ORIGINAL REPORT

A Survey of Suicide by Burning in Tehran, Iran

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Abstract- To identify the characteristics of completed suicide by burning in Tehran. A retrospective analysis of data obtained from Tehran's Legal Medicine Organization and judiciary system over 5-years (from 2002 to 2006). During the 5 years, 374 decedents (64.2% female and 35.8% male) were diagnosed as suicide by self-burning, and the annual incidence rate was 0.9 per 100,000 general population-years. The most at risk group was young females. Sixty-five decedents (17.4%) had died at the scene of incidents. The location at the time of attempted suicide in all female victims and 75.4% of male decedents was home. Sixty-one percent of decedents were married and 26.2% of them had no education. Most victims were residents of suburban areas. The annual incidence rate of self-burning suicide in Tehran was found to be lower than other Iran's geographic areas, although it was higher than developed countries. Self-burning was more frequent in females than in males and was noted mainly in young age groups' residents of suburban areas with low level of education. These characteristics suggest that social factors are the main drive leading to an unacceptably high rate of suicide by self-burning among women in Tehran.

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Key words: Burn; suicide; mortality; Iran

Introduction

Suicide is the result of an act deliberately initiated and performed by a person in the full knowledge or expectation of its fatal outcome. There are many different methods and means of deliberate self-injury according to geographical region, social factors and gender. It is well known that availability of means to commit suicide has a major impact on actual suicides in any region (1). Burns are serious health problems that are associated with high mortality and morbidity in developing countries. Suicide by burning is among the most dramatic of all forms of suicide. Perhaps more than any other form of self-destruction, the act of suicide by burning has a long documented history of powerful cultural meaning and political impact across much of the world (2,3). Accounts of culturally sanctioned ritualistic self-burning go back as far as the first century BC Greece (2), and intentional self-burning continues to be a major cause of serious burn injury and death in many parts of the world (4). The incidence, pattern and trends of suicide differ considerably between Asian and Western countries. They also differ considerably among Asian countries (5). In studies from the Indian subcontinent and the Middle East, for instance, the vast majority of victims of self-inflicted burn injuries are young women, accounting for more than 25% of all admissions to burn centers (4,6-8). In different parts of Iran, 1.39–40.3% of all suicides and para-suicides have been reported as coming about through self-inflicted burns (9,10). Women are the main victims of self-inflicted burns for suicide in Iran (1,9-11). In proportion to population, the Kohkiluyeh-Boyerahmad, Boushehr, Ilam, Kermanshah and Lorestan provinces of Iran were foremost in incidence of self-inflicted burns in 1993 (9). In Iran, over 80% of female suicides are by burning, and most victims are young, illiterate, impoverished married women (1).

Self-inflicted burns remain a socio-medical problem of global reach and significance. Intentional burns are still common in Iran. Studies that have investigated patient characteristics and outcomes related to self-

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inflicted burn injuries generally have been limited by small number of patients from single burn centers and with no reviewed evidence of self-burning death which occurred at scene of incident. Since self-inflicted burn is a major health and public problem, we considered it of some interest to analyze all such deaths over a period of 5 years which were referred to the Legal Medicine Organization (LMO) of Tehran city in order to confirm the tendency to use fire for suicide and to analyze the descriptive data of these victims.

Patients and Methods

Study design

The present study was carried out at the Tehran's LMO; this unit investigates all unnatural and suspicious deaths occurred in Tehran, the capital city of Iran. It is a retrospective study in which 1872 victims of the burns who referred to Tehran's LMO were screened over a period of 5 years (from 1 January 2002 through 1 January 2007) from which 374 victims of suicides by self-burning were found out.

Setting and Population

The population of the Tehran province is about 12 million and about 8 million of them reside in urban and suburban areas of Tehran city. Three hundred and seventy-four victims had committed a complete suicide by burning. These represented 20.0% of all cadavers with burns referred to the LMO of Tehran city over the same period. Deaths were identified by a review of death certificates and autopsy reports that listed burn as a possible primary or contributing cause of death in accordance with the International Classification of Disease (ICD-9). Additional data was obtained from the Tehran's LMO records and county judiciary reports. Extracted data comprised the demographic information of each decedent (e.g., subject number, age, gender, residence, date and place of death, educational status, marital status, occupational status, percentage of burns, method of self-inflicted burn, correctness of ICD-9 classification, and manner of death).

This analysis includes all cases of completed suicide by self-burning reported from 1 January 2002 through 1 January 2007 who resided in urban or suburban areas of Tehran city. To determine death rates and relative risks, we compared numbers and percentages of self-burning deaths to population and demographic data obtained from the Tehran Census. The annual incidence rates of suicide by self-burning were estimated by relating the numbers of deaths due to deliberate self-burning to the number of general population-years of observation, as estimated from the 2006 population census. To examine variations in the different categories of suicide incidents, it is necessary to account for the variations in the denominator populations. Therefore, the frequency counts are directly age and sex, standardized into rates per 100,000 with the Tehran's 2006 census as the standard regional population.

Data collection

Three hundred and seventy-four victims who had clearly and unequivocally committed suicide by self-burning were identified. Inclusion criteria were based on the judiciary reports identifying deliberate self-burning or a testimony of a reliable witness. Victims whose manner of death seemed suspicious or dubious and victims who were resident of other areas were excluded from the study.

Data analysis

Data analysis was performed by using SPSS 13 software. Associations between categorical variables within the sample were tested for statistical significance using Pearson's chi-square test. A Fisher exact test was used when the expected number of the subjects was less than five. A level of $P<0.05$ was considered significant.

Results

During the 5 years of the study, 2717 cases of death due to burns were referred to the LMOs of different cities in Tehran province, 1872 cases of the victims were referred to the LMO of Tehran city (23.4 per 100,000 general populations; the annual incidence rate being equal to 4.7 per 100,000 general population-year). In 374 (20.0%) of them, manner of death was diagnosed as self-burning, which the annual incidence rate is equal to 0.9 per 100,000 general population-year. Two hundred forty cases (64.2%) of self-burning victims were female and 134 (35.8%) were male. Sex and age distributions are shown in Table 1.

There is a variable trend in the number of decedents over the 5 years (Table 2). The mean age was 27.1±15.4 years (female; 26.5±15.2, male; 28.2±15.7), with a range of 15–64 years. A total 80.0% (n=299) of the decedents were in the 15–24 and 25–34 year age groups (1.6 per 100,000, 2.0 per 100,000 general population-year, respectively). The most at risk group was young females (25-34 year age group; 2.5/100,000 population-year and 15-24 year age group; 2.2/100,000 population-year). Relatively unusual incident rates were found among young male groups; (25-34 year age group; 1.4/100,000 population-year and 15-24 year age group; 1.0/100,000

Table 1. Age and sex distribution of suicidal self-burning deaths in Tehran from Jan 2002 to Dec 2006 (n=374)

Variable	Female	Male	All	P
Mean age ± S.D. (years)				
Age group- years [N (%)]	26.5±15.2	28.2±15.7	145 (38.8)	NS
15-24	98 (26.2)	47 (12.6)		P<0.05
25-34	97 (25.9)	57 (15.3)	154 (41.2)	P<0.05
35-44	19 (5.1)	20 (5.3)	39 (10.4)	NS
45-54	13 (3.5)	5 (1.3)	18 (4.8)	P<0.05
55-64	13 (3.5)	5 (1.3)	18 (4.8)	P<0.05
Total	240 (64.2)	134(35.8)	374 (100.0)	P<0.05

Table 2. The frequency of suicidal self-burning deaths in Tehran over the 5 years (from Jan 2002 to Dec 2006)

Variable	Female	Male	All
Year [N(%)]			
2002	51 (13.6)	28 (7.5)	79 (21.1)
2003	50 (13.4)	28 (7.5)	78 (20.9)
2004	50 (13.4)	27 (7.2)	77 (20.6)
2005	48 (12.8)	27 (7.2)	75 (20.0)
2006	41(11.0)	24 (6.4)	65 (17.4)
Total	240 (64.2)	134 (35.8)	374 (100.0)

population-year) and old females; (55-64 year age group; 1.1/100,000 population-year). Age and sex standardized incident rates (STRs) per 100,000 general population-years are shown in Table 3.

The method chosen for attempting suicide was kerosene in 271 (72.5%) cases, followed by gasoline (n=58, 15.5%), domestic gas (n=28, 7.5%) and alcohol (n=17, 4.5%). There was no significant difference between males and females in method of self-burning.

Sixty-five decedents (17.4%) who had died at the scene of incidents were referred from police station. Three hundred and nine patients died in hospital, 148 died within the first 48 h after admission. The length of hospital stay ranged from 1–62 days with a mean of 9.3 days. The location at the time of attempted suicide in all female victims and 75.4% of male decedents was home. The remnant male victims committed suicide in the work-place (20.1%) or other miscellaneous places (4.5%).

The complete suicide by burning was common during winter months (29.9%), followed by spring (24.9%), autumn (23.0%), and summer (22.2%). There was no significant seasonal variation. The total body surface area (TBSA) burn ranged from 27 to 100%, with a mean of 69.5% (S.D.=18.58).

Sixty-one percent of decedents were married and 26.2% of them had no education. The incidence rates for decedents with illiteracy, primary and secondary school levels were significantly (P<0.05) higher than victims with university degrees. Demographic data is shown in Table 4.

Among female decedents 87.9% were housekeeper. None of them were pregnant. Most of male victims (58.2%) were unemployed. Overall, two hundred and fifty-one victims (67.1%) were residents of suburban areas and remnant (32.9%) were residents of urban areas of Tehran (P<0.05).

Table 3. Age and sex standardized incident rates (STRs) per 100,000 (95% CIs) suicidal self-burning deaths in Tehran during a five years period from Jan 2002 to Dec 2006 (n=374)

Variable	Female	Male	All
Age groups [N(STRs per 100,000 population-year)][1]			
15-24	98 (2.2)	47 (1.0)	145 (1.6)
25-34	97 (2.5)	57 (1.4)	154 (2.0)
35-44	19 (0.6)	20 (0.6)	39 (0.6)
45-54	13 (0.6)	5 (0.2)	18 (0.4)
55-64	13 (1.1)	5 (0.4)	18 (0.7)
Total	240 (1.2)	134 (0.7)	374 (0.9)

1- STRs = Standardized incident rates per 100,000 population-year.

Table 4. Demographic data of completed suicides by self-burning in Tehran over a 5-year period (from Jan 2002 to Dec 2006)

State	Female	Male	All
Marital State [N(%)]			
Single	56 (23.3)	64 (47.8)	120 (32.0)
Married	168 (70.0)	60 (44.8)	228 (61.0)
Engaged	12 (5.0)	7 (5.2)	19 (5.1)
Widow/widower	4 (1.7)	3 (2.2)	7 (1.9)
Total	240 (100.0)	134 (100.0)	374 (100.0)
Educational state			
Illiterate	70 (29.2)	28 (20.9)	98 (26.2)
Primary school	45 (18.8)	28 (20.9)	73 (19.5)
Secondary school	86 (35.8)	59 (44.0)	145 (38.8)
High school	36 (15.0)	18 (13.4)	54 (14.4)
University	3 (1.2)	1 (0.8)	4 (1.1)
Total	240 (100.0)	134 (100.0)	374 (100.0)

Discussion

In the present study, a total of 374 completed suicides by self-burning are described in a retrospective way over a 5-year period, a mean of 75 deaths per year. They had clearly and unequivocally committed suicide by self-burning. Inclusion criteria were based on the judiciary reports identifying deliberate self-burning or a testimony of a reliable witness. Analysis of the data showed that the annual incidence rate of suicide by self-burning was 0.9/100,000 general population and male/female ratio was approximately 1: 2. Females' committed self-burning suicides were twice higher than the males'. In comparison with other Iranian studies, although some of these studies are based on hospital records and do not include deaths occurring at scene of incidents, which give some lower rates, the annual incidence rate of self-burning suicide in Tehran was found to be lower than other Iran's geographic areas (1,6,9-11). For example, in a study from Tabriz (north-west of Iran) Maghsoudi et al. reported that the incidence of suicide by self-inflicted burns was equal to 9.7 per 100,000 general population (during 4 years; 1998 to 2001). Thus the annual incidence rate of self-burning suicide in Tabriz was estimated 2.4/100,000 general population.[1] The annual incidence rate for suicide by self-burning in province of Kurdistan (west of Iran) is reported 2 per 100,000 person (12). This rate in Kermanshah, Ilam, Hamadan, Lorestan, Kohkiluye-Boyerahmad, Boushehr, Fars, khorasan and Khuzestan provinces are even higher (6,9,10,12-14). Instead, this is much higher than rates in Japanese (15), Australian (16) and Western populations (17-28).

Seemingly, the explanation of low annual incidence rate of suicide by self-burning in Tehran, in comparison with other parts of Iran, is social, cultural and educational differences, because residents of capital city are expected to have relatively higher levels of education and culture. As the overall social, cultural and educational levels in developed countries are higher than Tehran's residents. A noteworthy feature in this series was that the incidence rates for decedents with illiteracy, primary and secondary school levels were significantly (P<0.05) higher than victims with university degrees.

The mean age of patients in the present study is close to other reports from Iran, Indian subcontinent and the Middle East, but is much lower than reports from European and American populations (3,4). This might be explained, at least in part, by the fact of different age group distribution of Iran's population with higher percentage of younger adults and adolescents in relation to western countries.

In the present study, the comparatively younger age group of 15–34 years shows the most predispositions for the occurrence of self-burning, accounting for 80% of cases. Besides, in this age group, nearly 90% of the females were married. Similar findings have been reported from various parts of the country, but not from elsewhere in the world. The sociocultural reason for more women sustaining self-burning injuries at an early age compared to males is probably more exposure to social and family stress, much earlier than males. Women usually mature psychologically and physically earlier than males and in a developing country like Iran, females are married earlier than males in the family.

Of all self-burning victims, 61% were married, from which 73.7% were female. Again, the high percentage of married female burnings by suicide is a very rare event elsewhere in the world and can pose the possibility that some of these cases may actually be homicides, disguised as suicides which cannot be ruled out completely. As on the spot deaths at the scene of event are rare in burning, the victim usually survives a few days before succumbing to septicemia in most cases. This gives an ample time to the husband, family and relatives of the victim to convince her to record a false dying declaration before a Magistrate, regarding the manner of her sustaining the burn injuries. This way, the victim assures the physical safety and financial

provisions for her surviving children and parents on one hand, and on the other, a lesser or no punishment for her husband and spouse's immediate family.

In our review, flame was the most common cause of self-burning. The majority of decedents (88.0%) in the present study used kerosene or gasoline as a fire accelerant. This is close to the reports from other provinces of Iran, Indian subcontinent and the Middle East, while in European and north American populations, gasoline was frequently used (1,4,6). As most of self-burnings were happened in suburban areas, seemingly they had easy access to kerosene and gasoline as a fire accelerant.

The mean TBSA of the decedents was 69.5 percent. This is similar to other reports from other parts of Iran, Indian subcontinent and the Middle East, but is higher than the majority of European and American populations (1,4,6). There is a general consensus that mortality is extremely high when TBSA burn exceeds 70%. It seems that self-burnings, in contrast to unintentional burns, can cause severe damages. Of 309 patients died in hospital, 148 (47.9%) died within the first 48 h after admission. The length of hospital stay ranged from 1–62 days with a mean of 9.3 days. In the present study, there was a significant correlation between TBSA burn and mortality rate ($p<0.001$). On the other hand, the mean hospitalization period increased significantly ($p<0.001$) with an extension of burn size up to 60%. In contrast, the mean hospital stay decreased significantly ($p<0.001$) with increasing TBSA burn over 60%, due to increased mortality rate.

Regarding the locations where self-burning occurred, most of victims' injuries happened at home. Most of the female victims in our study were students and housewives, and more than half of the males were unemployed. This explains why most of the self-burning attempts occurred at home.

Winter was the most common season for burns, followed by spring. This may be explained by easy access to burning methods in the colder seasons. However, the variations were slight and there was no significant seasonal variation noted in the present report; similar findings have been described by others (12,13). This is probably due to the temperate climatic condition, and limited use of traditional heating devices due to modernity.

The present data shows the female predominance of self-inflicted burns. This is in agreement with several studies (1,4,6). Literature on suicide indicates that men are more likely to commit suicide than women, whereas women are more prone to make suicidal attempts (29). But our study revealed that the main victims of completed suicide by burning in Tehran were women. This is similar to the situation seen in Cairo (30), in other Asian populations (24,31-33), and in other provinces of Iran (9-11). In Western countries, single old men form the majority who commit suicide (20,28,34,35). In Iran, the majority of suicides are young married women (9-11). Therefore, it seems that the young married women are high risk for self-inflicted burns in our society. The number of young victims in our study highlights the need for the establishment of appropriate counseling services in the community.

Rate of suicide by different means of both sexes is various in different parts of Iran. Drug overdose, hanging, self-burning, firearm, cuts and poisons are common methods of suicide (9), but to the best of our knowledge, no other population-based completed suicide rate among Iranian people has been reported. Data on suicide rates from economically developing countries often do not exist. Where they are available, there are often problems associated with the numerator (e.g., underreporting as the result of inefficient civil registration systems, variations in coroners practices, and differences in the extent to which family and friends may try to conceal the cause of death because of social stigma, religious sanctions, and legal issues associated with suicide) and with the denominator (e.g., unreliable population counts) (36). There is a general consensus among suicide researchers that to date figures have underestimated the extent of the problem in economically developing countries. Although a number of studies have reported various rates on suicide and particularly suicide by burns in different regions in Iran, no accurate and reliable national rate for suicide is available. According to the World Health Organization, the national rate of suicide by all methods in 1991 in Iran was 0.2 per 100,000 population (provided by the Iranian Government), which is lower than the reported rates in various studies as well as our study (0.9 per 100,000 population). Thus, unfortunately we had no access to nationwide precise data for analytic comparison and ranking self-burning among various methods of suicide in this survey.

Apart from suicides, an incidence of 4.7 deaths per 100,000 general population-years from burns is enormous. Although, a survey by Sheikhazadi et al. (37) have showed a fair decline of fetal burns in Tehran from 2001 to 2005, yet, the large number of deaths due to burns in Tehran continues to be a major challenge to the health care providers and society. Thus, there is an urgent need to plan and implement a burn prevention

program in Iran which should direct towards reducing the incidence of burn injuries and associated mortality among young persons.

There were limitations that should be taken into consideration in interpreting the results from this study. First, this study examined cadavers that have been associated with psychiatric diagnoses in the context of suicide, but presented only admittedly flawed data on actual psychiatric diagnoses. In addition, it was a retrospective study based on forensic and judicial data and some data was unavailable. Prospective researches are needed to document the psychiatric characteristics of patients who attempt suicide by burning and to provide recommendations for acute and long-term integrated psychiatric and medical care. The systematic recording by the LMO of the causes of trauma in lethal burns (using the ICD coding) associated with clinical recording may be suggested for a prospective study.

In summary, the incidence of suicide by self-burning in Tehran is lower than other parts of Iran. The highest incidence rates of suicide by self-burning were in the young age groups. Self-burning was more frequent in females than in males. Flame by kerosene was the major cause of self-burning. Self-inflicted burns were noted mainly in young age groups with low level of literacy. A large number of suicides by self-burning, which affects both genders, occur at home. The frequency of suicide by self-burning in suburban areas was higher than urban areas. In our opinion, social factors are the main drive leading to an unacceptably high rate of suicide by self-burning among women in Iran. The problem is difficult to address and will depend precisely upon economic, educational and social advancement for the amelioration. For further study, a prospective survey comprising the hospital records, LMO repots and judicial opinions is recommended.

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