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# Socio-demographic status and 12 years trend of completed suicide in East Azerbaijan Province, Iran, during the period 2007–2018

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## Abstract

**Background:** The incidence rate of suicide has been increased in Iran over the past decades especially in East Azerbaijan Province which there are limited studies on suicide. We aimed to investigate the 12-year trend of suicide and demographic characteristics in East Azerbaijan Province during the period 2007–2018. We obtained the data on the suicide mortality and socio-demographic status from the Death Registry Information System (DRIS) and compared with legal medicine suicide statistics during the study period.

**Results:** A total of 2422 and 1783 suicide cases were reported by legal medicine and DRIS (average incidence rate 5.94 vs 4.4 per 100,000) in the 12-year period from 2007 to 2018, respectively. The suicide rate in males was more than two times that of females. The mean and median age of suicide was 34.07 and 31 years, respectively. The most common suicide method was hanging (51.9%). The incidence rate of suicide cases was decreasing between 2007 and 2014, however from 2015 to 2018 has been increased.

**Conclusions:** The incidence rate of suicide in this province has been increasing with a smooth slope. Community-based programs and measures should be taken to stop the growth rate of suicide.

**Keywords:** Suicide, Incidence, Trend, East Azerbaijan

## Background

Suicide has defined the act of intentionally self-killing [1, 2]. Suicide is an important and ongoing health concern around the world [3]. Annually, approximately 1 million people die due to suicide, yet in many settings, most suicide deaths go undetected and these numbers are the tip of the iceberg [2, 4]. Suicide rate is usually higher among developed and Eastern Europe and Eastern Mediterranean, and Islamic countries have lower suicide rates, due to

many social and religious aspects and/or lack of effective registry for suicide systems [5, 6]. However, based on standard mortality rates for suicide, low- and middle-income and high-income countries have similar rates at 11.2 and 12.7 per 100,000 people, respectively [7]. In fact, over 79% of global suicides occurred in low- and middle-income countries in 2016 and approximately 60% of the suicides occur in Asian countries [8]. It seems that suicide has come from Western Europe to Eastern Europe, and now Asia has become the heart of the problem [9].

World Health Organization (WHO) reported that the average rate of suicide in Iran is 5.3 per 100,000 people and across the provinces mortality rate of suicide ranged from 2.2 to 19.53 per 100,000 persons in 2012 which

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majority of suicides has occurred in men (66%) [10, 11]. The high incident of suicides in both sexes were occurred in the adult age groups (16.1 per 100,000) that directly affect Years of Life Lost (YLL) and also Disability Adjusted Life Years (DALY) [11].

There are many important risk factors for completed suicide including psychiatric disorders, particularly depressive disorders, history of suicide attempts or suicidal behaviors, physical illnesses, and lack of social support and personality aspects [12, 13]. In developed countries, more than 90% of suicide cases have some grade of mental illness, and among Asian countries including India and China, almost 60% of suicides have suffered from psychological disorders [10]. In Iran, the most common ways of suicide and suicide attempts are medication overdose or poisoning and hanging. However, the suicide method is different base on demographic characteristics including age, sex, and social or education level [14].

Researches on suicide have been broadly published in developed and industrialized settings; however, it is poorly understood among low- and middle-income countries especially in East Azerbaijan Province and Iran. In East Azerbaijan Province, there is a lack of studies on a better understanding of long-term suicide distribution and demographic situation. Moreover, advances in understanding local and up-to-date information about suicide trends and distributions in East Azerbaijan as a developing setting provide valuable information for the policymakers on need assessment and revising of the development strategies. Consequently, this study was aimed to investigate the 12-year trend and rate of suicide and demographic characteristics in East Azerbaijan Province during the period 2007–2018.

## Methods

### Study design and setting

This cross-sectional study was investigated all suicide deaths in East Azerbaijan Province during the period 2007–2018. Data were collected from the Death Registry Information System (DRIS), legal statistics, and the department of mental health for suicide surveillance systems. Legal medicine is a valid data source for any injury, factional, and criminal lethal in Iran. Suicide death was determined based on specialist legal medicine doctors after anatomic assessment and confirmation.

In the DRIS, all deaths, as well as suicide deaths, were collected from all over community-based health homes and health centers, hospitals, legal medicine, and cemeteries based on the same “death certificates” in each county and then all confirmed deaths included in the DRIS. The overlap cases were corrected in the province registry system. Demographic characteristics and population size data were obtained through the results of the general population census and DRIS. Moreover, we

obtained numbers of suicide deaths from province legal medicine for comparing suicide rates between these two databases and reliability assessment of suicide deaths.

Morbidity of mental disorder was determined based on the electronic suicide registry system and the Health Integrated System (SIB). In this system, mental disorders screened by family physicians in the initial step and then confirmed by psychiatrists after psychiatric interview via structured tools.

### Data analysis

Data were analyzed using SPSS (v. 19.0, Chicago, IL, USA) and EXEL 2013. Descriptive statistics and graphs were used to describe frequencies and ratios of suicide deaths. The incidence rate was calculated per 100,000 by years from the data on population from the statistical center of Iran.

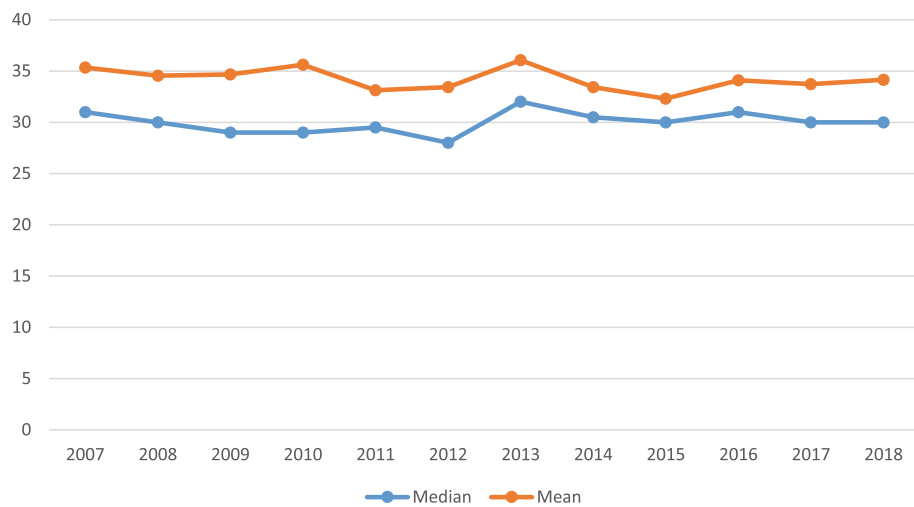
## Results

This study included 2422 and 1783 cases of suicide deaths in the 12-year period 2007–2018 in East Azerbaijan Province based on two vital statistic information systems including DRIS and legal medicine, respectively. The mean age of suicide cases was higher than the median age in all over the years. The overall mean age of all suicide cases was  $34.07 \pm 15.68$  (range 7–92) years while the median age was 31 years (Fig. 1).

The majority of suicidal cases 1102 (61.82%) were in the age group of 25–59 years while the lowest suicide distribution 59 (3.33%) occurred in the age group below 14 years. The gender distribution for all suicide cases was 1204 (67.5%) males, 1152 (64.63%) were married, and 36.5% were unemployed. Likewise, more than 58% of participants had secondary school education, and almost 70% of those have occurred in urban settings. Moreover, out of those, 17.7%, and 6.2% had a history of at least one psychiatric disorder and history of attempt, respectively (Table 1).

The completed suicidal rates by two different database systems including DRIS and legal medicine are shown in Table 2. Totally, suicide rates in legal medicine were higher than DRIS the all over years. The total number of suicide cases based on legal medicine and DRIS in the 12-year period were 5.94, and 4.4 per 100,000 in both genders, respectively. In both registry systems and all years of the study period, suicidal deaths were high among males. In both registry systems of legal medicine and DRIS, the highest rate in 2008 (8.42, and 6.17 per 100,000) and the lowest rate occurred in 2014 (3.78, and 2.7 per 100,000), respectively. Overall, the incidence trend of suicide in this province increasing from 2.7 in 2004 to 5.65 per 100,000 persons in 2018.

Table 3 indicates suicide methods in the 12 years. The most common method of suicide was hanging 1058



**Fig. 1** Mean and median age of suicides in East Azerbaijan Province during 2007–2018 ( $P = 0.027$ )

(61.6%) and poisoning or medication overdose methods 471 (26.4%).

## Discussion

This study investigates the rate of completed suicide in the general population in East Azerbaijan Province during the years 2007 to 2018, where there are limited documents about suicide. The trend of suicide cases was decreasing between 2007 and 2014, but from 2015 to 2018 has been increasing with a smooth slope. Totally, the incidence rate of suicide has increased slightly during the study period from 2007 to 2018. The pattern of suicide trend in the present study is in line with the trend of all Iranian completed suicide cases reported by Razai et al. [10].

The incidence rate of suicide in males was higher than in females all over the years. The highest incidence rate was in men, 6.17 per 100,000 in 2008. For females, the highest suicide rate was 2.16 per 100,000 in 2018. Our findings were congruent with other studies done in various provinces of Iran [15–17]. A systematic review and meta-analysis study in Iran revealed that western regions have shown the highest suicide rate 12.9 per 100,000 [18].

In this study, we compared suicide incidence trends via two valid registry-based systems including legal medicine and DRIS while most studies have only evaluated the trend of suicide through a single database. In this province, the incidence rates of suicide based on legal medicine were higher than DRIS around all years and there was a noticeable difference in the number of suicides between the two databases.

In the present study, 2422, and 1783 suicide cases (total incidence rate 5.94 vs 4.4 per 100,000) were reported by legal medicine and DRIS in East Azerbaijan Province during the period 2007–2018, respectively.

Hajebi et al. found the incidence rate of suicide ranged from 1.76 to 2.23 per 100,000 persons among Iranian from 2009 to 2012 based on National Suicide Registration System [19]. Similar to the present study in Hajebi study and also a recently published study in 2021 by Mahdavi, the hanging was the most common suicide methods among all country suicide cases [20].

In the present study, the mean and median age of suicide death was 34.07 and 31 years, respectively and 67.5% were males, and 64.63% were married. The highest suicide rates were found in the age groups of 15–24 (26.21%) and 25–59 years (61.82%), the majority of suicidal people used hanging (61.6%) as the suicide method. Occupation distribution was (36.5%) unemployment or free, and secondary education level was 58.1%, and the urban setting was 69.2%. Currently, a study in agreement with our study that performed based on the Iranian forensic medicine during 2016 and 2018 found that the median age of suicide cases was 31 years, and 30 to 59 age group was prevalent category and 71.2% were men [20].

The findings of the present study were in agreement with the study in Brazil, the incidence rate of suicide has increased from 5.84 per 100,000 persons in 2000 to 7.23 per 100,000 in 2015 and represents a 19% increase in the incidence of suicide deaths over the period [13].

In the present study, males have committed suicide more than two times than females. According to the WHO report in 2016, the mortality rate by suicide in males has been about twice that of females [10]. Likewise, the male to female sex ratio was 1.4 in the Zhong study, and suicide in men has been observed 40% higher than in women [21]. In the study in Brazil from 1980 to 2009, the male to female sex ratio was more than 4 times [22]. In the study by Sharafkhani et al. in Oromiya, Iran, the ratio of the odds of suicide steer to death in

**Table 1** Baseline characteristics of suicide deaths based on Death Registry Information System in East Azerbaijan Province, during 2007-2018

Variable	Frequency (n = 1783)	%
Gender		
Female	579	32.5
Male	1204	67.5
Age		
Mean $\pm$ SD, (range)	34.07 $\pm$ 15.68, (7–92)	
$\leq$ 14	59	3.33
15–24	467	26.21
25–59	1102	61.82
$\geq$ 60	144	8.1
Educational level		
Primary school	522	29.3
Secondary school	1036	58.1
High school and Academic	219	12.3
Resident		
Urban	1234	69.2
Rural	549	30.8
Occupation		
Free, and unemployment	651	36.5
Student (school-university)	225	12.6
Housewife	464	26
Farming or farming related	269	15.1
Employment	55	3.1
Others	119	6.7
Marital status		
Single	575	32.25
Married	1152	64.63
Widow and divorced	56	3.12
History of attempt		
Yes	111	6.2
No	1637	91.8
History of mental disorder		
Yes	316	17.7
No	1467	82.3

males was 3 times higher than that of females [23]. However, in most findings, suicide attempts have been more prevalent among females. Using harsher and aggressive methods including the hanging methods and firearms are the main reasons for the significant difference in suicide mortality in males compared to females that increased fatal and decreased odds of survival. In contrast, females tend to medication overdose and poisoning that are fewer considered to be lethal [24].

Likewise, in the present study, more than 61% of participants used the hanging suicide method. Evidence indicates the use of violent and aggressive methods for suicide growths the hazard of completed suicide 12 times [10]. Drug and substance abuse and also mental-neurological problems are other reasons for high suicide rates among males [25]. The same results were found in the USA and Brazil that 72% of suicide cases were committed using firearms [13, 26]. Despite that, hanging is the most commonly used suicide method globally; however, the distribution of the methods is diverse among various settings.

In the recent decade, the concern of suicide death has shifted from developed and industrialized countries and now to Asia [27]. Decreasing social and mental health supports and also social happiness, alterations in the family and community habits and customs are the most important factors in rising of suicide and suicidal behaviors over the last year s[10]

In the present study, the majority of suicidal cases were observed in the age groups of 25–59 and 15–25 years, which were consistent with the results of previous studies [16, 28, 29]. This shows the essence of paying attention to this group of people, as they are the productive generation of the community. The suicidal behaviors distribution and correlated factors in the age group of 15–29 years have been the focus of various studies, proposing the role of family conflicts and divorce, disturbing hormonal fluctuations and mental health status, and access to the firearm as the main elements for the high incidence rate in this people [3, 30]. In Iran, one of the factors that belong in the event of Konkoor as a national university entrance exam that imposes great pressure on Iranian adolescences at this age group, and the higher suicidal behaviors incident in June and July might also be attributed to the same event [31].

Comparing the incidence rate of the present study with other studies shows that the suicide mortality in East Azerbaijan Province is lower than most European countries and the USA [32, 33] and also lower than in Eastern Provinces of Iran including Ilam [34]; however, it is slightly higher than whole country suicide mortality rates which shows the necessity to pay attention to this social concern issue in this province, as the fourth populous province of Iran.

#### Strengths and limitations

The main strength of this study is using two valid suicide registry-based systems including legal medicine and DRIS to prevent the possibility of under-reporting which rare studies focused on. Nevertheless, this study had limitations. First, we did not calculate age standard mortality rates; however, the age

**Table 2** Comparison of suicide rates between legal medicine statistics and Death Registry Information System in East Azerbaijan Province during the period 2007–2018

Years	Population	Legal medicine		Death registry system			
		N	Rate	N	Total rate	Female	Male
2007	3263637	248	7.60	184	5.63	2.11	4.27
2008	3289747	277	8.42	203	6.17	2.05	5.02
2009	3296587	175	5.31	131	3.97	1.48	2.83
2010	3358849	202	6.01	151	4.5	1.87	3.88
2011	3301616	186	5.63	139	4.21	1.69	3.23
2012	3334491	194	5.82	142	4.26	1.56	3.46
2013	3400618	168	4.94	121	3.56	1.38	2.77
2014	3408425	129	3.78	92	2.7	1.25	2.09
2015	3526045	159	4.51	120	3.4	1.41	2.64
2016	3506581	183	5.22	137	3.9	1.57	2.57
2017	3518990	227	6.45	161	4.57	1.74	3.43
2018	3572038	274	7.67	202	5.65	2.16	4.18
Total		2422	5.94	1783	4.40	1.52	3.26

distribution in this province and age categories are similar to the age distribution of the national population and there are no differences between those.

Second, we used only one data source (DRIS source) for presenting study results due to the unavailability and inaccessibility of participant's characteristics and ethical limitations of suicide cases in legal medicine.

## Conclusion

A total of 2422 and 1783 suicide cases (average incidence rate 5.94 vs 4.4 per 100,000) were reported by legal medicine and DRIS in East Azerbaijan Province during the period 2007–2018. The incidence rates of suicide based on legal medicine were higher than DRIS. Overall, the incidence rate of suicide in this province has been increasing with a smooth slope so that it was increased from 2.7 in 2014 to 5.65 per 100,000 persons in 2018. Considering the increasing trend of suicide rates in East Azerbaijan Province, community-based programs and measures should be taken to suicide prevention.

**Table 3** Methods of suicide deaths in East Azerbaijan Province based on DRIS during the period 2007-2018

Suicide methods	N = 1783	%
Hanging	1098	61.6
Poisoning or medications	471	26.4
Self-injury	125	7
Fall	39	2.2
Self-immolation	30	1.7
Others or unknown	14	0.8

## Abbreviation

DRIS: Death Registry Information System

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## Authors' contributions

MF and HA: concept and design. MN and MF: data collection and interpretation of the data. VA, MN, AH, and II performed the study and analysis. HA and MF: writing of the draft. All authors read and approved the study.

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## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

This study was approved by ethics committee of Tabriz University of Medical Sciences to number: IR.TBZMED.REC.1398.870. The present study was derived from the MD thesis and no human samples were investigated or interviewed.

### Consent for publication

Not applicable

### Competing interests

The authors declare that there is no conflict of interest and financial disclosure.

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