



# Suicides, Homicides, and Fatal Occupational Accidents in Iran: A Cross-Sectional, Retrospective Study Based on Autopsy Reports; Need to Develop Preventive Strategies

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## Abstract

**Background:** There are five different kinds of death; natural death due to any disease, accidental death, suicidal death, homicidal death, and undetermined death.

**Objectives:** This study aimed to determine the major causes of death based on the autopsied reports to aid the development of preventive strategies.

**Methods:** This study was a retrospective cross-sectional study consisting of autopsy reports of all suicidal, homicidal and occupational deaths recorded in all forensic medicine dissection halls in thirty-two provinces of Iran from March 2011 to March 2015. A questionnaire was designed containing all the information required for our studies such as gender, age, cause of death, and the autopsy reports.

**Results:** There were 19288 suicides, 11655 homicides, and 8558 occupational deaths during five years. Among suicidal deaths, there were seventy percent male and thirty percent female. Most victims (about 22%) were between 18 to 24 years old (Mean age  $\pm$  SD: 33.1  $\pm$  13.1 years). The highest cases of suicide were 52% hanging, and 25% poisoning, respectively. Among homicidal victims, there were 18% males and 20% females. Most victims were between 25 to 29 years old (24%) (Mean age  $\pm$  SD: 32.4  $\pm$  15.6 years). The most common methods were 46% firearms, and 29% stab wounds, respectively. Among occupational deaths happened in 99% of males and 1% of females. The most common victims' age-group was 30 - 39 years old (25%) (Mean age  $\pm$  SD: 35.8  $\pm$  10.3 years). Seventy-four percent of cases were caused by blunt trauma as a result of falling from a height. The second common cause of death was Electrocutation (21% of the cases).

**Conclusions:** The analysis of the causes of suicidal, homicidal, occupational deaths, can aid the development of preventive strategies to decrease the occurrence of these kinds of preventable deaths in Iran.

**Keywords:** Accidents, Autopsy, Death, Fatal, Forensic Medicine, Homicide, Occupational, Prevention, Suicide

## 1. Background

There are five different kinds of death including natural death, accidental death, suicidal death, homicidal death, and undetermined death (1). Natural deaths caused by any kind of disease or disorder like cardiovascular disorders, cerebral disorders, autoimmune diseases, hematologic diseases, infectious diseases, malignant tumors, etc. all of them can be congenital or acquired. Accidental deaths include any kind of fatal accident like occupational fatal accidents, transport accidental deaths, electrocution, lightning, drowning, unintentional poisoning, and so on. Suicidal deaths are those caused by any intentional act that a person carries out towards ending his own life such as

self-immolation, intentional drug overdose, falling from a height, etc. Homicidal death is a criminal offense, an act of killing a person. There are many different forms of homicide like hanging, strangulation, using firearms, assaults, and so on. Undetermined deaths include any kind of death not categorized in the above groups (2, 3). Most suicidal deaths, homicidal deaths, and occupational fatal accidents can be preventable (4, 5), but in order for responsible organizations in our country to discover preventive strategies such as the Ministry of Health and Education of Iran, Ministry of Labor and Social Affairs of Iran, State Welfare Organization of Iran, Iranian Psychiatric Association, and etc. We should investigate the underlying causes of these kinds of deaths. According to Iranian laws, any un-

natural death should be referred to the autopsy hall in order to determine the leading cause of death by toxicological, histopathological, and clinical studies. We did not find any official statistics about the characteristics of suicidal deaths, homicidal deaths and also occupational fatal accidents in Iran. Therefore

## 2. Objectives

The present retrospective cross-sectional study was carried out to examine the characteristics of all suicidal, homicidal and occupational death files in Iran autopsy halls from 2011 to 2015. We had extracted gender, age, and methods of all suicidal, homicidal and occupational deaths during the five-year study.

## 3. Methods

### 3.1. Study Design

In this retrospective cross-sectional study during five years, from March 2011 to March 2015, autopsy reports of all suicidal, homicidal and occupational deaths referred to all forensic medicine dissection halls in all 32 provinces of Iran, were studied. As a rule, all unnatural deaths in any province of Iran must refer to the dissection hall in order to determine cause of death through autopsy; accordingly, when we investigated the autopsy files of all thirty-two provinces dissection hall, we were able to obtain all the autopsy files related to suicidal, homicidal and occupational deaths.

### 3.2. Data Collection

We designed a questionnaire containing all information required in our study such as gender, age, and autopsy for each year. The data from the autopsy files belonged to suicidal, homicidal and occupational deaths from all thirty-two provinces of Iran were extracted to complete our questionnaire. We had not mentioned any deceased' identity information in our study. We had extracted public data from their autopsy files such as sex, age-group, autopsy cause of death, and total numbers each year. The code of ethical approval is IRLMO.REC.1396.36.

### 3.3. Inclusion and Exclusion Criteria

The exclusion criteria in our study were insufficient data on the characteristics of suicidal and homicidal death; however, there was any autopsy file with insufficient data. The total numbers of fatal occupational accidents in Iran were 8,947 cases over five years. Among occupational deaths; an autopsy found 398 positive toxicology samples; therefore, we excluded these files from our data, because

we wanted to study pure fatal occupational deaths without the effect of any drug, opioid or alcohol in victims' blood or tissue samples. Thus, from 8,947 fatal occupational accident autopsy files, a total of 8,558 files were included in our study.

### 3.4. Statistical Analysis

After collecting the autopsy files from all forensic medicine dissection halls in Iran, and defining based on male and female characteristics of suicidal, homicidal and occupational deaths during the five-year autopsy reports, data were coded and analyzed by the IBM SPSS Statistics for Windows, version 24.0 (IBM Corp., Armonk, N.Y., USA). We utilized descriptive statistics, Chi-square test and univariate analysis of variance. Significance level was recorded as  $P < 0.05$ .

## 4. Results

### 4.1. Characteristics of Suicidal Deaths

The numbers of suicidal autopsies in Iran were 19,288 cases over five years.

#### 4.1.1. Gender

Among all suicidal deaths, there were 70% male and 30% female; Therefore, the incidence of suicidal deaths in male was statistically more than female sex ( $P < 0.05$ ).

#### 4.1.2. Age

We divided each year's victims into eight different age-groups. Most of victims (about 22%) were between 18 to 24 years old, and 19% were between 25 to 29 years old, respectively. (Mean age: 33.1; median age: 29.0 years). Therefore, there was an obvious preference among the Iranian youth for suicide.

#### 4.1.3. Suicidal Death Methods

Among suicidal deaths, methods of death were 52% hanging, 10% self-immolation, 26% poisoning, 7% shotgun, 1% stab wounds, 3% blunt trauma, 0.1% electrocution, half a tenth of a percent drowning and 1% others. Therefore, the most common methods for suicide were hanging and poisoning, respectively. Characteristics of suicidal death for each year are shown in [Table 1](#).

### 4.2. Characteristics of Homicidal Death

There were a total number of 11,655 homicidal deaths during five years' study.

**Table 1.** Age, Gender and Autopsy Cause of Suicidal Death<sup>a</sup>

Variables	2011 (N = 3459)	2012 (N = 3649)	2013 (N = 4052)	2014 (N = 4084)	2015 (N = 4044)
<b>Sex</b>					
Male	2505 (72.4)	2545 (69.7)	2792 (68.9)	2846 (69.7)	2914 (72.1)
Female	954 (27.6)	1104 (30.2)	1260 (31.1)	1238 (30.3)	1130 (27.9)
<b>Age, y</b>					
Under 10	2 (0.05)	2 (0.1)	2 (0.04)	0	3 (0.07)
10 - 17	964 (27.9)	1029 (28.2)	328 (8.1)	354 (8.6)	497 (12.2)
18 - 24	673 (19.5)	641 (17.6)	1073 (26.5)	994 (24.3)	849 (21.0)
25 - 29	769 (22.2)	811 (22.2)	708 (17.5)	695 (17.0)	634 (15.7)
30 - 39	352 (10.2)	404 (11.1)	891 (22.0)	942 (23.0)	950 (23.5)
40 - 49	398 (11.5)	471 (12.9)	523 (12.9)	499 (12.2)	476 (11.8)
50 - 59	189 (5.4)	198 (5.4)	424 (10.4)	397 (9.7)	419 (10.3)
Above 60	112 (3.2)	93 (2.5)	103 (2.5)	203 (4.9)	216 (5.3)
<b>Autopsy cause of death</b>					
Hanging	1863 (53.9)	1859 (50.9)	2115 (52.1)	2091 (51.2)	2166 (53.5)
Self-immolation	382 (11.0)	389 (10.7)	399 (9.8)	375 (9.2)	332 (8.2)
Poisoning	829 (23.9)	978 (26.8)	1035 (25.5)	1090 (26.6)	1027 (25.4)
Shotgun	207 (6.0)	251 (6.8)	283 (6.9)	270 (6.6)	291 (7.2)
Stabbing	37 (1.1)	29 (0.7)	49 (1.2)	69 (1.7)	40 (1.0)
Blunt trauma	79 (2.3)	74 (2.0)	87 (2.1)	132 (3.2)	130 (3.2)
Electrocution	0	4 (0.1)	7 (0.1)	3 (0.1)	5 (0.1)
Drowning	21 (0.6)	15 (0.4)	19 (0.4)	20 (0.5)	24 (0.6)
Others	41 (1.2)	50 (1.4)	58 (1.4)	34 (0.8)	29 (0.7)

<sup>a</sup>Values are expressed as No. (%).

#### 4.2.1. Gender

There were 18% male and 20% female; thus the majority of cases belonged to male; because the incidence of homicidal deaths in male had statistically significant difference than female ( $P < 0.05$ ).

#### 4.2.2. Age

We divided each year's victims into eight different age-groups. Most victims were between 25 to 29 years old and between 18 to 24 years old, respectively. (Mean age: 32.4; median age: 30.0 years).

#### 4.2.3. Homicidal Death Methods

Among homicidal deaths, methods of death were 46% use of weapons, 29% stab wounds, 13% blunt trauma, 9% ligature strangulation, 0.9% poisoning, 0.4% burns, 0.2% suffocation, and 0.7% other causes. Therefore, among used methods for homicides, the most common methods were firearms and stab wounds, respectively. Each year charac-

teristics of occupational fatal accidents are shown in [Table 2](#).

#### 4.3. Characteristics of Occupational Accidents Leading Death

The numbers of occupational fatal accidents were eight thousand five hundred and fifty-eight during the five years' study.

##### 4.3.1. Gender

There were 99% percent male and 1% female, so there was male dominance in occupational fatal accidents. This is due to the dominance of male workers.

##### 4.3.2. Age

We divided each year's victims into eight different age-groups. Among occupational fatal accidents, the most common victims' age-group was 30 - 39 years old (25%). (Mean age: 35.8; median age: 33.0 years).

**Table 2.** Age, Gender and Autopsy Cause of Homicidal Death<sup>a</sup>

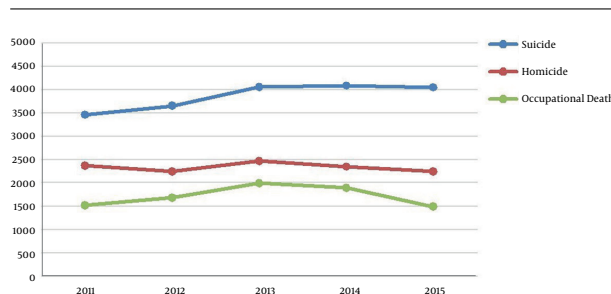
Variables	2011 (N = 2364)	2012 (N = 2239)	2013 (N = 2466)	2014 (N = 2344)	2015 (N = 2242)
<b>Sex</b>					
Male	1903 (80.5)	1764 (78.7)	1960 (79.5)	1873 (79.9)	1801 (80.3)
Female	461 (19.5)	475 (21.3)	505 (20.5)	471 (20.1)	441 (19.7)
<b>Age, y</b>					
Under 10	10 (0.4)	1 (0.0)	1 (0.2)	2 (0.1)	2 (0.1)
10 - 17	412 (17.4)	199 (8.9)	197 (8.0)	219 (9.3)	48 (2.1)
18 - 24	459 (19.4)	591 (26.3)	628 (25.4)	543 (23.2)	588 (26.2)
25 - 29	608 (25.7)	466 (20.8)	670 (27.1)	503 (21.4)	390 (17.3)
30 - 39	289 (12.2)	404 (18.0)	305 (12.3)	452 (19.2)	561 (25.0)
40 - 49	312 (13.1)	276 (12.3)	304 (12.3)	285 (12.2)	263 (11.7)
50 - 59	203 (8.5)	239 (10.6)	300 (12.1)	289 (12.3)	330 (14.7)
Above 60	71 (3.0)	63 (2.8)	61 (2.4)	51 (2.1)	60 (2.6)
<b>Autopsy cause of death</b>					
Ligature strangulation	193 (8.2)	216 (9.6)	226 (9.1)	216 (9.2)	193 (8.6)
Use of weapons/forearms	1058 (44.8)	997 (44.5)	1203 (48.7)	1091 (46.5)	1064 (47.4)
Poisoning	28 (1.2)	16 (0.7)	20 (0.8)	19 (0.8)	22 (0.9)
Stab wounds	689 (29.1)	640 (28.5)	684 (27.7)	705 (30.1)	706 (31.5)
Blunt trauma	340 (14.4)	350 (15.6)	304 (12.3)	282 (12.0)	236 (10.5)
Burns	19 (0.8)	6 (0.2)	9 (0.3)	6 (0.2)	4 (0.1)
Suffocation	3 (0.1)	7 (0.3)	2 (0.1)	5 (0.2)	6 (0.3)
Others	34 (1.4)	7 (0.3)	18 (0.7)	20 (0.8)	11 (0.5)

<sup>a</sup>Values are expressed as No. (%).

**4.3.3. Causes of Occupational Fatal Accidents**

Among occupational fatal accidents, 74% of cases were caused by blunt trauma, and most of them were due to falling from a height. The second common cause of death was Electrocutation (21% of cases). Characteristics of occupational fatal accidents for each year are shown in Table 3.

Each year rates of suicidal, homicidal and occupational deaths are shown in Figure 1.

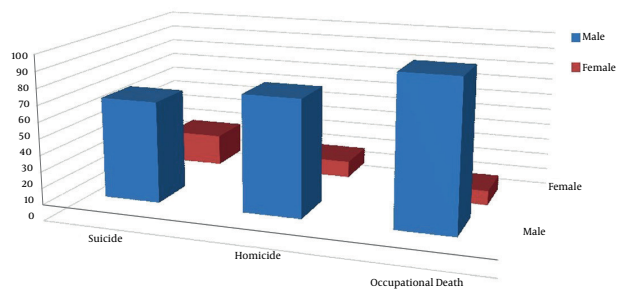


**Figure 1.** Each year rate of suicidal, homicidal and occupational death

Overall gender differences of suicidal, homicidal and occupational deaths are shown in Figure 2.

**5. Discussion**

The main aim of this study is to investigate the characteristics suicidal, homicidal and occupational deaths'



**Figure 2.** Overall gender differences of Suicidal, Homicidal and Occupational death

**Table 3.** Age, Gender and Autopsy Cause of Occupational Accident Leading Death<sup>a</sup>

Variables	2011 (N = 1517)	2012 (N = 1679)	2013 (N = 1988)	2014 (N = 1888)	2015 (N = 1486)
<b>Sex</b>					
Male	1500 (98.9)	1647 (98.1)	1958 (98.6)	1872 (99.2)	1472 (99.1)
Female	17 (1.1)	31 (1.9)	30 (1.5)	16 (0.8)	14 (0.9)
<b>Age, y</b>					
Under 10	0	2 (0.1)	1 (0.1)	0	0
10 - 17	65 (4.2)	64 (3.8)	103 (5.2)	65 (3.4)	75 (5.0)
18 - 24	361 (23.7)	343 (20.4)	404 (20.3)	370 (19.6)	238 (16.0)
25 - 29	280 (18.4)	283 (16.9)	318 (16.0)	292 (15.5)	232 (15.6)
30 - 39	389 (25.6)	383 (22.8)	522 (26.2)	489 (25.9)	394 (26.5)
40 - 49	301 (19.8)	315 (18.8)	330 (16.5)	335 (17.7)	283 (19.0)
50 - 59	112 (7.3)	280 (16.6)	302 (15.1)	330 (17.4)	261 (17.6)
Above 60	9 (0.5)	9 (0.5)	8 (0.4)	7 (0.3)	3 (0.2)
<b>Autopsy cause of death</b>					
Electrocution	351 (23.1)	346 (20.6)	401 (20.1)	382 (20.2)	320 (21.5)
Head trauma	334 (22.0)	385 (22.9)	452 (22.7)	418 (22.1)	399 (26.8)
Multiple trauma <sup>b</sup>	803 (52.9)	853 (50.8)	1020 (51.3)	997 (52.8)	694 (46.7)
Burning	8 (0.5)	6 (0.3)	11 (0.5)	7 (0.3)	6 (0.4)
Carbon monoxide poisoning	14 (0.9)	59 (3.5)	66 (3.3)	52 (2.7)	38 (2.5)
Drowning	0	0	0	0	0
Others	7 (0.4)	30 (1.7)	38 (1.9)	32 (1.6)	29 (1.9)

<sup>a</sup>Values are expressed as No. (%).

<sup>b</sup>Multiple traumas include Limb fractures, visceral perforation, hemorrhagic shock, etc.

forensic autopsy halls in thirty-two provinces of Iran during five years. There were 9,288 suicidal deaths from 2011 to 2015. Incidence of suicides in male had statistically significant difference than female ( $P < 0.05$ ). Therefore, suicide was more common in male, and is compatible with studies conducted in Brazil (6), India 2006 - 2015 (7), South Africa (8), India 2003 - 2007(9), Cuba (10), Iran, Fars Province 2007 - 2011 (11), and Norway (12). Our findings showed that the most common age of suicide was between 18 - 24 years old within a 5-year duration, and this result is compatible with studies conducted in South Africa (8), India 2003 - 2007 (9), and Norway (10), but it is in contrast with data in Brazil (6), India 2006 - 2015 (7), Cuba (10), Germany, Hungary, Ireland, and Portugal (13), and Virginia (14). Our findings showed that the most common method of suicidal death was hanging and in this sense it is compatible with studies performed in Brazil (6), India 2006 - 2015 (7), South Africa (8), Cuba (10) and Norway (12), but it is in contrast with data in India 2003 - 2007 (9), Germany, Hungary, Ireland and Portugal (13), and Virginia (14).

Among homicidal deaths; there were 11,655 cases over five years. The numbers of men were obviously higher than

women, and this result is similar to data in turkey (15), France 2000 - 2003 (16), Iran Isfahan Province 2013 - 2015 (17), South Africa 2007 - 2008 (18), and Western Norway (19), but it is in contrast with data in India 2008 (20). Our findings showed that most victims were between 25 to 29 years old during a five-year study and this result is in contrast with data in Turkey (15), Western Norway (19), India 2008 (20), Senegal (21) and France 2000 - 2003 (16), but it is compatible with study performed in Iran Isfahan Province 2013 - 2015 (17). We discovered that the most commonly used method for homicide in Iran was the use of weapons which is similar to studies performed in turkey (15), France 2000 - 2003 (16), South Africa 2007 - 2008 (18) and France 1994 - 2008 (22), but it is in contrast with results in Iran Isfahan Province 2013 - 2015 (17), Western Norway (19), India 2008 (20) and Senegal (21); also our findings showed that stab wounds and blunt traumas were commonly used methods after firearms, respectively and it is similar to data in France 1994 - 2008 (22). In cases of fatal occupational accidents; we studied 8,558 deaths during study. Majority of victims were males similar to other studies performed in many countries (Mexico (23), Malaysia (24), Great Britain

(25), Lideta Sub-City, Addis Ababa, Ethiopia (26), Iran 2008 (27), Spain 2001 (28), Spain 2003 (29), and Canada (30)). Most victims were between 30 - 39 years old and this result is compatible with studies conducted in Mexico (23), Malaysia (24), Great Britain (25), Lideta Sub-City, Addis Ababa, Ethiopia (26) and Canada (30) but it is in contrast with studies performed in Iran 2008 (27), Spain 2001 (28), and Spain 2003 (29). Our findings showed that the most common cause of death among workers was blunt trauma including head trauma and multiple traumas (limb fractures, visceral perforation, hemorrhagic shock, etc.) which is compatible with studies performed in Great Britain (25) and Iran 2008 (27) and Canada (30) but it is in contrast with studies performed in Mexico (23). The second major cause of occupational fatal death was electrocution in 1800 cases (21.0%) and in this sense it is in contrast with studies conducted in Mexico (23), Great Britain (25).

### 5.1. Conclusions

The present study shows rates of Suicidal, Homicidal and Occupational deaths in all forensic autopsy halls in 32 provinces of Iran during five-year study from March 2011 to March 2015. Our main goal was determining causes of suicidal, homicidal and occupational deaths which can aid the provision of preventive strategies to decrease the occurrence of these kinds of preventable deaths in Iran. Based on our findings in the present study suicidal deaths were more prevalent in male sex, which is the same as the other studies. Also, our investigation provided useful data in suicide cases in Iran, such as, the most common age-group who commit suicide is between 18 - 24-year olds and the most prevalent method of suicide is hanging in both genders. Unfortunately, the majority of victims were young. As a result of the fact that Iran is a developing country, youth population has a major role in the promotion of the nation's financial and social development; thus it signifies the necessity of finding leading causes of suicide in order to prevent this tragic event. The origin of this awful phenomenon should thoroughly investigate. We hope that our findings will serve as an encouragement to the Ministry of Health and Medical Education of Iran in providing preventive strategies for decreasing the occurrence of suicides among Iranian useful potential population. Among homicidal deaths; our findings show preference of homicide in 25 - 29 years old men and the most commonly used method for homicide in Iran was the use of firearms. Also, the origin of this awful result may be due to the prevalence of violence in young men in Iran, but it requires further research in order to identify its underlying causes in the provision of preventive strategies in a bid to decrease homicidal rate in Iran. Some methods include the

teaching of behavioral habits from early childhood, dispelling anger, etc. Among occupational accidents leading deaths, our findings show that the majority of victims were men, like many other countries. This is as a result of male workers' dominance. However, because the most common cause of death in Iranian workers is blunt trauma, especially due to falls from a height; it shows the necessity of providing safety equipment such as helmets, eye protection glasses, appropriate gloves, etc., for workers and make their usage mandatory for workers. It is also necessary to hold work safety training courses annually. We hope our findings can serve as an aid to the Ministry of Health and Medical Education, Iranian psychologists and psychiatrics to provide preventive strategies for decreasing occurrence of suicidal deaths in Iranian population. Also, we hope our findings can aid the Ministry of Labor and Social Affairs of Iran in providing the preventive strategies according to causes of work-related deaths in order to decrease the occurrence of fatal occupational accidents between workers.

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### Footnotes

**Authors' Contribution:** Study concept and design and study supervision: Abdolrazagh Barzegar; drafting of the manuscript, critical revision of the manuscript for important intellectual content: Masoud Ghadipasha; acquisition of data: Ali Khademi; statistical analysis, analysis and interpretation of data: Samira Aram.

**Conflict of Interests:** Authors recorded no conflict of interests.

**Ethical Approval:** We followed Helsinki statement. The code of ethical approval is IR.LMO.REC.1396.36.

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