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## Incidence, survival pattern and prognosis of self-immolation: a case study in Iran

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**Abstract** *Aim:* Our aim was to describe the survival pattern and prognostic predictors of individuals attempting suicide by self-immolation. *Subjects and methods:* We performed a cohort study of all self-immolation subjects diagnosed/registered between 1988 and 2004 in the Sina University Hospital of the Tabriz University of Medical Sciences, Tabriz, Iran. Cases were followed from diagnosis/admission to recovery or death. *Results:* Of 117 cases, 91 died, giving a case fatality rate of 78% (95% CI: 69–84). Most subjects were married (58%), female (78%) and from urban areas (66%). The proportion of subjects surviving to 2 and 6 weeks were 29% and 5%, respectively. Most deaths occurred in the early days after the event. Univariate analysis revealed survival to be significantly lower in subjects with more than 75% burns in the total surface body area (TSBA) ( $P=0.0001$ ), those with burns in the head and neck ( $P=0.003$ ), and in the trunk ( $P=0.004$ ), genital organs ( $P=0.027$ ), upper limbs ( $P=0.013$ ) and lower limbs ( $P=0.0001$ ). No statistical differences in survival were observed by gender, marital status, residence status, tools used for suicide, income, history of family conflict,

age or weight. Using the Cox proportional hazard model, cases with more than 75% burns in TSBA (RR=2.6, 95% CI: 1.6–4.3), those with burns in the head and neck (RR=2.5, 95% CI: 1.1–5.2), and those with burns in the lower limbs (RR=5.8, 95% CI: 2.2–14.9) were at higher risk of dying than others. *Conclusion:* One in ten subjects attempting suicide by self-immolation survives for at least 5 weeks. Further epidemiological and qualitative studies are required to determine prognosis more precisely, and to elucidate the public health impacts and socio-economic origins of such tragic events, as well as health care needs and preventive strategies in high risk populations.

**Keywords** Incidence · Survival · Prognosis · Self-immolation · Iran

### Introduction

Self-immolation is a tragic, violent, and dramatic suicide method that occurs frequently in a number of countries. The occurrence of, and reasons for, self-immolation vary, however, in different countries, ranging from socio-economic issues to political protests (Cave Bondi et al. 2001; Rastegar Lari and Alaghebandan 2004; Sheth et al. 1994; Gehlot and Nathawat 1983; Singh et al. 1982; Zarghami and Khalilian 2002; Hamshahri Newspaper 2000; Açikel et al. 2001).

Self-immolation is responsible for a high proportion of suicide attempts in some Middle-Eastern and Asian countries (Sheth et al. 1994; Zarghami and Khalilian 2002; Hamshahri Newspaper 2000). In contrast to the wide range of published research on the occurrence and epidemiological features of suicide by self-immolation (Cave Bondi et al. 2001; Rastegar Lari and Alaghebandan 2004; Sheth et al. 1994; Gehlot and Nathawat 1983; Singh et al. 1982; Zarghami and Khalilian 2002; Hamshahri Newspaper 2000; Açikel et al. 2001; Groohi et al. 2002; Dibaei and Gharebagi 2000; Rothschild et al. 2001; O'Donoghue et al. 1998; Ho and Ying 2001; McDonald 2004; Iran Newspaper 2004; BBC Monitoring South Asia 2004; Mabrouk et al.

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1999; Mzezewa et al. 2000; Laoe and Ganesan 2002; Wagle et al. 1999; Kumar 2003; Esfandiari 2001; Cameron et al. 1997; Krummen et al. 1998; Ganizadeh et al. 1996; Palmu et al. 2004; Nakae et al. 2003; Haberal et al. 1989), few published data are available on the survival patterns, prognosis, and predictor factors of this type of suicide.

The aim of this study was to describe the incidence, survival pattern, prognosis, and predictor factors of self-immolation as a case study in the Northwest of Iran.

## Methods

The main source of data was the Sina University Hospital of Tabriz, a major city in the northwest of Iran, covering the population of northwest provinces of the country, including East Azarbaijan, West Azarbaijan, Ardebil and Kurdistan. Within this area, all confirmed cases of suicide attempts identified by a psychiatrist are admitted/registered in this hospital.

Self-immolation was classified using the ICD-10-based coding system, which includes intentional self-harm by smoke, fire, flames or hot objects (ICD-10 codes: X76 and X77; World Health Organisation 1992). A total of 117 confirmed cases of self-immolation admitted between 1998 and 2004 in Sina University Hospital was prospectively followed. Follow-up was attempted for each case until death or recovery. The following variables were included in

the analyses: gender, marital status, residence status, tools used for suicide, income, history of family conflict, age, weight, body surface area burned, and, where relevant, date of death (Tables 1, 2).

The Kaplan–Meier method was used to generate a summary estimate of survival with 95% confidence. The log-rank test was used to compare and test the equality of survival experience between sub-categories of predictor variables. Cox's regression model was applied to assess the prognostic effect of each predictor variable on subject survival.

## Results

A total of 117 cases of attempted suicide by self-immolation was studied over the study period (1998–2004), of which 91 (77.8%) died and 26 (22.2%) were still alive at the end of the study. Most subjects were married (58%), female (78%) and from urban areas (66%). Kerosene and petrol were used as the most common tools used to attempt suicide by self-immolation. The age and weight (mean±standard deviation) of subjects were 28.4±13.4 years and 59.0±11.3 kg, respectively (Table 1).

The overall incidence rate of self-immolation in the region was 4.9 per 1,000,000 population (CI 95%: 4.1–5.9), ranging from 1.49 per 1,000,000 population (CI 95%: 0.48–3.4) in 1998 to 5.5 per 1,000,000 population

**Table 1** Characteristics of the study subjects

		Female		Male		Total	
		n	%	n	%	n	%
Marital status	Single	28	31.5	18	64.3	46	39.3
	Married	59	66.3	9	32.1	68	58.1
	Unknown	2	2.2	1	3.6	3	2.6
Residence status	Urban	57	64	20	71.4	77	65.8
	Rural	32	36	8	28.6	40	34.2
Outcome	Death	69	77.5	22	78.6	91	77.8
	Recovered	20	22.5	6	21.4	26	22.2
Tools used for self-immolation	Kerosene/petrol	81	91	26	92.9	107	91.5
	Other	8	9	2	7.1	10	8.5
Income	Having income	1	1.1	14	50	15	12.8
	No income	88	98.9	14	50	102	87.2
History of family conflicts	Yes	24	27.0	7	25.0	31	26.5
	No	13	14.6	9	32.1	22	18.8
	Unknown	52	58.4	12	42.9	64	54.7
		Female		Male		Total	
		Mean±SD <sup>a</sup>	(95% CI) <sup>b</sup>	Mean±SD	(95% CI)	Mean±SD	(95% CI)
Age (years)		29.2±14.2	(26.0–32.3)	26.3±10.8	(22.0–30.6)	28.4±13.4	(25.9–31.0)
Weight (kg)		58.1±10.7	(55.7–60.5)	61.9±12.8	(56.8–66.9)	59.0±11.3	(56.9–61.2)
TBSA (%) <sup>c</sup>		63.3±27.6	(57.2–69.5)	65.1±30.5	(53.1–77.2)	63.8±28.2	(58.4–69.2)

<sup>a</sup>Standard deviation of the mean

<sup>b</sup>Confidence interval for the mean

<sup>c</sup>Total body surface area

**Table 2** Survival features of subjects of self-immolation

		Median <sup>a</sup>	Two weeks	Five weeks	Log-rank test
Gender	Male	4(2.1–5.9) <sup>b</sup>	29.6(7.3–29.8)	11.1(10.9–11.3)	0.878
	Female	5(3.2–6.8)	29.4(10.9–29.5)	9.5(9.4–9.6)	
Marital status	Married	5(4.0–5.9)	30.5(30.4–30.6)	11.5(11.4–11.6)	0.599
	Single	5(3.4–6.6)	22.6(11.4–22.7)	0(0.0–0.0)	
Residence status	Rural	5(2–7.9)	39.2(39.0–39.4)	12.1(12.0–12.2)	0.316
	Urban	5(4.1–5.9)	23.5(12.0–23.6)	7.4(7.3–7.5)	
Tools used for suicide	Other	3(0–7.1)	40(10.6–40.3)	20(19.7–20.3)	0.477
	Kerosene/petrol	5(4.2–5.8)	28.3(19.7–28.4)	7.8(7.7–7.9)	
Income	Having income	4(0–11.3)	38.9(9.4–39.2)	0(0.0–0.0)	0.711
	No income	5(4.2–5.8)	27.9(27.8–28.0)	10.7(10.6–10.8)	
History of family conflict	No	3(0.03–5.9)	34.8(4.4–35.0)	7.7(7.6–7.8)	0.258
	Yes	5(0–13.6)	41.5(7.6–41.7)	0(0.0–0.0)	
Age	≥25 years	4(2.9–5.1)	37(36.9–37.1)	17(16.9–17.1)	0.37
	<25 years	5(2.3–7.7)	21.2(16.9–21.3)	0(0.0–0.0)	
Weight	<50 kg	4(3.1–4.9)	29.9(29.8–30.0)	11.1(11.0–11.2)	0.88
	≥50 kg	6(3.6–8.4)	26.2(11.0–26.4)	0(0.0–0.0)	
TBSA <sup>c</sup>	<75%	15(8.0–21.9)	51.3(51.2–51.4)	17.1(17.0–17.2)	0.0001
	≥75%	3(2.3–3.7)	2(17.0–2.0)	0(0.0–0.0)	
Burns in head and neck	No	12(0–33.7)	49.1(48.9–49.3)	36.9(36.6–37.2)	0.003
	Yes	4(3.2–4.8)	25.9(36.6–26.0)	3.6(3.5–3.7)	
Burns in trunk	No	28(16.5–39.5)	91.7(3.5–91.9)	37.5(37.0–38.0)	0.004
	Yes	4(3.2–4.8)	22.9(37.0–23.0)	6.3(6.2–6.4)	
Burns in genital organs	No	7(5.0–8.9)	95.7(6.2–95.8)	7.7(7.6–7.8)	0.027
	Yes	4(2.9–5.0)	17.3(7.6–17.4)	12.9(12.8–13.0)	
Burns in upper limb	No	39 <sup>d</sup>	85.7(12.8–86.0)	57.1(56.6–57.6)	0.013
	Yes	5(4.2–5.8)	26.4(56.6–26.5)	4.5(4.4–4.6)	
Burns in lower limb	No	27(14.2–39.8)	90(4.4–90.1)	36.6(36.1–37.1)	0.0001
	Yes	4(3.4–4.6)	16.3(16.1–16.4)	4.5(4.4–4.6)	

<sup>a</sup>Median, 2 and 5 weeks survival are per days and percent, respectively

<sup>b</sup>Figures in parentheses represent 95% confidence intervals

<sup>c</sup>Total body surface area

<sup>d</sup>Too few subjects to calculate confidence interval

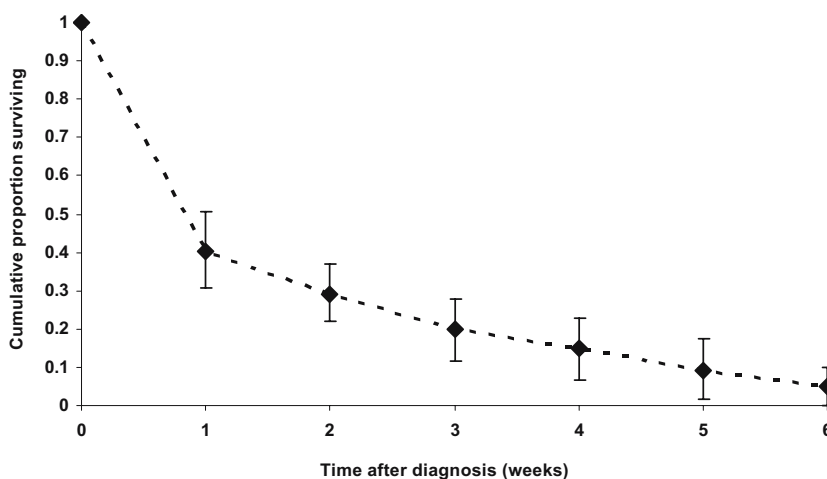
(CI 95%: 3.4–8.5) in 2004, i.e. the incidence of self-immolation increased by more than three times over the study period.

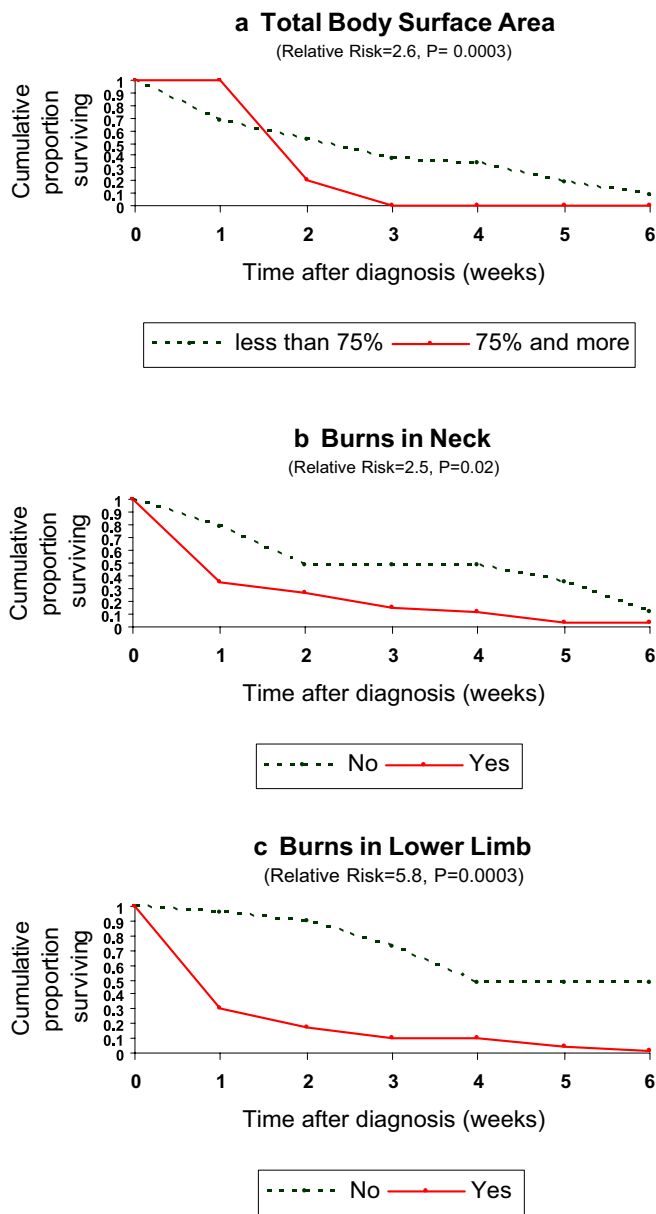
The proportion of cases attempting suicide by self-immolation surviving 2 and 6 weeks were 29% (CI 95%:

21–36) and 5% (CI 95%: 0.1–12), respectively. Most deaths occurred in the early days after the event (Fig. 1).

Some key survival indicators of subjects of self-immolation (including median survival time, 2- and 5-week survival rates, and the results of log-rank tests for

**Fig. 1** Survival rate (with 95% confidence interval) of self-immolation





**Fig. 2** Survival pattern of self-immolation by selected predictor variables. **a** Total body surface area. **b** Burns in neck. **c** Burns in lower limbs

comparison of the equality of survival experience between sub-categories of predictor variables) are presented in Table 2. In this univariate analysis, survival was significantly lower in subjects with more than 75% burns in total surface body area (TSBA) ( $P=0.0001$ ), those with burns in the head and neck ( $P=0.003$ ), and in the trunk ( $P=0.004$ ), genital organs ( $P=0.027$ ), upper limbs ( $P=0.013$ ) and in lower limbs ( $P=0.0001$ ). No statistical differences in survival pattern were observed by gender, marital status, residence status, tools used for suicide, income, history of family conflict, age or weight.

The Cox proportional hazard model was performed to evaluate the effect of each variable adjusted for all the others presented in the model. Cases with more than 75% burns in TSBA (RR=2.6, 95% CI: 1.6–4.3), those with

burns in the head and neck (RR=2.5, 95% CI: 1.1–5.2) and those with burns in the lower limbs (RR=5.8, 95% CI: 2.2–14.9) were at higher risk of dying than others (Fig. 2). None of the other variables and interactions emerged as a statistically significant prognostic factor.

## Discussion

The present study utilised data from a university hospital in Tabriz, a major Iranian city in the northwest of the country, to conduct a retrospective cohort study designed to describe the survival pattern, prognosis, and predictor factors of self-immolation in the region.

A total of 117 suicide attempts by self-immolation was surveyed from 1998 to 2004, representing an overall incidence rate in the area of 5 per 1,000,000 population, with a greater than 3-fold increase in incidence over the study period.

The overall incidence of suicide by self-immolation found in this study is in general agreement with the findings of other studies reported from other countries (Sheth et al. 1994; Gehlot and Nathawat 1983; Singh et al. 1982; O'Donoghue et al. 1998; Ho and Ying 2001; McDonald 2004; BBC Monitoring South Asia 2004; Mzezewa et al. 2000; Laoe and Ganesan 2002; Palmu et al. 2004; Nakae et al. 2003). Similar to research reports from other provinces in the country (Rastegar and Alaghebandan 2004; Zarghami and Khalilian 2002; Groohi et al. 2002; Dibaei and Gharebagi 2000; Esfandiari 2001; Ganizadeh et al. 1996), there was an increasing trend of self-immolation over time in the northeast region.

The survival of the cohort as a whole fell from 40% by the end of the first week, to 15% at 4 weeks, and to 5% at 6 weeks after the suicide attempt.

We found that cases with more than 75% burns in the body had an increased risk of mortality, as had subjects with burns in the head and neck, trunk, genital organs, upper and lower limbs. This too is fairly consistent with the findings of other studies (Açikel et al. 2001; Rothschild et al. 2001; Kumar 2003; Palmu et al. 2004; Nakae et al. 2003). No statistical differences in survival status were observed by socio-economic and demographic factors. This reflects the view that these factors might play a role in the etiology of self-immolation rather than in the prognosis and survival of patients.

Applying the Cox proportional hazard model, compared to other predictive factors, TSBA, burns to the head and neck, and burns in lower limbs had a significant impact on prognosis following self-immolation. A likely explanation is that these subjects have lower survival rates due to difficulties in movement, as they have been unable to move and get help after attempting suicide.

The findings of this study offer care providers in the emergency services and emergency departments, as well as psychiatrists and psychologists, a rare source of data on the mortality, survival patterns, and factors influencing the prognosis of patients attempting suicide by self-immolation. Such information is potentially important for the urgent

clinical decision making that follows attempted suicide, and for planning appropriate health care for affected people.

In conclusion, our study suggests that one in ten subjects attempting suicide by self-immolation survives for at least 5 weeks. Further epidemiological and qualitative studies are required to determine prognosis more precisely, and to elucidate the public health impact and socio-economic origins of such tragic events, as well as the health care needs and preventive strategies in high risk populations.

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