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An Estimation of Drug-Related Deaths in Iran, Using the Capture-Recapture Method (2014-2016)

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Original Article

Abstract

Background: The Ministry of Health and Medical Education (MOHME) and the Legal Medicine Organization (LMO) are the 2 death registration systems in Iran for registering drug-related deaths. The aim of the present study was to assess the number of undercount and the overlap between the deaths registered by the 2 sources.

Methods: In this descriptive study, according to the 10th revision of the International Classification of Diseases (ICD-10), the registered data on drug-related deaths in the years 2014-2016, as recorded by the MOHME and the LMO, were collected and the number of deaths was estimated using 2-source capture-recapture method and Excel and SPSS software.

Findings: The total number of drug-related deaths, as registered by the 2 sources, was 8639 during the 3 years. A major part of the drug-related deaths (75% of the data) had been registered by the LMO and only 25% of deaths had been registered by the MOHME. There was also a small overlap (7.7% of deaths) between the data from the 2 sources. The final estimation from the capture-recapture model and analysis of sensitivity showed that, during the 3 years, the total number of drug-related deaths was 14517 [95% confidence interval (CI):14498-14558]. Based on the complete overlap assumption and 50% of unidentified individuals in the 2 sources, the number of deaths was estimated at 11341 and 12418, respectively. The largest number of drug-related deaths had occurred within the age range of 25-39 years and in men. Kermanshah, Hamedan, and Zanjan Provinces (Iran) had the largest number of cumulative incidences of drug-related deaths. Based on the data provided by the MOHME, the most common cause of death was Methadone poisoning.

Conclusion: There was a small overlap between the MOHME and the LMO in the registration of drug-related deaths. Failure to enter accurate and correct information has led to miscalculations of these deaths in Iran.

Keyword: Death; Substance-related disorders; Iran

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Introduction

Based on the World Health Organization estimations in 2015, about 450000 people have lost their lives due to illegal drug use, out of which about 160000 were directly related to disorders caused by drug use and 118000 were caused by opioids.[1]

Despite the measures taken nationwide in Iran to reduce the consequences of illegal drug use, the prevalence of drug use has been growing in the last two decades particularly among men.[2] The results of a study carried out from 2006 to 2011 in Iran to determine drug-related fatality rate showed that fatality rate varied from 3.62 to 2.77 in every 100.000 individuals in 2006 and 2011, respectively.[3] One major reason for this might be Iran's neighboring countries; one of these neighboring countries, i.e., Afghanistan, is the largest producer of opium in the world, which makes easy access to drugs possible.[4] Drug overdose, hospitalization in psychiatric departments, suicide, injective drug use, drug use in families, and imprisonment have been identified as the most important causes of drug-induced deaths in Iran.[5,6]

Today, death registration has legal aspects and many uses in different fields. Accurate identification of the causes of death can be helpful in the development and execution of certain plans to decrease the risk factors associated with different diseases. The quality of death registration procedures varies across organizations, and this endangers the validity of information.[7] Considering the fact that correct and accurate death registration provides a legally important document with many applications at the state and national levels in the disease tracking process, public health policies, and allocation of financial resources and research, it is important to exercise care both in death registration and in determining the cause of death.[8,9]

However, there is no specialized countrywide registration system in Iran for identifying suicide cases in addiction. Moreover, different organizations and sources provide different statistics in this regard. The capture-recapture technique is a cost-effective method to resolve this problem relying on two or more sources of incomplete, but independent information and, more importantly, their degree of overlap. This method assesses the number of reported deaths by integrating the number of deaths registered in different sources.[10]

Deaths and diseases caused by tobacco products, alcohol, and illegal drugs impose a heavy burden on public health in Iran. Accordingly, gathering comprehensive data to identify the target deceased population and evaluate the efficiency of different policies in the prevention and treatment of drug use and its harms is quite essential. The findings of the current study, and examination of the geographical distribution and the likely undercount of drug-induced deaths can be informative to the related authorities in terms of analyzing the likely changing trend of death causes and planning to improve both the quantity and quality of registration of drug-related deaths. The present study was conducted to assess the accuracy of drug-induced deaths registered from 2014 to 2016 in the 2 sources of death registration in Iran including the Health Department of the Ministry of Health and Medical Education (MOHME) and the Legal Medicine Organization (LMO).

Methods

In this descriptive study, the number of drug-related deaths among the deceased individuals was separately calculated for each province in Iran in the years 2014-2016 based on the 2 sources of death registration, the Department of Health affiliated with the MOHME and LMO.

The drug-induced death codes were searched in accordance with the 10th revision of the International Classification of Diseases (ICD-10) based on type of drug causing the death with the codes T.40.0, T.40.3, T.50.9, T.51.9, T.43.6, and T.42.4 and the underlying cause of death with the codes X41, X42, X45, X61, X62, X65, Y11, Y12, Y15, Y40.0, Y49.7, and Y47.1. The underlying causes of drug-related overdose death in this classification[11] include fatal poisoning by alcohol (ethanol and methanol), opioid substances poisoning/overdose (e.g., opium derivatives), sedatives (e.g., barbiturates and benzodiazepines), stimulants (e.g., cocaine and amphetamines), nicotine, a combination of several substances, and medical drugs (e.g., tramadol).[12] However, if an individual dies in outpatient clinics, surgery centers, hospitals, or their house due to drug use, the corpse is transferred by the physician to the LMO for autopsy because the cause of these deaths are suspicious. Then, the information related to the deceased will be accessible from that organization in the form of a death certificate.

The number of deaths was estimated using the 2-source capture-recapture method and data scrubbing was done manually in a Microsoft Excel file. The MOHME and LMO were requested to provide information about the deceased persons including their name, family name, national code, age, gender, province in which they lived, province in which they died, month of death, and type of drug causing the death. LMO did not have the information related to the type of drug causing the death. After obtaining the data, first, for the sake of homogeneity, unusual names were reviewed (the space between the letters was removed and the names that could be written in different forms were identified and homogenized). To calculate the overlap between the 2 sources, the cases with at least 5 similar characteristics including name, family name, age, gender, national code, and province in which they died were considered as common between the 2 sources.

Excel and SPSS software (version 23, IBM Corporation, Armonk, NY, USA) were used for recording and analyzing the collected data, respectively. Descriptive statistics were utilized for reporting the demographic information related to the deceased individuals such as their age, gender, type of drug consumed, and place of death. Cumulative incidence (Risk) of each related cause of death was assessed for provinces (the nominator was the number of deaths for each related cause and the denominator was the population in 2014 multiplied by 100000). The demographic characteristics data were obtained from the Statistical Center of Iran. To calculate the total number of drug-related deaths (N) at a confidence interval (CI) of 95%, the following formulas were used based on capture-recapture method: where ''a'' is the total number of deaths determined by LMO (primary source), "b" is the total number of cases determined by the Department of Health (secondary source), and "c" is the number of cases common between the 2 sources.[13,14]

$$\mathrm{var(N)} = \frac{[(a+1)(b+1)(b-c)(a-c)]}{(c+1)^2(c+2)}$$

$$95\%\ \mathrm{CI} = \ \mathrm{N} \pm \mathrm{Z}\sqrt{\mathrm{var(N)}}$$

$$\mathrm{N} = \left[\frac{(a+1)(b+1)}{(c+1)}\right] - 1$$

In the capture-recapture estimate (sensitivity analysis), 3 analyses were conducted. In the first analysis, all unidentified deceased persons (those without any information available regarding their name, family name, age, gender, and national code) were eliminated. In the second analysis, 50% of the unidentified deceased persons were considered. In the third analysis, all of them were included in the analysis. Then, the outcomes of the 3 analyses were reported with 95% CI.

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Results

As shown in table 1, the total number of reported deaths in the 2 sources during the 3 years is 8639. A major part (6484 people, accounting for 75%) of the data related to drug-induced deaths belongs to the LMO and the share of MOHME in the registered deaths in the 3 years is 2155 individuals. Accordingly, only a small portion (665 individuals, accounting for 7.7%) of the data was common between the 2 sources.

The highest exposure to poisoning and drug-related death can be observed in both men and women and within the age range of 25 to 39 years and the biggest contributing cause of death is methadone (according to MOHME data). Due to the LMO's lack of reporting of the type of poisoning causing the death some cells are left empty in this table.

As shown in table 2, the highest cumulative drug-induced death incidence during the 3 years was in Kermanshah, Hamedan, and Zanjan (Iran) with 22.78, 20.56, and 18.55 deaths in every 100000 individuals, respectively.

As presented in table 3, in the final estimation of the capture-recapture model and analysis of sensitivity carried out based on the status of identified and unidentified individuals during the 3 years, the total number of drug-related deaths in Iran was calculated to be 14517 (at 95% CI: 14498-14558).

This estimate, taking into account all and half of the unidentified deceased persons, was 12418 and 11341 death as registered by the two mentioned sources, respectively. That is, in the most optimistic way (with all unidentified deceased and with half of the unidentified deceased) to calculate drug-related deaths in 2014-2016 with capture-recapture method.

Table 1. Characteristics of sample by registry sources

Year		LMO	MOHME		Total
		Only LMO	Only MOHM	Both	
2016	Total [n (%)]	2361 (100)	284 (100)	541 (100)	3186 (100)
	Total male [n (%)]	2096 (88.8)	257 (90.5)	456 (84.3)	2809 (88.1)
	Total female [n (%)]	265 (11.2)	27 (9.5)	85 (15.7)	377 (11.9)
	Unknown [n (%)]	0 (0)	0 (0)	0 (0)	0 (0)
2015	Total [n (%)]	1985 (100)	211 (100)	550 (100)	2746 (100)
	Total male [n (%)]	1753 (88.3)	189 (89.6)	460 (83.6)	2402 (87.5)
	Total female [n (%)]	228 (11.5)	22 (10.4)	90 (16.4)	340 (12.4)
	Unknown [n (%)]	4 (0.2)	0 (0)	0 (0)	4 (0.1)
2014	Total [n (%)]	2138 (100)	170 (100)	399 (100)	2707 (100)
	Total male [n (%)]	1940 (90.7)	158 (93.0)	333 (83.7)	2431 (89.1)
	Total female [n (%)]	194 (9.07)	12 (7.0)	66 (16.3)	272 (10.7)
	Unknown [n (%)]	4 (0.2)	0 (0)	0 (0)	4 (0.2)
Age					
2016	Age of men (year) (mean ± SD)	37.1 ± 12.8	38.4 ± 13.0	42.9 ± 17.7	39.4 ± 14.5
	< 25 [n (%)]	356 (17.0)	34 (13.3)	63 (13.8)	453 (14.2)
	25-39 [n (%)]-	953 (45.5)	116 (45.3)	142 (31.1)	1211 (38.0)
	40-59 [n (%)]	641 (30.6)	78 (30.5)	151 (33.1)	870 (27.3)
	≥ 60 [n (%)]	119 (5.7)	16 (6.3)	76 (16.7)	211 (6.5)
	Unknown	27 (1.3)	12 (4.7)	24 (5.3)	63 (2.0)
	Age of women (year) (mean ± SD)	31.5 ± 14.4	34.5 ± 15.3	40.3 ± 25.5	35.4 ± 18.4
	< 25 [n (%)]	85 (32.1)	5 (18.5)	27 (31.8)	117 (3.7)
	25-39 [n (%)]-	113 (42.6)	15 (55.6)	21 (24.7)	149 (4.7)
	40-59 [n (%)]	45 (17.0)	4 (14.8)	13 (15.3)	62 (2.0)
	≥ 60 [n (%)]	11 (4.2)	2 (7.4)	23 (27.1)	36 (1.1)
	Unknown [n (%)]	11 (4.2)	1 (3.7)	1 (1.2)	14 (0.5)
	Age of the whole population (year) (mean ± SD)	36.5 ± 13.1	38.1 ± 13.2	42.5 ± 19.1	39.0 ± 15.1
2015	Age of men (year) (mean ± SD)	36.0 ± 14.9	36.9 ± 13.0	41.3 ± 17.3	37.5 ± 13.3
	< 25 [n (%)]	319 (18.2)	28 (14.8)	65 (14.3)	412 (17.3)
	25-39 [n (%)]-	797 (45.5)	88 (46.6)	160 (34.9)	1045 (43.4)
	40-59 [n (%)]	536 (30.5)	58 (30.7)	149 (32.5)	743 (30.9)
	≥ 60 [n (%)]	78 (4.4)	11 (5.8)	71 (15.5)	160 (6.7)
	Unknown [n (%)]	25 (1.4)	4 (2.1)	13 (2.8)	42 (1.7)
	Age of women (year) (mean ± SD)	2308 ± 13.6	36.4 ± 21	34.4 ± 23.9	23.6 ± 17.4
	< 25 [n (%)]	60 (26.6)	8 (36.4)	36 (40)	104 (30.5)
	25-39 [n (%)]-	99 (43.2)	6 (27.3)	21 (23.3)	126 (37.0)
	40-59 [n (%)]	60 (26.2)	3 (13.6)	18 (20.0)	81 (23.8)
	≥ 60 [n (%)]	5 (2.2)	5 (22.7)	13 (14.4)	23 (6.7)
	Unknown [n (%)]	4 (1.7)	0 (0)	2 (2.2)	6 (1.2)
	Age of the whole population (year) (mean ± SD)	36.6 ± 32.5	36.9 ± 14.2	41.3 ± 17.3	36.8 ± 14.1
2014	Age of men (year) (mean ± SD)	38.1 ± 32.8	36.8 ± 11.8	38.5 ± 19.06	37.8 ± 21.2
	< 25 [n (%)]	304 (15.6)	20 (12.6)	56 (16.8)	380 (15.0)
	25-39 [n (%)]-	864 (44.6)	87 (55.1)	120 (36.0)	1071 (45.0)
	40-59 [n (%)]	655 (33.7)	42 (26.6)	103 (30.9)	800 (33.0)
	≥ 60 [n (%)]	87 (4.5)	8 (5.1)	45 (13.5)	140 (5.6)
	Unknown [n (%)]	30 (1.6)	1 (0.6)	9 (2.8)	40 (1.5)
	Unknown [n (%)]	38.4 ± 14.8	31.9 ± 18.9	31.2 ± 24.4	32.6 ± 19.2
	Age of women (year) (mean ± SD)	49 (24.9)	5 (41.7)	30 (45.5)	84 (31.0)
	< 25 [n (%)]	77 (39.1)	5 (41.7)	16 (24.2)	98 (36.02)
	25-39 [n (%)]-	52 (26.4)	0 (0)	11 (16.7)	63 (23.2)
	40-59 [n (%)]	14 (7.1)	2 (16.7)	13.6 (9)	25 (9.1)
	≥ 60 [n (%)]	2 (2.5)	0 (0)	0 (0)	2 (0.7)
	Unknown [n (%)]	37.7 ± 31.6	36.5 ± 12.4	38.5 ± 16.06	37.6 ± 21.04

Table 1. Characteristics of sample by registry sources (continue)

Year		LMO	MOHME		Total
		Only LMO	Only MOHM	Both	
Type of drug (cause of death)					
2016	Methadone	-	190 (67.2)	275 (50.9)	-
	Alcohol	-	5 (1.8)	43 (8.0)	-
	Amphetamines	-	9 (2.2)	60 (11.0)	-
	Opioids	-	79 (28.0)	137 (25.3)	-
	Accidental consumption of pills and sedatives	-	1 (0.4)	23 (4.7)	-
2015	Methadone	-	101 (47.8)	275 (50.0)	-
	Alcohol	-	2 (1.0)	32 (5.8)	-
	Amphetamines	-	18 (8.6)	54 (9.9)	-
	Opioids	-	88 (41.7)	169 (30.7)	-
	Accidental consumption of pills and sedatives	-	22 (4.1)	1 (0.4)	-
2014	Methadone	-	94 (56.0)	132 (58.1)	-
	Alcohol	-	1 (0.6)	25 (6.4)	-
	Amphetamines	-	2 (5.3)	50 (12.4)	-
	Opioids	-	59 (34.5)	73 (18.3)	-
	Accidental consumption of pills and sedatives	-	2 (1.2)	16 (4.1)	-

MOHME: Ministry of Health and Medical Education; LMO: Legal Medicine Organization; SD: Standard deviation

Discussion

A high discrepancy was observed in the death cases registered by the 2 methods of death registration in the LMO and MOHME of Iran during the 3 years with only a small portion of the data (i.e., 7.7%) being common between the 2 sources. The largest rate of drug poisoning was observed in the age range of 25-39 years and in men. Kermanshah, Hamedan, and Zanjan had the most cases of cumulative incidence of drug-related death per population of 100 thousand. According to the results of the present study, the MOHME reports that the most common underlying cause of death was the consumption of methadone. Based on the final estimation of the capture-recapture model and sensitivity analysis in the examined period, the total number of drug-related deaths in Iran was 14517 (at 95% CI: 14498-14558). This estimate, taking into account all and half of the unidentified deceased persons, was 12418 and 11341 deaths, respectively.

The findings revealed a small overlap between the data obtained from the 2 sources. There may be many reasons for the small overlap. First, many cases of deaths caused by drugs are discovered in different places such as houses, prisons, addiction treatment camps, drop-in centers, shelters, and other public places like streets, and thus, are directly transferred to LMO, rather than hospitals, for the identification of the underlying cause of death and an autopsy. In specifying the cause of death, LMO takes different factors into account, including examination of the death scene, toxicological analysis of the biological samples, drug use history of the individual, and police reports, and then, reports the cause of death.[15] The second reason might be that when issuing the death certificate, the physicians at hospitals may not have reported drug use as the cause of death despite the fact that clinical case records had announced illegal drug use as the cause of death. In other words, LMO reports based on autopsy results may be more precise in specifying the cause of death.[7] Another reason might be that the relatives may refuse to provide accurate information about the drug use history of the deceased to avoid the stigma of addiction to drugs.[16] The problems of the electronic registration of death such as unfamiliarity, physicians' low experience in registering the death certificate and mistaking of the cause of death with death mechanism, inappropriate completion of the forms related to death registration, inappropriate use of identification codes, lack of sufficient training in the field of death registration, fatigue, time limitation, and lack of understanding of the importance of death registration can be mentioned as other reasons for the undercount.[16-18] Moreover, during the 3 years, no feedback was given by the LMO to hospitals that referred suspicious deaths to the LMO.

Table 2. Place of death and cumulative incidence (per 100000 person) in the Provinces of Iran by registry sources

Province of death	Year	LMO	MOHME		Total	Total in three years	Cumulative incidence (per 100000 person)
		Only MOHME	Both	Only LMO			
East	2016	44 (1.9)	87 (30.7)	39 (7.2)	170 (5.3)	413 (4.8)	10.77
Azarbaijan	2015	40 (2.0)	24 (11.4)	48 (8.7)	112 (4.1)		
	2014	56 (2.6)	31 (18.7)	44 (11.0)	131 (4.9)		
West	2016	32 (1.4)	2 (0.7)	11 (2.0)	45 (1.5)	117 (1.3)	3.66
Azarbaijan	2015	9 (0.5)	0 (0)	30 (5.5)	39 (1.4)		
	2014	8 (0.4)	5 (2.9)	20 (5.0)	33 (1.2)		
Ardabil	2016	18 (0.8)	18 (6.4)	22 (4.1)	58 (1.9)	131 (1.5)	10.38
	2015	8 (0.4)	0 (0)	30 (5.5)	38 (1.4)		
	2014	24 (1.1)	3 (1.8)	8 (2.0)	35 (1.2)		
Isfahan	2016	161 (6.8)	25 (8.8)	56 (10.4)	242 (7.6)	7.3 (632)	12.57
	2015	170 (8.6)	10 (4.7)	25 (4.5)	205 (7.5)		
	2014	162 (7.6)	4 (2.3)	19 (4.8)	185 (6.9)		
Alborz	2016	155 (6.6)	1 (0.4)	2 (0.4)	158 (5.0)	419 (4.9)	16.10
	2015	137 (6.9)	0 (0)	2 (0.4)	139 (5.1)		
	2014	119 (5.6)	2 (1.2)	1 (0.3)	122 (4.5)		
Ilam	2016	7 (0.3)	1 (0.4)	8 (1.5)	16 (0.5)	44 (0.5)	7.70
	2015	12 (0.6)	2 (0.9)	5 (0.9)	19 (0.7)		
	2014	9 (0.4)	0 (0)	0 (0)	9 (0.3)		
Bushehr	2016	6 (0.3)	2 (0.7)	1 (0.2)	9 (0.3)	0.3 (25)	2.25
	2015	7 (0.4)	0 (0)	5 (0.9)	12 (0.43)		
	2014	2 (0.1)	0 (0)	2 (0.5)	4 (0.1)		
Tehran	2016	668 (28.3)	6 (2.1)	46 (8.5)	720 (22.6)	1774 (20.5)	13.83
	2015	460 (23.2)	6 (2.8)	30 (5.5)	496 (18.1)		
	2014	527 (24.6)	18 (10.5)	13 (3.3)	558 (20.6)		
Chahar-Mahal	2016	52 (2.2)	1 (0.4)	2 (0.4)	55 (1.7)	107 (1.3)	11.56
Bakhtiari	2015	19 (1.0)	0 (0)	4 (0.7)	23 (0.83)		
	2014	27 (1.3)	0 (0)	2 (0.5)	29 (1.0)		
South	2016	12 (0.5)	0 (0)	0 (0)	12 (0.3)	58 (0.7)	7.69
Khorasan	2015	8 (0.4)	4 (1.9)	12 (2.2)	24 (0.9)		
	2014	10 (0.5)	3 (1.8)	9 (2.3)	22 (0.8)		
Razavi	2016	190 (8.0)	27 (9.5)	45 (8.3)	262 (8.2)	831 (9.6)	13.28
Khorasan	2015	254 (12.8)	19 (9.0)	52 (9.5)	325 (11.8)		
	2014	196 (9.2)	17 (9.9)	31 (7.7)	244 (9.0)		
North	2016	21 (0.9)	3 (1.1)	6 (1.1)	30 (0.9)	65 (0.7)	7.51
Khorasan	2015	8 (0.4)	0 (0)	3 (0.5)	11 (0.4)		
	2014	17 (0.8)	2 (1.2)	5 (1.3)	24 (0.9)		
Khuzestan	2016	48 (2.0)	16 (5.7)	46 (8.5)	110 (3.5)	288 (3.3)	6.20
	2015	48 (2.4)	6 (2.8)	34 (6.2)	88 (3.2)		
	2014	67 (3.1)	3 (1.8)	20 (5.0)	90 (3.0)		
Zanjan	2016	41 (1.7)	4 (1.4)	11 (2.0)	56 (1.7)	193 (2.3)	18.55
	2015	44 (2.2)	6 (2.8)	11 (2.0)	61 (2.2)		
	2014	64 (3.0)	3 (1.8)	9 (2.3)	76 (2.8)		
Semnan	2016	15 (0.6)	9 (3.2)	7 (1.3)	31 (1.0)	83 (1.0)	12.33
	2015	20 (1.0)	3 (1.4)	5 (0.9)	28 (1.0)		
	2014	18 (0.8)	2 (1.2)	4 (1.0)	24 (0.9)		
Sistan and	2016	54 (2.3)	1 (0.4)	13 (2.4)	68 (2.1)	247 (2.9)	9.22
Balochistan	2015	67 (3.4)	8 (3.8)	15 (2.7)	90 (3.3)		
	2014	76 (3.6)	1 (0.6)	12 (3.0)	89 (3.3)		
Fars	2016	141 (6.0)	13 (4.6)	37 (6.8)	191 (6.0)	576 (6.6)	12.13
	2015	136 (6.9)	27 (12.8)	40 (7.3)	203 (7.4)		
	2014	127 (5.9)	10 (5.8)	45 (11.3)	182 (6.8)		

Table 2. Place of death and cumulative incidence (per 100000 person) in the Provinces of Iran by registry sources (continue)

Province of death	Year	LMO	MOHME		Total	Total in three years	Cumulative incidence (per 100000 person)
		Only MOHME	Both	Only LMO			
Qazvin	2016	18 (0.8)	20 (7.1)	11 (2.0)	49 (1.5)	132 (1.5)	10.60
	2015	24 (1.2)	5 (2.4)	17 (3.1)	46 (1.7)		
	2014	29 (1.4)	2 (1.2)	6 (1.5)	37 (1.3)		
Qom	2016	47 (2.0)	0 (0)	2 (0.4)	49 (1.5)	128 (1.5)	10.37
	2015	33 (1.7)	0 (0)	0 (0)	33 (1.2)		
	2014	45 (2.1)	0 (0)	1 (0.3)	46 (1.7)		
Kurdistan	2016	41 (1.7)	1 (0.4)	5 (0.9)	47 (1.4)	104 (1.2)	6.67
	2015	22 (1.1)	2 (0.9)	6 (1.1)	30 (1.1)		
	2014	24 (1.1)	0 (0)	3 (0.8)	27 (1.0)		
Kerman	2016	78 (3.3)	1 (0.4)	11 (2.0)	90 (3.0)	217 (2.5)	7.06
	2015	29 (1.5)	2 (0.9)	16 (2.9)	47 (1.7)		
	2014	52 (2.4)	1 (0.6)	27 (6.8)	80 (3.0)		
Kermanshah	2016	137 (5.8)	14 (4.9)	24 (4.4)	175 (5.5)	444 (5.1)	22.78
	2015	83 (4.2)	32 (15.2)	23 (4.2)	138 (5.0)		
	2014	113 (5.3)	6 (3.5)	12 (3.0)	131 (4.8)		
Kohgilouyeh and Boyerahmad	2016	17 (0.7)	0 (0)	4 (0.7)	21 (0.6)	51 (0.6)	7.38
	2015	10 (0.5)	0 (0)	3 (0.5)	13 (0.5)		
	2014	12 (0.6)	0 (0)	5 (1.3)	17 (0.6)		
Golestan	2016	19 (0.8)	1 (0.4)	14 (2.6)	34 (1.1)	92 (1.0)	5.02
	2015	15 (0.8)	0 (0)	20 (3.6)	35 (1.2)		
	2014	16 (0.7)	0 (0)	7 (1.8)	23 (0.9)		
Gilan	2016	96 (4.1)	1 (0.4)	13 (2.4)	110 (3.5)	257 (3.0)	10.23
	2015	66 (3.3)	2 (0.9)	7 (1.3)	75 (3.0)		
	2014	53 (2.5)	4 (2.3)	15 (3.8)	72 (2.7)		
Lorestan	2016	68 (2.9)	7 (2.5)	17 (3.1)	92 (3.0)	307 (3.5)	17.46
	2015	103 (5.2)	3 (1.4)	4 (0.7)	110 (3.8)		
	2014	91 (4.3)	4 (2.3)	10 (2.5)	105 (4.0)		
Mazandaran	2016	27 (1.1)	1 (0.4)	23 (4.3)	51 (1.6)	127 (1.5)	3.97
	2015	24 (1.2)	2 (0.9)	14 (2.5)	40 (1.5)		
	2014	24 (1.1)	0 (0)	12 (3.0)	36 (1.4)		
Markazi	2016	16 (0.7)	0 (0)	4 (0.7)	20 (0.6)	109 (1.3)	7.65
	2015	34 (1.7)	2 (0.9)	4 (0.7)	40 (1.5)		
	2014	45 (2.1)	2 (1.2)	2 (0.5)	49 (1.9)		
Hormozgan	2016	18 (0.8)	3 (1.1)	22 (4.0)	43 (1.3)	147 (1.7)	8.67
	2015	19 (1.0)	2 (0.9)	22 (4.1)	43 (1.6)		
	2014	44 (2.1)	2 (1.2)	15 (3.8)	61 (2.3)		
Hamedan	2016	88 (3.7)	9 (3.2)	20 (3.7)	117 (3.6)	359 (4.1)	20.56
	2015	66 (3.3)	27 (12.8)	27 (4.9)	120 (4.4)		
	2014	56 (2.6)	45 (26.3)	21 (5.3)	122 (4.5)		
Yazd	2016	8 (0.3)	7 (2.5)	14 (2.6)	29 (0.9)	79 (0.9)	7.29
	2015	2 (0.1)	3 (1.4)	20 (3.6)	25 (0.9)		
	2014	14 (0.7)	0 (0)	11 (2.8)	25 (1.0)		
Unknown	2016	18 (0.8)	2 (0.7)	5 (0.9)	26 (0.8)	83 (1.0)	-
	2015	8 (0.4)	14 (6.6)	16 (2.9)	38 (1.5)		
	2014	11 (0.5)	0 (0)	8 (2.0)	19 (0.7)		
Total	2016	2361 (100)	284 (100)	541 (100)	3186 (100)	8639 (100)	11.07
	2015	1985 (100)	211 (100)	550 (100)	2746 (100)		
	2014	2138 (100)	170 (100)	399 (100)	2707 (100)		

MOHME: Ministry of Health and Medical Education; LMO: Legal Medicine Organization

Table 3. Annual source of drug-related deaths (DRDs) in 2014-2016 with capture-recapture method

Estimation of drug-related deaths	Year	Both LMO and MOHME	Only MOHME	Only LMO	Estimate (upper-lower)	Total in the 3 years estimate (upper-lower)
With all unidentified deceased	2016	384	641	2461	4104 (4117-4092)	11341 (11357-11332)
	2015	317	656	2091	4321 (4304-4339)	
	2014	335	417	2305	2707 (2701-2712)	
Without unidentified deceased	2016	284	541	2361	4491 (4511-4471)	14517 (14498-14558)
	2015	211	550	1985	5161 (5126-5196)	
	2014	170	399	2138	5003 (4961-5044)	
With half of the unidentified deceased	2016	334	591	2411	4646.3 (4670.3-4622.4)	12418.9 (12406.8-12442.7)
	2015	264	603	2038	4646.3 (4622.4-4670.3)	
	2014	262	408	2221	3454.5 (3440.1-3468.8)	

MOHME: Ministry of Health and Medical Education; LMO: Legal Medicine Organization

According to the reports by Iran's MOHME, methadone is the most common cause of death in fatal poisonings with drugs. Methadone is used as an alternative to opioids.[19] Although it is an appropriate option as a replacement for heroin in order to reduce damage in individuals, its consumption for fun and treatment, incidentally, or for committing suicide or murder, even at low doses, can lead to death in both children and adults.[20,21] In Iran, there have been reports indicating a considerable rise in the number of deaths caused by methadone.[22,23] The Toxicology Center of the LMO has introduced this substance as a significant cause of death in Iran.[22] One of the reasons for this increasing trend can be the growing tendency toward drugs, methadone overdose, low supervision over its prescription and disregard for protocols, inappropriate storage conditions, and incidental use of drugs by children out of curiosity.[22-24]

The results of the present study further showed that, not taking unidentified individuals into account, 14517 deaths have occurred due to drugs during the years 2014-2016. The rate of drug-related deaths is lower, however, in Iran compared to other countries. In America, for example, the results of analysis by the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC) show that drug-related deaths in the United States have increased from 16849 in 1999 to 70237 in 2017.[25] The results of similar cross-sectional studies carried out by the LMO in Iran show that in 1 year (from March 2014 to February 2015) 2986 drug-induced deaths have been referred to this organization. The number of deaths has been estimated to be 38.4 in every 100000.[4] The number of drug-related deaths referred to the LMO in the following year (from 25th of March 2015 to February 2016) was 2306, which is estimated to be 38.22 individuals in every 1000000 persons.[5] However, although there is a lower rate of drug-induced death in Iran compared to the United States, it should be noted that America has a larger population.[26]

The findings of the present study are indicative of a higher rate of cumulative incidence of death in younger ages in Iran (age range: 20-40 years; mean age: 36) particularly in Kermanshah, Hamedan, and Zanjan Provinces. The results of similar studies confirm this; during recent years, the highest rate of drug-related death in Iran has been reported in Kermanshah, Hamedan, and Zanjan[5,27] and within the age range of 20-40 years (mean age: 36) and this rate has been increasing.[5,28-30] Lower rate in marriage rate in this age range, unemployment or lack of a good job, and lack of financial security and housing can be mentioned as the most important risk factors for drug-related deaths. Therefore, if the related authorities attend to these factors, the loss of young working force in the country will decrease. In addition, a large number of these individuals have consumed these substances intentionally and in order to commit suicide. Paying attention to the mental status of those who refer to addiction treatment camps and timely treatment of their illnesses which could lead to suicide such as depression can play a significant and preventive role in this respect.

Conclusion

There is a high discrepancy and a small overlap between the data from the MOHME and the LMO

concerning registration of drug-induced deaths and a large part of the data belongs to the LMO. Accordingly, there is a need to design a more accurate system for registering these deaths in Iran. During the examined period, the total number of deaths caused by drug use was 14517. The number of deaths registered by the 2 sources was estimated to be 11341 and 12418, respectively, based on the complete overlap assumption and 50% of the unidentified individuals. It is suggested that a similar study be carried out after informing the related authorities about the status quo to examine the effects of providing feedback. The necessary corrective measures are expected to be taken for preventing undercount and creating an interaction between different departments responsible for the registration of drug-induced deaths.

Limitations

The present study is the first in Iran to make an estimation of the number of drug-induced deaths using 2 official sources of death registration. However, the study suffers from certain limitations. One of the major limitations is that the existing reports about the number of drug-related deaths are likely to be lower than the real number. To avoid the stigma of addiction, many families refuse to provide exact information about the drug use history of the deceased. Moreover, many of the individuals who pass away due to drug use are buried in the same place and their death is not reported to official sources due to extreme poverty. Lack of reporting of the type of poisoning causing the death by the LMO is another limitation of the study. Furthermore, despite the agreement of Deputy of Treatment associated with the MOHME, the security department refused to provide the data related to drug-related deaths to researchers, which limits the information sources available and lowers their validity.

Conflict of Interests

The authors have no conflict of interest.

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Authors' Contribution

MB, MZ and AA designed the study. MB and MZ conducted the study. SSHN, MS, MG and AK contributed to data collection. MB and AA conducted the statistical analysis. MB and MZ and AA wrote the first draft of the manuscript. All authors read and approved the content of the final manuscript.

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برآورد مرگ به علت مصرف مواد در ایران با روش صید بازصید طی سال‌های ۹۵-۱۳۹۳

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مقاله پژوهشی

چکیده

مقدمه: ثبت مرگ بر اثر مواد در ایران، به طور انحصاری توسط وزارت بهداشت، درمان و آموزش پزشکی و پزشکی قانونی انجام می‌شود. پژوهش حاضر با هدف برآورد مرگ به علت مصرف مواد و بررسی میزان هم‌پوشانی و کم‌ثبتی در بین این دو منبع انجام شد.

روش‌ها: آمارهای ثبت شده مرگ ناشی از مصرف مواد مطابق با International Classification of Diseases-۱۰ (ICD-۱۰) طی سال‌های ۹۵-۱۳۹۳ از دو منبع مذکور (وزارت بهداشت و پزشکی قانونی) جمع‌آوری گردید و سپس تعداد موارد مرگ و میر با استفاده از روش صید بازصید دو منبعی در نرم‌افزار Excel و SPSS مورد تجزیه و تحلیل قرار گرفت.

یافته‌ها: مجموع تمامی مرگ‌ها بر اثر مصرف مواد در طول سه سال در دو منبع، ۸۶۳۹ نفر گزارش شد. بخش بزرگی از داده‌های ثبت مرگ بر اثر مواد، متعلق به مرکز پزشکی قانونی کشور بود (حدود ۷۵ درصد) و سهم وزارت بهداشت ایران در داده‌های ثبت شده، ۲۵ درصد بود. تنها سهم کوچکی از داده‌ها بین دو منبع مشترک بود (حدود ۷/۷ درصد). برآورد نهایی از مدل صید بازصید در حالت کلی و آنالیز حساسیت انجام شده نشان داد که در طی سه سال، همه مرگ‌ها به دلیل مصرف مواد در کشور (با حدود اطمینان ۹۵ درصد برابر با ۱۴۵۵۸-۱۴۴۹۸) ۱۴۵۱۷ نفر برآورد گردید. این برآورد با فرض اشتراک تمام و ۵۰ درصد مجهول‌الهویه‌ها در دو منبع به ترتیب ۱۱۳۴۱ و ۱۲۴۱۸ نفر به دست آمد. بیشترین مسمومیت‌ها در طبقه سنی ۲۵ تا ۳۹ سال و در مردان مشاهده گردید. استان‌های کرمانشاه، همدان و زنجان به ترتیب بیشترین میزان بروز تجمعی را از مرگ بر اثر مواد داشتند. شایع‌ترین علت زمینه‌ای فوت در متوفیان در منبع وزارت بهداشت، عوارض ناشی از داروی مخدر متادون بود

نتیجه‌گیری: در مطالعه حاضر از منابع تخصصی ثبت مرگ ناشی از مصرف مواد استفاده شد. بهتر است جهت جلوگیری از خطا و کم‌ثبتی، ترکیب اطلاعات دو منبع هنگام ثبت مد نظر قرار گیرد.

واژگان کلیدی: مرگ، اختلالات سوء مصرف مواد، ایران

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