is more prevalent in the spring. But overall, the first two seasons of the year can be considered as the deadliest in all regions of Iran, and probably other countries.[102,174-176]

Our investigation uncovered that hanging is the predominant approach to suicide in Iran, which aligns with prior studies done in the country.[20,22,37,38,47,50,52,54,56,57,61,62,65,70,71,80,86,90-92,96,101] Use of drugs/toxins/substances and self-immolation were the next frequently utilized methods. The pattern of suicide methods observed in the Eastern Mediterranean Region (EMR) countries mirrored our findings.[177]

While hanging is widely recognized as a leading fatal suicide technique across various nations, it is worth mentioning that suicide techniques in Asia, specifically in EMR countries, vary significantly from those in Western countries. Unlike Western countries, where firearms are commonly used, Asian countries more frequently witness pesticide ingestion and self-immolation as the preferred methods.[178] In three studies, among suicide deaths that occurred through poisoning, the majority of them were especially by the use of aluminum phosphide.[80,81,83] Although medications, opioids and pesticide ingestion are more common due to accessibility, the fatality rate is greater when aluminum phosphide is employed.[29,46,59,60,72,179-181]

Our analysis regarding the geographical variations in Iran also highlighted significant incidents of self-immolation, particularly in the western parts of the country, although occurrences are noted in other areas as well. Research indicates that self-immolation is predominantly observed among young married women with limited education, often linked to family conflicts.[29,47,50,53,66,71,77,82,94,101,182-185] To effectively address this issue, it is important to conduct additional studies and formulate region-specific suicide prevention strategies that consider cultural, religious, and practical elements influencing the choice of suicide method.[28] The use of multiple suicide methods during an episode presents researchers with a major challenge that has never been studied before. Therefore, forensic medicine and hospitals need to be more vigilant in determining the cause of death and further research is needed in this area.

Limitations and Recommendations

Over the past two decades, research in Iran has predominantly focused on suicide attempts and their risk factors, potentially leading to differences in contributing factors between fatal and attempted suicides. Many studies analyzed fatality rates associated with suicide attempts instead of concentrating on rates of the fatal ones. The scarcity of competent cohort studies on suicides in Iran hindered a more in-depth analysis of risk factors. Consequently, this review primarily reported the contributing factors of suicides and their prevalence,

facing challenges in assessing changes over time due to cumulative reporting and the lack of global reports for each year. The review also highlighted a scarcity of studies delving into the primary reasons for fatal suicides. In our research, over half of the papers on the STROBE checklist demonstrated moderate quality, which may impact the validity of our findings. Consequently, interpretation of the results requires careful consideration. Future studies should strive for higher quality and address the limitations identified in prior research to enhance reliability.

Recommendations for further research include a crucial need to shift focus towards fatal suicides, with future longitudinal studies aiming to identify specific risk factors associated with them. Researchers are encouraged to report findings comprehensively, enabling trend analysis over time, and conducting more cohort studies to explore causal relationships within this concept. Lastly, adopting a universal approach for reporting socioeconomic status factors in future studies is crucial, given their significant role in suicides.

Conclusion

This study describes key contributing factors to suicides in Iran, including gender (male), age (over 25), low education attainment, unemployment, specific suicide methods (e.g. hanging), and seasonal variations (spring and summer). Despite higher suicide rates among those over 25, an increasing number of young individuals are affected, underscoring the need for future research. Notably, certain risk factors (e.g. a history of mental illness) were absent in a significant percentage of cases, highlighting the necessity for additional research to understand causative factors, potentially linked to inadequate record-keeping systems.

The meta-analysis emphasized the region-dependent nature of suicide factors, highlighting the influence of geographical and regional variations. Future studies should utilize multivariate models to collectively analyze these factors across different regions. Divergent findings in some studies may stem from variable factors over time, emphasizing the importance of consistently identifying vulnerable groups in different periods, particularly post-pandemic and economic downturns. The study seeks to guide Iran's health policymakers in developing or modifying policies for the screening and treatment of vulnerable individuals affected by fatal suicides.

Authors' Contribution

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Supervision: Sulmaz Ghahramani, Kamran Bagheri Lankarani.
Validation: Sulmaz Ghahramani.
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Writing–original draft: All authors.
Writing–review & editing: All authors.

Competing Interests

The authors declare no conflict of interest.

Consent for Publication

Not applicable.

Data Availability Statement

The data generated and/or analyzed during the current study are included in the published articles or its supplementary files.

Ethical Approval

Not applicable.

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Supplementary Files

Supplementary file 1: The Search String Used for the Literature Search
Supplementary file 2: The Extraction Table for Final Records

References

1. Fleischmann A, Paul E. Suicide Worldwide in 2019: Global Health Estimates. World Health Organization; 2021. Available from: https://www.who.int/publications/i/item/9789240026643.
2. Matthay EC. Suicide falls by a third globally. BMJ. 2019;364:l416. doi: 10.1136/bmj.l416.
3. Ilic M, Ilic I. Worldwide suicide mortality trends (2000-2019): a joinpoint regression analysis. World J Psychiatry. 2022;12(8):1044-60. doi: 10.5498/wjp.v12.i8.1044.
4. Afifi M. Adolescent suicide in the Middle East: ostrich head in sand. Bull World Health Organ. 2006;84(10):840. doi: 10.1590/s0042-96862006001000019.
5. Rezaeian M. Suicide among young Middle Eastern Muslim females. Crisis. 2010;31(1):36-42. doi: 10.1027/0227-5910/a000005.
6. Farahbakhsh M, Fakhari A, Davtalab Esmaeili E, Azizi H, Mizapour M, Asl Rahimi V, et al. The role and comparison of stressful life events in suicide and suicide attempt: a descriptive-analytical study. Iran J Psychiatry Behav Sci. 2020;14(2):e96051. doi: 10.5812/ijpbs.96051.
7. Hajebi A, Ahmadzad-Asl M, Ershadi M, Nikfarjam A, Davoudi F. National registration system of suicide behaviors in Iran: barriers and challenges. Arch Suicide Res. 2013;17(4):416-25. doi: 10.1080/13811118.2013.803445.
8. Fleischmann A, De Leo D. The World Health Organization's report on suicide: a fundamental step in worldwide suicide prevention. Crisis. 2014;35(5):289-91. doi: 10.1027/0227-5910/a000293.
9. Aschan L, Goodwin L, Cross S, Moran P, Hotopf M, Hatch SL. Suicidal behaviours in South East London: prevalence, risk factors and the role of socio-economic status. J Affect Disord. 2013;150(2):441-9. doi: 10.1016/j.jad.2013.04.037.
10. Plans L, Barrot C, Nieto E, Rios J, Schulze TG, Papiol S, et al. Association between completed suicide and bipolar disorder: a systematic review of the literature. J Affect Disord. 2019;242:111-22. doi: 10.1016/j.jad.2018.08.054.
11. Duarte SK, Hillesheim D, Hallal A. Temporal trend of mortality by suicide among adults in Brazil: 2000 to 2015. Trends Psychiatry Psychother. 2021;43(1):65-71. doi: 10.47626/2237-6089-2020-0009.
12. Ati NA, Paraswati MD, Windarwati HD. What are the risk factors and protective factors of suicidal behavior in adolescents? A systematic review. J Child Adolesc Psychiatr Nurs. 2021;34(1):7-18. doi: 10.1111/jcap.12295.
13. Giner L, Guija JA. AS07-01 - Completed suicide vs suicide

atempt: similarities and differences? Eur Psychiatry. 2012;27 Suppl 1:1. doi: 10.1016/s0924-9338(12)73967-6.
14. Dorpat TL, Ripley HS. The relationship between attempted suicide and committed suicide. Compr Psychiatry. 1967;8(2):74-9. doi: 10.1016/s0010-440x(67)80071-3.
15. Fushimi M, Sugawara J, Saito S. Comparison of completed and attempted suicide in Akita, Japan. Psychiatry Clin Neurosci. 2006;60(3):289-95. doi: 10.1111/j.1440-1819.2006.01504.x.
16. Song J, Hong SH, Kim J, Chang S, Yook KH, Hong HJ. Comparison of suicide attempts and suicide deaths by jumping from a high place in Korean children and adolescents. Int J Environ Res Public Health. 2021;18(18):9513. doi: 10.3390/ijerph18189513.
17. Parra Uribe I, Blasco-Fontecilla H, García-Parés G, Giró Batalla M, Llorens Capdevila M, Cebrià Meca A, et al. Attempted and completed suicide: not what we expected? J Affect Disord. 2013;150(3):840-6. doi: 10.1016/j.jad.2013.03.013.
18. Hofstra E, van Nieuwenhuizen C, Bakker M, Özgül D, Elfeddali I, de Jong SJ, et al. Effectiveness of suicide prevention interventions: a systematic review and meta-analysis. Gen Hosp Psychiatry. 2020;63:127-40. doi: 10.1016/j.genhosppsych.2019.04.011.
19. Asadiyun M, Daliri S. Suicide attempt and suicide death in Iran: a systematic review and meta-analysis study. Iran J Psychiatry. 2023;18(2):191-212. doi: 10.18502/ijps.v18i2.12370.
20. Fakhari A, Farahbakhsh M, Davtalab Esmaeili E, Azizi H. A longitudinal study of suicide and suicide attempt in northwest of Iran: incidence, predictors, and socioeconomic status and the role of sociocultural status. BMC Public Health. 2021;21(1):1486. doi: 10.1186/s12889-021-11527-9.
21. Emamgholipour S, Arab M, Shirani R. Socioeconomic determinants of suicide in Iran: panel data study. Iran J Public Health. 2021;50(11):2309-16. doi: 10.18502/ijph.v50i11.7587.
22. Heidari M, Khanjani N, Haghdoost A. Silent change of suicide in the west of Iran (Kermanshah): joinpoint regression analysis. Iran Red Crescent Med J. 2024;19(4):1-10. doi: 10.5812/ircmj.43061.
23. Shakeri MT, Dadpour B, Vafaeinezhad R, Aghajani H, Hadianfar A, Yousefi R, et al. The study of epidemiological and geographical pattern of suicide attempt in Mashhad, Iran: 2016. Med J Mashhad Univ Med Sci. 2021;63(6):3053-65. doi: 10.22038/mjms.2021.17627.
24. Khademi N, Zangeneh A, Ziapour A, Saeidi S, Teimouri R, Yenneti K, et al. Exploring the epidemiology of suicide attempts: risk modeling in Kermanshah-Iran. Front Public Health. 2022;10:924907. doi: 10.3389/fpubh.2022.924907.
25. Snowdon J. Differences between patterns of suicide in East Asia and the West. The importance of sociocultural factors. Asian J Psychiatr. 2018;37:106-11. doi: 10.1016/j.ajp.2018.08.019.
26. Matsubayashi T, Ueda M. The effect of national suicide prevention programs on suicide rates in 21 OECD nations. Soc Sci Med. 2011;73(9):1395-400. doi: 10.1016/j.socscimed.2011.08.022.
27. Mehri K. Meta-analysis of suicide studies in Iran. Social Welfare Quarterly. 2022;22(85):271-300. [Persian].
28. Zarani F, Ahmadi Z. Suicide in Iranian culture: a systematic review study. Rooyesh. 2021;10(9):205-16. [Persian].
29. Daliri S, Rostami C, Sayehmiri K, Karimi A, Delpisheh A. Causes and attempts methods of suicide in the Iranian pepole during 2001-2014: a systematic review and meta-analysis study. Koomesh. 2018;20(3):417-24. [Persian].
30. Sharif Nia H, Heidari M, Naghavi N, Lehto RH, Haghdoost AA, Jafari-Koulaee A, et al. Age changes and suicidal activity in Iran over the past decade: a systematic review and meta-analysis. Omega (Westport). 2022;86(1):312-37. doi: 10.1177/0030222820966934.
31. Daliri S, Bazyar J, Sayehmiri K, Delpisheh A, Sayehmiri F. The incidence rates of suicide attempts and successful suicides in seven climatic conditions in Iran from 2001 to 2014: a systematic review and meta-analysis. Sci J Kurdistan Univ Med Sci. 2017;21(6):1-15. doi: 10.22102/21.6.1. [Persian].
32. Migliavaca CB, Stein C, Colpani V, Barker TH, Ziegelmann PK, Munn Z, et al. Meta-analysis of prevalence: I^2 statistic and how to deal with heterogeneity. Res Synth Methods. 2022;13(3):363-7. doi: 10.1002/jrsm.1547.
33. Ghahramani S, Bagheri Lankarani K, Yousefi M, Heydari K, Shahabi S, Azmand S. A systematic review and meta-analysis of burnout among healthcare workers during COVID-19. Front Psychiatry. 2021;12:758849. doi: 10.3389/fpsyt.2021.758849.
34. Begg CB, Mazumdar M. Operating characteristics of a rank correlation test for publication bias. Biometrics. 1994;50(4):1088-101.
35. Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. Biometrics. 2000;56(2):455-63. doi: 10.1111/j.0006-341x.2000.00455.x.
36. Duval S, Tweedie R. A nonparametric "trim and fill" method of accounting for publication bias in meta-analysis. J Am Stat Assoc. 2000;95(449):89-98. doi: 10.1080/01621459.2000.10473905.
37. Amiri B, Pourreza A, Rahimi Foroushani A, Hosseini SM, Poorolajal J. Suicide and associated risk factors in Hamadan province, west of Iran, in 2008 and 2009. J Res Health Sci. 2012;12(2):88-92.
38. Ghaleiha A, Khazaee M, Afzali S, Matinnia N, Karimi B. An annual survey of successful suicide incidence in Hamadan, western Iran. J Res Health Sci. 2009;9(1):13-6.
39. Azizpour Y, Sayehmiri K, Asadollahi K, Kaikhavani S, Bagheri M. Epidemiological study of suicide by physical methods between 1993 and 2013 in Ilam province, Iran. BMC Psychiatry. 2017;17(1):304. doi: 10.1186/s12888-017-1461-5.
40. Nazarzadeh M, Bidel Z, Ranjbaran M, Hemmati R, Pejhan A, Asadollahi K, et al. Fatal suicide and modelling its risk factors in a prevalent area of Iran. Arch Iran Med. 2016;19(8):571-6.
41. Mohamadian F, Cheraghi F, Narimani S, Direkvand-Moghadam A. The epidemiology of suicide death and associated factors, Ilam, Iran (2012-2016): a longitudinal study. Iran J Psychiatry Behav Sci. 2019;13(2):e11460. doi: 10.5812/ijpbs.11460.
42. Veisani Y, Delpisheh A, Sayehmiri K, Moradi G, Hassanzadeh J. Suicide attempts in Ilam province, western Iran, 2010-2014: a time trend study. J Res Health Sci. 2016;16(2):64-7.
43. Veisani Y, Bakhtiyari A, Mohamadian F. Years of life lost (YLLs) due to suicide and homicide in Ilam province: Iran, 2014-2018. Bull Emerg Trauma. 2022;10(1):16-20. doi: 10.30476/beat.2022.92045.1293.
44. Veisani Y, Delpisheh A, Mohamadian F, Valizadeh R. Trends of suicide attempts and completed suicide in Ilam province of Iran; a demographic analysis study. Bull Emerg Trauma. 2018;6(3):245-8. doi: 10.29252/beat-0603010.
45. Havassi N, Khorshidi A, Khorshidi A, Jafari A, Havassi F. Evaluating the predictors of suicide deaths. J Mazandaran Univ Med Sci. 2017;27(147):217-27. [Persian].
46. Azizpour Y, Asadollahi K, Sayehmiri K, Kaikhavani S, Abangah G. Epidemiological survey of intentional poisoning suicide during 1993-2013 in Ilam province, Iran. BMC Public Health. 2016;16(1):902. doi: 10.1186/s12889-016-3585-9.
47. Nazari Kangavari H, Shojaei A, Hashemi Nazari SS. Suicide mortality trends in four provinces of Iran with the highest mortality, from 2006-2016. J Res Health Sci. 2017;17(2):e00382.
48. Safaie P, Jahangiri K, Barkhordar N, Barkhordar N. Trend and factors influencing suicides in rural areas of Kermanshah (in Iran) during 7 years (2000-2006). In: 2009 3rd International Conference on Bioinformatics and Biomedical Engineering. Beijing, China: IEEE; 2009. p. 1-4. doi: 10.1109/icbbe.2009.5163718.
49. Rostami M, Jalilian A, Poorolajal J, Mahaki B. Time series analysis of monthly suicide rates in west of Iran, 2006-2013. Int

J Prev Med. 2019;10:78. doi: 10.4103/ijpvm.IJPVM_197_17.
50. Rostami M, Jalilian A, Rezaei-Zangeneh R, Salari A. Factors associated with the choice of suicide method in Kermanshah province, Iran. Ann Saudi Med. 2016;36(1):7-16. doi: 10.5144/0256-4947.2016.7.
51. Rashidi F, Mansouri Baghbaderani M, Salehinezhad F, Dastoorpoor M. Investigating the status of suicide attempt and suicide deaths in population covered by Dezful University of Medical Sciences during 2012-2018. Int J Epidemiol Res. 2020;7(4):157-62. doi: 10.34172/ijer.2020.28.
52. Rostami C, Karami K, Daliri S, Mardani A, Narimisa F. Epidemiological study of suicide in Khuzestan province, south west of Iran, during 2011 to 2014. Arch Med Sadowej Kryminol. 2017;67(1):46-60. doi: 10.5114/amsik.2017.70337.
53. Groohi B, Rossignol AM, Barrero SP, Alaghehbandan R. Suicidal behavior by burns among adolescents in Kurdistan, Iran: a social tragedy. Crisis. 2006;27(1):16-21. doi: 10.1027/0227-5910.27.1.16.
54. Raeisi A, Montazeri M, Hosseini H. A comparative study of the causes and methods of completed suicide referred to legal medicine organization in Bushehr province, south of Iran, 2006-2015. Preprints. January 24, 2017. Available from: https://www.preprints.org/manuscript/201701.0106.
55. Fakhari A, Allahverdipour H, Davtalab Esmaeili E, Chattu VK, Salehiniya H, Azizi H. Early marriage, stressful life events and risk of suicide and suicide attempt: a case-control study in Iran. BMC Psychiatry. 2022;22(1):71. doi: 10.1186/s12888-022-03700-0.
56. Farahbakhsh M, Nejad Asgari M, Aslrahimi V, Hemmati A, Iranzad I, Azizi H. Socio-demographic status and 12 years trend of completed suicide in East Azerbaijan province, Iran, during the period 2007-2018. Middle East Curr Psychiatry. 2021;28(1):32. doi: 10.1186/s43045-021-00111-x.
57. Azizi H, Fakhari A, Farahbakhsh M, Davtalab Esmaeili E, Mirzapour M. Outcomes of community-based suicide prevention program in primary health care of Iran. Int J Ment Health Syst. 2021;15(1):67. doi: 10.1186/s13033-021-00492-w.
58. Najafi F, Hasanzadeh J, Moradinazar M, Faramarzi H, Nematollahi A. An epidemiological survey of the suicide incidence trends in the southwest Iran: 2004-2009. Int J Health Policy Manag. 2013;1(3):219-22. doi: 10.15171/ijhpm.2013.40.
59. Mokhtari AM, Sahraian S, Hassanipour S, Baseri A, Mirahmadizadeh A. The epidemiology of suicide in the elderly population in southern Iran, 2011-2016. Asian J Psychiatr. 2019;44:90-4. doi: 10.1016/j.ajp.2019.07.027.
60. Mokhtari AM, Gholamzadeh S, Salari A, Hassanipour S, Mirahmadizadeh A. Epidemiology of suicide in 10-19 years old in southern Iran, 2011-2016: a population-based study on 6720 cases. J Forensic Leg Med. 2019;66:129-33. doi: 10.1016/j.jflm.2019.06.018.
61. Zarenezhad M, Gorgi Z, Sheikh Fathollahi M, Gholamzadeh S, Ghadipasha M, Rezaeian M. Epidemiological survey of suicide in Fars province in the south of Iran during 2003 to 2011. J Rafsanjan Univ Med Sci. 2015;13(12):1129-40. [Persian].
62. Mirahmadizadeh A, Rezaei F, Moftakhar L, Heiran N, Azarbakhsh H. Years of life lost due to suicide in southern Iran 2011-18: a population-based study. Arch Iran Med. 2022;25(1):12-6. doi: 10.34172/aim.2022.03.
63. Sefid Fard Jahromi M, Eghbal MH, Rahmanian V. Epidemiology of suicide and suicide attempts in Jahrom district, southern Iran in light of COVID pandemic: a prospective observational study. Health Sci Rep. 2022;5(6):e933. doi: 10.1002/hsr2.933.
64. Delam H, Zarebi K, Kavi E, Shokrpour N, Bazrafshan MR. Epidemiology of suicide attempts and deaths: a population-based study in the south of Iran (2012-2017). J Health Sci Surveill Syst. 2020;8(3):115-20. doi: 10.30476/jhsss.2020.86633.1095.
65. Sekhavati E, Rahimian M, Abbasnia P, Namazi O. Explaining the Prevalence of Suicides and Suicide Attempts According to the Socio-Economic Determinants of Health in Larestan County During the Years 2014-2015. World Conference on Psychology and Educational Sciences, Law and Social Sciences at the Beginning of the Third Millennium; 2016; Shiraz. [Persian].
66. Mobayen M, Baghi I, Homaei Rad E, Jafaraghaee F, Ashoobi MT. Epidemiological study of self-immolated patients referring to Velayat burn and reconstructive surgery center of Rasht. Journal of Surgery and Trauma. 2020;8(2):66-72.
67. Taziki MH, Semnani SH, Golalipour MJ, Behnampour N, Taziki SA, Rajaee S, et al. Epidemiological survey of suicide in Golestan province in the North of Iran (2003). J Mazandaran Univ Med Sci. 2006;16(55):72-7. [Persian].
68. Beygom Kazemi S, Kord F, Rahimian SH, Kalantari S, Mohammadi R, Ghana Pek S, et al. Epidemiology of suicide in patients referred to hospitals affiliated to Golestan University of Medical Sciences in 2013. Journal of Nurse and Physician Within War. 2016;4(10-11):19-27. [Persian].
69. Bakhsha F, Behnampour N, Charkazi A. The prevalency of attempted suicide in Golestan province, north of Iran during 2003-2007. J Gorgan Univ Med Sci. 2011;13(2):79-85. [Persian].
70. Hassanipour S, Kazemi H, Ghayour AR, Kazemi-Najafabadi A, Nikbakht HA, Ghaem H. Epidemiological trend of suicide in center of Iran from 2012 to 2016. Clin Epidemiol Glob Health. 2019;7(4):559-63. doi: 10.1016/j.cegh.2018.12.009.
71. Karimi J, Holakouie-Naieni K, Koehler SA, Soleymanpour A, Karimi R, Mohammad K. A forensic epidemiological investigation of the characteristics of completed suicides in Isfahan province, Iran. Iran J Psychiatry Behav Sci. 2018;12(2):e8035. doi: 10.5812/ijpbs.8035.
72. Gheshlaghi F, Jafar Salehi M. Suicide attempts by self-poisoning in elderly. J Res Med Sci. 2012;17(Spec 2):S272-5.
73. Pouradeli S, Ahmadinia H, Vazirinezhad R, Amyan A, Souresrafil A, Rezaeian M. An analysis of suicide rates in Kerman province, the largest province in Iran, before and after COVID-19: (2017-2020). Asian J Psychiatr. 2023;85:103614. doi: 10.1016/j.ajp.2023.103614.
74. Moqaddasi Amiri M, Ahmadi Livani A, Moosazadeh M, Mirzajani M, Dehghan A. Seasonal pattern in suicide in Iran. Iran J Psychiatry Behav Sci. 2015;9(3):e842. doi: 10.17795/ijpbs-842.
75. Alami A, Nejatian M, Lael-Monfared E, Jafari A. Epidemiology of suicide/suicide attempt and its association with individual, family, and social factors in eastern part of Iran: a historical cohort study. Iran J Public Health. 2019;48(8):1469-77.
76. Ranjbar MR, Liaghat AR, Ranjbar A, Mohabbati H. Toxicologic laboratory findings in cases reported with hanging death: a two-year retrospective study in northeast Iran. Asia Pac J Med Toxicol. 2013;2(3):92-5.
77. Alaghehbandan R, Dinn NA, Rastegar Lari E, Rastegar Lari A. Suicidal behavior by burns among women in two bordering provinces in Iran. Ann Burns Fire Disasters. 2015;28(2):147-54.
78. Pourazizi M, Zolfaghari S, Shahinfar H, Nikkhah R, Ghorbani R. Epidemiologic study of 1217 suicide attempts in Semnan province. Koomesh. 2014;16(1):29-35. [Persian].
79. Mojahedi M, Esmaeili A, Mahdizadeh K, Nakhaei MH, Salehiniya H, Sahranavard S. Trends of suicide attempts and factors related to completed suicide during the years 2014-2019 in South Khorasan province, Iran. Asian J Psychiatr. 2021;65:102825. doi: 10.1016/j.ajp.2021.102825.
80. Soltani S, Aghakhani K, Barzegar A, Ghadirzadeharani M, Fallah F. Epidemiology of completed suicides referred to forensic pathology organization of Tehran, Iran, during March 2011 to March 2016. Int J Med Toxicol Forensic Med. 2017;7(3):151-8. doi: 10.22037/ijmtfm.v7i3(Summer).16802.
81. Forouzesh M, Barzegar A, Mahdavi SA, Ghadipasha M, Mousavi SS, Kordrostami R, et al. The rate of suicide and its reasons in children under the age of 18 years. Int J Med

Toxicol Forensic Med. 2021;12(2):35084. doi: 10.32598/ijmtfm.vi.35084.
82. Taghaddosinejad F, Sheikhazadi A, Behnoush B, Reshadati J, Sabery SH. A survey of suicide by burning in Tehran, Iran. Acta Med Iran. 2010;48(4):266-72.
83. Kordrostami R, Akhgari M, Ameri M, Ghadipasha M, Aghakhani K. Forensic toxicology analysis of self-poisoning suicidal deaths in Tehran, Iran; trends between 2011-2015. Daru. 2017;25(1):15. doi: 10.1186/s40199-017-0181-1.
84. Koohestani A, Owliaey H, Salimi Z, Bidaki R, Ghazanfari Nasrabad M. Investigating the related factors on suicide methods and suicide attempts in Yazd, Iran. Journal of Fundamentals of Mental Health. 2021;23(4):299-304. doi: 10.22038/jfmh.2021.19012.
85. Ghodsi Z, Moghaddam SS, Vezvaei P, Yoosefi M, Rezaei N, Saadat S, et al. The mortality rate from self-harm in Iran. Public Health. 2020;186:44-51. doi: 10.1016/j.puhe.2020.06.015.
86. Hajebi A, Ahmadzad-Asl M, Davoudi F, Ghayyomi R. Trend of suicide in Iran during 2009 to 2012: epidemiological evidences from national suicide registration. Iran J Psychiatry Behav Sci. 2016;10(4):e4398. doi: 10.17795/ijpbs-4398.
87. Hajebi A, Abbasi-Ghahramanloo A, Hashemian SS, Khatibi SR, Ghasemzade M, Khodadost M. Risk-taking behaviors and subgrouping of suicide in Iran: a latent class analysis of national registries data. Psychiatry Res. 2017;255:355-9. doi: 10.1016/j.psychres.2017.05.052.
88. Hashemi Nazari SS, Mansori K, Nazari Kangavari H, Shojaei A, Arsang-Jang S. Spatio-temporal distribution of suicide risk in Iran: a Bayesian hierarchical analysis of repeated cross-sectional data. J Prev Med Public Health. 2022;55(2):164-72. doi: 10.3961/jpmph.21.385.
89. Ahmad Kiadaliri AA, Saadat S, Shahnavazi H, Haghparast-Bidgoli H. Overall, gender and social inequalities in suicide mortality in Iran, 2006-2010: a time trend province-level study. BMJ Open. 2014;4(8):e005227. doi: 10.1136/bmjopen-2014-005227.
90. Izadi N, Mirtorabi SD, Najafi F, Nazparvar B, Nazari Kangavari H, Hashemi Nazari SS. Trend of years of life lost due to suicide in Iran (2006-2015). Int J Public Health. 2018;63(8):993-1000. doi: 10.1007/s00038-018-1151-1.
91. Razai D, Ghadirzadeh MR, Mahdavi SA, Hasani J, Hashemi Nazari SS. The suicide rate in the elderly population of Iran between 2008 and 2014. J Res Health Sci. 2020;20(1):e00471. doi: 10.34172/jrhs.2020.06.
92. Saberi-Zafaghandi MB, Hajebi A, Eskandarieh S, Ahmadzad-Asl M. Epidemiology of suicide and attempted suicide derived from the health system database in the Islamic Republic of Iran: 2001-2007. East Mediterr Health J. 2012;18(8):836-41. doi: 10.26719/2012.18.8.836.
93. Sharif-Alhoseini M, Rasouli MR, Saadat S, Haddadi M, Gooya MM, Afsari M, et al. Suicide attempts and suicide in Iran: results of national hospital surveillance data. Public Health. 2012;126(11):990-2. doi: 10.1016/j.puhe.2012.06.006.
94. Shojaei A, Shamsiani H, Moradi S, Alaedini F, Khademi A. The study of successful cases of suicide commitment referred to Iran Legal Medicine Organization in 2010. Iran J Forensic Med. 2012;18(1):7-15.
95. Snowdon J, Saberi SM, Moazen-Zadeh E. A comparison between the age patterns and rates of suicide in the Islamic Republic of Iran and Australia. East Mediterr Health J. 2020;26(6):748-54. doi: 10.26719/2020.26.6.748.
96. Shojaei A, Moradi S, Alaeddini F, Khodadoost M, Barzegar A, Khademi A. Association between suicide method, and gender, age, and education level in Iran over 2006-2010. Asia Pac Psychiatry. 2014;6(1):18-22. doi: 10.1111/appy.12097.
97. Tabesh A, Haj-Manoochehri R. Determining the socio-economic factors affecting the suicide rate in Iran based on Bayesian model averaging approach. Iran J Forensic Med. 2021;27(2):93-104.
98. Kazemi-Galougahi MH, Mansouri A, Akbarpour S, Bakhtiyari M, Sartipi M, Moradzadeh R. Income-related inequality in completed suicide across the provinces of Iran. Epidemiol Health. 2018;40:e2018012. doi: 10.4178/epih.e2018012.
99. Hajizadeh Asl A, Jafari J, Khodamoradi H. Investigating the impact of economy on suicide rate in Iran. Police Cultural Studies. 2021;8(2):1-14. [Persian].
100. Haghparast-Bidgoli H, Rinaldi G, Shahnavazi H, Bouraghi H, Ahmad Kiadaliri AA. Socio-demographic and economics factors associated with suicide mortality in Iran, 2001-2010: application of a decomposition model. Int J Equity Health. 2018;17(1):77. doi: 10.1186/s12939-018-0794-0.
101. Mahdavi SA, Rezaeian S, Rostami M. Profile of fatal suicide in Iran: a report from the Iranian forensic medicine between 2016 and 2018. Acta Med Iran. 2020;58(10):508-12. doi: 10.18502/acta.v58i10.4913.
102. Azizpour Y, Asadollahi K, Sayehmiri K, Kaikhavani S. Investigation of the outcomes and varieties of violent suicides during a period of twenty years in Ilam, Iran. Tehran Univ Med J. 2017;75(7):530-7. [Persian].
103. Miranda-Mendizabal A, Castellví P, Parés-Badell O, Alayo I, Almenara J, Alonso I, et al. Gender differences in suicidal behavior in adolescents and young adults: systematic review and meta-analysis of longitudinal studies. Int J Public Health. 2019;64(2):265-83. doi: 10.1007/s00038-018-1196-1.
104. Freeman A, Mergl R, Kohls E, Székely A, Gusmao R, Arensman E, et al. A cross-national study on gender differences in suicide intent. BMC Psychiatry. 2017;17(1):234. doi: 10.1186/s12888-017-1398-8.
105. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) Fatal Injury Reports. 2020. Available from: https://webappa.cdc.gov/sasweb/ncipc/mortrate.html.
106. Health Resources and Services Administration. The Health Professional Shortage Areas (HPSAs). 2020. Available from: https://data.hrsa.gov/tools/shortage-area/hpsa-find.
107. U.S. Department of Veterans Affairs, Office of Mental Health and Suicide Prevention. 2020 National Veteran Suicide Prevention Annual Report. 2020.
108. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Suicide Data and Statistics, Facts About Suicide. 2023. Available from: https://www.cdc.gov/suicide/suicide-data-statistics.html.
109. Statista Research Department. Suicide Rate in England and Wales in 2021, by Age Group 2023. Available from: https://www.statista.com/statistics/289102/suicide-rate-in-the-united-kingdom-uk-by-age.
110. Rostami M, Jalilian A, Mahdavi SA, Bagheri N. Spatial heterogeneity in gender and age of fatal suicide in Iran. J Res Health Sci. 2021;22(1):e00541. doi: 10.34172/jrhs.2022.76.
111. Goldston DB, Daniel SS, Erkanli A, Reboussin BA, Mayfield A, Frazier PH, et al. Psychiatric diagnoses as contemporaneous risk factors for suicide attempts among adolescents and young adults: developmental changes. J Consult Clin Psychol. 2009;77(2):281-90. doi: 10.1037/a0014732.
112. Miranda-Mendizabal A, Castellví P, Parés-Badell O, Alayo I, Almenara J, Alonso I, et al. Gender differences in suicidal behavior in adolescents and young adults: systematic review and meta-analysis of longitudinal studies. Int J Public Health. 2019;64(2):265-83. doi: 10.1007/s00038-018-1196-1.
113. Castellví P, Miranda-Mendizábal A, Parés-Badell O, Almenara J, Alonso I, Blasco MJ, et al. Exposure to violence, a risk for suicide in youths and young adults. A meta-analysis of longitudinal studies. Acta Psychiatr Scand. 2017;135(3):195-211. doi: 10.1111/acps.12679.
114. Olfson M, Blanco C, Wall M, Liu SM, Saha TD, Pickering RP, et al. National trends in suicide attempts among adults in the United States. JAMA Psychiatry. 2017;74(11):1095-103. doi: 10.1001/jamapsychiatry.2017.2582.
115. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). Atlanta, GA: National Centers for Injury Prevention and Control; 2022. Available from: https://wisqars.cdc.gov/data/lcd/home.

116. Case A, Deaton A. Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. Proc Natl Acad Sci U S A. 2015;112(49):15078-83. doi: 10.1073/pnas.1518393112.
117. Phillips JA, Hempstead K. Differences in U.S. suicide rates by educational attainment, 2000-2014. Am J Prev Med. 2017;53(4):e123-30. doi: 10.1016/j.amepre.2017.04.010.
118. Daliri S, Bazyar J, Sayehmiri K, Delpisheh A, Sayehmiri F. Investigation of the incidence rate of suicide in Iran during years 2001-2014: a systematic review and meta-analysis study. J Shahid Sadoughi Univ Med Sci. 2016;24(9):757-68. [Persian].
119. Canetto SS. Language, culture, gender, and intersectionalities in suicide theory, research, and prevention: challenges and changes. Suicide Life Threat Behav. 2021;51(6):1045-54. doi: 10.1111/sltb.12758.
120. van Zalinge E. The Relationship Between Intersectionality and Suicide on Five Different Social Identity Levels [dissertation]. Rijksuniversiteit Groningen; 2021.
121. Øien-Ødegaard C, Hauge LJ, Reneflot A. Marital status, educational attainment, and suicide risk: a Norwegian register-based population study. Popul Health Metr. 2021;19(1):33. doi: 10.1186/s12963-021-00263-2.
122. Durkheim E. Suicide: A Sociological Study. Paris: Alcan; 1897.
123. Fässberg MM, van Orden KA, Duberstein P, Erlangsen A, Lapierre S, Bodner E, et al. A systematic review of social factors and suicidal behavior in older adulthood. Int J Environ Res Public Health. 2012;9(3):722-45. doi: 10.3390/ijerph9030722.
124. Al-Sabaileh S, Abusamak M, Jaber H, Al-Buqour A, Al-Salamat HA, Sabayleh RS, et al. Suicide trends in Jordan in correlation with the COVID-19 pandemic: a forensic medicine perspective. Cureus. 2023;15(7):e42636. doi: 10.7759/cureus.42636.
125. Milner A, Hjelmeland H, Arensman E, De Leo D. Social-environmental factors and suicide mortality: a narrative review of over 200 articles. Sociology Mind. 2013;3(2):137-48. doi: 10.4236/sm.2013.32021.
126. Moradi S, Khademi A. Evaluation of suicides resulting in death in Iran, comparing with the world rates. Iran J Forensic Med. 2002;8(27):16-21. [Persian].
127. Saberi-Zafarghandi MB, Mosavi S, Ghorbani R. Epidemiologic study on suicide attempt in affiliated hospitals of Semnan University of Medical Sciences. 2005;6(4):311-8. [Persian].
128. Amiri S. Unemployment and suicide mortality, suicide attempts, and suicide ideation: a meta-analysis. Int J Ment Health. 2022;51(4):294-318. doi: 10.1080/00207411.2020.1859347.
129. Mathieu S, Treloar A, Hawgood J, Ross V, Kõlves K. The role of unemployment, financial hardship, and economic recession on suicidal behaviors and interventions to mitigate their impact: a review. Front Public Health. 2022;10:907052. doi: 10.3389/fpubh.2022.907052.
130. Milner A, Page A, LaMontagne AD. Long-term unemployment and suicide: a systematic review and meta-analysis. PLoS One. 2013;8(1):e51333. doi: 10.1371/journal.pone.0051333.
131. Haw C, Hawton K, Gunnell D, Platt S. Economic recession and suicidal behaviour: possible mechanisms and ameliorating factors. Int J Soc Psychiatry. 2015;61(1):73-81. doi: 10.1177/0020764014536545.
132. Gunnell D, Chang SS. Economic recession, unemployment, and suicide. In: O'Connor RC, Pirkis J, eds. The International Handbook of Suicide Prevention. Wiley; 2016. p. 284-300. doi: 10.1002/9781118903223.ch16.
133. Mäkinen IH, Rojas Y, Wasserman D. Labour market, work environment, and suicide. In: Wasserman D, ed. Oxford Textbook of Suicidology and Suicide Prevention. Oxford University Press; 2021.
134. Milner A, Page A, LaMontagne AD. Cause and effect in studies on unemployment, mental health and suicide: a meta-analytic and conceptual review. Psychol Med. 2014;44(5):909-17. doi: 10.1017/s0033291713001621.
135. Ivey-Stephenson AZ, Crosby AE, Jack SPD, Haileyesus T, Kresnow-Sedacca MJ. Suicide trends among and within urbanization levels by sex, race/ethnicity, age group, and mechanism of death - United States, 2001-2015. MMWR Surveill Summ. 2017;66(18):1-16. doi: 10.15585/mmwr.ss6618a1.
136. Satherley RM, Hazell CM, Jones CJ, Hanna P. A systematic review of the effects of urban living on suicidality and self-harm in the UK and Ireland. J Urban Health. 2022;99(3):385-408. doi: 10.1007/s11524-022-00611-z.
137. Helbich M, Blüml V, de Jong T, Plener PL, Kwan MP, Kapusta ND. Urban-rural inequalities in suicide mortality: a comparison of urbanicity indicators. Int J Health Geogr. 2017;16(1):39. doi: 10.1186/s12942-017-0112-x.
138. Casant J, Helbich M. Inequalities of suicide mortality across urban and rural areas: a literature review. Int J Environ Res Public Health. 2022;19(5):2669. doi: 10.3390/ijerph19052669.
139. Piraee E, Shahkolahi Z, Salehiniya H. Epidemiological study of suicide and attempted suicide and related factors in Kohgiluyeh, Iran. J Isfahan Med Sch. 2014;32(305):1706-17. [Persian].
140. Nafilyan V, Morgan J, Mais D, Sleeman KE, Butt A, Ward I, et al. Risk of suicide after diagnosis of severe physical health conditions: a retrospective cohort study of 47 million people. Lancet Reg Health Eur. 2023;25:100562. doi: 10.1016/j.lanepe.2022.100562.
141. Jacob L, Oh H, Koyanagi A, Smith L, Kostev K. Relationship between physical conditions and attempted or completed suicide in more than 9,300 individuals from the United Kingdom: a case-control study. J Affect Disord. 2020;274:457-63. doi: 10.1016/j.jad.2020.05.121.
142. Ahmedani BK, Peterson EL, Hu Y, Rossom RC, Lynch F, Lu CY, et al. Major physical health conditions and risk of suicide. Am J Prev Med. 2017;53(3):308-15. doi: 10.1016/j.amepre.2017.04.001.
143. Phillips JA, Hempstead K. The role of context in shaping the relationship between physical health and suicide over the life course. SSM Popul Health. 2022;17:101059. doi: 10.1016/j.ssmph.2022.101059.
144. Fegg M, Kraus S, Graw M, Bausewein C. Physical compared to mental diseases as reasons for committing suicide: a retrospective study. BMC Palliat Care. 2016;15:14. doi: 10.1186/s12904-016-0088-5.
145. Pacchioni F, Bosia M, Moretti G, Barbieri C, Bellumore S, Travaini G. Mind the past: a systematic review on psychological autopsy. Behav Sci Law. 2023;41(5):343-72. doi: 10.1002/bsl.2619.
146. Too LS, Spittal MJ, Bugeja L, Reifels L, Butterworth P, Pirkis J. The association between mental disorders and suicide: a systematic review and meta-analysis of record linkage studies. J Affect Disord. 2019;259:302-13. doi: 10.1016/j.jad.2019.08.054.
147. Moitra M, Santomauro D, Degenhardt L, Collins PY, Whiteford H, Vos T, et al. Estimating the risk of suicide associated with mental disorders: a systematic review and meta-regression analysis. J Psychiatr Res. 2021;137:242-9. doi: 10.1016/j.jpsychires.2021.02.053.
148. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Violence Prevention. National Violent Death Reporting System (NVDRS). 2023. Available from: https://www.cdc.gov/violenceprevention/datasources/nvdrs/index.html.
149. National Alliance on Mental Illness. Risk of Suicide. 2023. Available from: https://www.nami.org/About-Mental-Illness/Common-with-Mental-Illness/Risk-of-Suicide.
150. Yeh HH, Westphal J, Hu Y, Peterson EL, Williams LK, Prabhakar D, et al. Diagnosed mental health conditions and risk of suicide mortality. Psychiatr Serv. 2019;70(9):750-7. doi: 10.1176/appi.ps.201800346.
151. Corrigan PW, Druss BG, Perlick DA. The impact of mental

illness stigma on seeking and participating in mental health care. Psychol Sci Public Interest. 2014;15(2):37-70. doi: 10.1177/1529100614531398.
152. Tesfaye Y, Agenagnew L, Anand S, Tucho GT, Birhanu Z, Ahmed G, et al. Knowledge of the community regarding mental health problems: a cross-sectional study. BMC Psychol. 2021;9(1):106. doi: 10.1186/s40359-021-00607-5.
153. Mak WW, Cheung FM, Wong SY, Tang WK, Lau JT, Woo J, et al. Stigma towards people with psychiatric disorders. Hong Kong Med J. 2015;21 Suppl 2:9-12.
154. Taghva A, Farsi Z, Javanmard Y, Atashi A, Hajebi A, Khademi M. Stigma barriers of mental health in Iran: a qualitative study by stakeholders of mental health. Iran J Psychiatry. 2017;12(3):163-71 .
155. Wahl O, Aroesty-Cohen E. Attitudes of mental health professionals about mental illness: a review of the recent literature. J Community Psychol. 2010;38(1):49-62. doi: 10.1002/jcop.20351.
156. Masoomi M, Hosseinikolbadi S, Saeed F, Sharifi V, Jalali Nadoushan AH, Shoib S. Stigma as a barrier to suicide prevention efforts in Iran. Front Public Health. 2022;10:1026451. doi: 10.3389/fpubh.2022.1026451.
157. Favril L, Yu R, Geddes JR, Fazel S. Individual-level risk factors for suicide mortality in the general population: an umbrella review. Lancet Public Health. 2023;8(11):e868-77. doi: 10.1016/s2468-2667(23)00207-4.
158. Favril L, Yu R, Uyar A, Sharpe M, Fazel S. Risk factors for suicide in adults: systematic review and meta-analysis of psychological autopsy studies. Evid Based Ment Health. 2022;25(4):148-55. doi: 10.1136/ebmental-2022-300549.
159. Shakeri A, Jafarizadeh F. The reasons for successful suicides in Fars province. J Mazandaran Univ Med Sci. 2013;22(97):271-5. [Persian].
160. Rizk MM, Herzog S, Dugad S, Stanley B. Suicide risk and addiction: the impact of alcohol and opioid use disorders. Curr Addict Rep. 2021;8(2):194-207. doi: 10.1007/s40429-021-00361-z.
161. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. Psychol Med. 2003;33(3):395-405. doi: 10.1017/s0033291702006943.
162. Wilcox HC, Conner KR, Caine ED. Association of alcohol and drug use disorders and completed suicide: an empirical review of cohort studies. Drug Alcohol Depend. 2004;76 Suppl:S11-9. doi: 10.1016/j.drugalcdep.2004.08.003.
163. Cheek SM, Nestor BA, Liu RT. Substance use and suicidality: specificity of substance use by injection to suicide attempts in a nationally representative sample of adults with major depression. Depress Anxiety. 2016;33(6):541-8. doi: 10.1002/da.22407.
164. Esang M, Ahmed S. A closer look at substance use and suicide. Am J Psychiatry Resid J. 2018;13(6):6-8. doi: 10.1176/appi.ajp-rj.2018.130603.
165. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Facts About Suicide. 2023. Available from: https://www.cdc.gov/suicide/facts/index.html.
166. Orpana H, Giesbrecht N, Hajee A, Kaplan MS. Alcohol and other drugs in suicide in Canada: opportunities to support prevention through enhanced monitoring. Inj Prev. 2021;27(2):194-200. doi: 10.1136/injuryprev-2019-043504.
167. Buckley N. Substance Use and Suicide among Youth: Prevention and Intervention Strategies - Robyn J. McQuaid, Research and Policy Analyst. Canada: Mental Health Commission of Canada; 2017.
168. Jafari F, Ahmadi A, Amiresmaili M, Moosazadeh M. Seasonality pattern of suicide in Iran: a systematic review. Journal of School of Public Health & Institute of Public Health Research. 2014;12(3):23-35. [Persian].
169. 170Partonen T, Haukka J, Nevanlinna H, Lönnqvist J. Analysis of the seasonal pattern in suicide. J Affect Disord. 2004;81(2):133-9. doi: 10.1016/s0165-0327(03)00137-x.
170. Christodoulou C, Douzenis A, Papadopoulos FC, Papadopoulou A, Bouras G, Gournellis R, et al. Suicide and seasonality. Acta Psychiatr Scand. 2012;125(2):127-46. doi: 10.1111/j.1600-0447.2011.01750.x.
171. Della DF, Allison S, Bidargaddi N, Wa SK, Bastiampillai T. An umbrella systematic review of seasonality in mood disorders and suicide risk: the impact on demand for primary behavioral health care and acute psychiatric services. Prim Care Companion CNS Disord. 2023;25(3). doi: 10.4088/PCC.22r03395.
172. Coimbra DG, Pereira E Silva AC, de Sousa-Rodrigues CF, Barbosa FT, de Siqueira Figueredo D, Araújo Santos JL, et al. Do suicide attempts occur more frequently in the spring too? A systematic review and rhythmic analysis. J Affect Disord. 2016;196:125-37. doi: 10.1016/j.jad.2016.02.036.
173. Vyssoki B, Kapusta ND, Praschak-Rieder N, Dorffner G, Willeit M. Direct effect of sunshine on suicide. JAMA Psychiatry. 2014;71(11):1231-7. doi: 10.1001/jamapsychiatry.2014.1198.
174. Saadat M. Epidemiology and mortality of hospitalized burn patients in Kohkiluye va Boyerahmad province (Iran): 2002-2004. Burns. 2005;31(3):306-9. doi: 10.1016/j.burns.2004.10.012.
175. Mehrpour O, Javadinia SA, Malic C, Dastgiri S, Ahmadi A. A survey of characteristics of self-immolation in the east of Iran. Acta Med Iran. 2012;50(5):328-34.
176. Räsänen P, Hakko H, Jokelainen J, Tiihonen J. Seasonal variation in specific methods of suicide: a national register study of 20,234 Finnish people. J Affect Disord. 2002;71(1-3):51-9. doi: 10.1016/s0165-0327(01)00411-6.
177. Morovatdar N, Moradi-Lakeh M, Malakouti SK, Nojomi M. Most common methods of suicide in Eastern Mediterranean region of WHO: a systematic review and meta-analysis. Arch Suicide Res. 2013;17(4):335-44. doi: 10.1080/13811118.2013.801811.
178. Wu KC, Chen YY, Yip PS. Suicide methods in Asia: implications in suicide prevention. Int J Environ Res Public Health. 2012;9(4):1135-58. doi: 10.3390/ijerph9041135.
179. Farzaneh E, Mehrpour O, Alfred S, Hassanian Moghaddam H, Behnoush B, Seghatoleslam T. Self-poisoning suicide attempts among students in Tehran, Iran. Psychiatr Danub. 2010;22(1):34-8.
180. Bidel Z, Nazarzadeh M, Ayubi E, Sayehmiri K. Prevalence of important poisoning methods used in Iranian suicides: a systematic review and meta-analysis. Koomesh. 2013;14(3):257-64. [Persian].
181. Bagherian F, Kalani N, Rahmanian F, Abiri S, Hatami N, Foroughian M, et al. Aluminum phosphide poisoning mortality rate in Iran; a systematic review and meta-analysis. Arch Acad Emerg Med. 2021;9(1):e66. doi: 10.22037/aaem.v9i1.1396.
182. Ahmadi A. Suicide by self-immolation: comprehensive overview, experiences and suggestions. J Burn Care Res. 2007;28(1):30-41. doi: 10.1097/BCR.0b013E31802C8878.
183. Sayemiri K, Tavan H, Shohani M, Valizadeh R. Forms of self-immolation in Iran: a systematic review and meta-analysis. Iran J Psychiatry Behav Sci. 2021;15(1):e83774. doi: 10.5812/ijpbs.83774.
184. Masoomi M, Gholamian F, Sharifi V, Shadloo B. Self-immolation among women in Iran: a narrative review. Iran J Psychiatry Behav Sci. 2020;14(4):e96557. doi: 10.5812/ijpbs.96557.
185. Keyvanara M, Kalantari E, Shaarbafchizadeh N. Social contexts of self-immolation among women admitted to Isfahan burns hospital, Iran: a qualitative study. J Health Syst Res. 2022;18(2):95-103. doi: 10.48305/jhsr.v18i2.1452. [Persian].