

# Epidemiology of Burn Injuries in West Azerbaijan Province, Western Iran

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## Abstract

**Background:** Burn injuries are in many respects the most of all tragedies an individual can experience. So there was an attempt to quantify the frequency of burn injuries, identify the risk and predisposing factors, determine the health outcomes at Imam Khomeini Hospital in Urmia, western Iran.

**Methods:** From March 2005 to March 2006, all demographic and epidemiological information of 639 patients (48.36% female and 51.64% male) about the burns and the complications were provided from the records of patients at Imam Khomeini Hospital in Urmia, Western Azarbaijan Province, western Iran.

**Results:** The incidence rate of burn hospitalization was 21.6 per 100,000. Almost 31.8% of admissions were in the 16-25 years age group. Pediatric (<5 years) and geriatric (>65 Years) burns were (21.6%) and (3.2%), respectively. Burning with flame, the most common cause of burning, accounted for 36.4% of admissions in males and for 43.6% in females. The mortality rate was 25.9%. The percentage of patients who had more than 40% body surface area (BSA) burn was 30.9%. Patients with >40% BSA burn had a mortality of 76.7%. The mean BSA burn was 33.8% in males and 25.2% in females. Admissions from Urmia were the most among the cities of the province. The mean duration of hospitalization was 7.76 days. The most cases occurred from October 22 to November 22; 10.95% and from Jun 21 to July 21; 9.54%.

**Conclusion:** The results of this study help to guide health care efforts towards the prevention of burn injuries and provide a valuable baseline for assessing future efforts directed toward the prevention of burn injuries.

**Keywords:** Burn injuries; Urmia; Iran

## Introduction

Burns are a main cause of disability and mortality throughout the world and have severe economic and social consequences. They can also lead to pain, somatic and psychological complications too.<sup>1</sup> Iran has a very high incidence of burn injuries with a formidable public health problem in terms of mortality, morbidity and permanent disabilities. Variations in management standards, available facilities and workload factors are so diverse in different parts of the country that small epidemiological samples can not sufficiently recommend on possible optimum therapeutic interventions in a developing country with limited resources and a large population.<sup>2</sup> Because of a few

published studies about burn injuries in different regions of Iran, the nature and extent of this problem is still unknown.<sup>3</sup>

This research was designed to study epidemiological parameters over one year to assist in devising strategies towards burn prevention and cost-effective management in developing regions like West Azerbaijan Province in west of Iran. The characteristics of high-risk persons, together with risk factors in the environment are identified too.

## Materials and Methods

The province of West Azerbaijan is located in the north-west of Iran. Its population is 3,015,361 living in 39487 Km<sup>2</sup>. There is only one burn center located in Imam Khomeini Hospital in Urmia and all important burn cases in the province are referred to it.

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A retrospective study was done and the data were collected by analyzing medical records of 639 patients hospitalized in the burn ward from the 1<sup>st</sup> of March 2005 to the 1<sup>st</sup> of March 2006. Age, gender, duration of hospitalization, the percentage of body surface area (BSA) burned, cause and type of burning, and outcome of the therapies were studied. The reading of the records was authorized by the hospital manager. Differences among various groups were evaluated, using Student's t-test or the Chi-Square test. The level of significance was set at 0.05. Statistical analysis was performed, using software SPSS (version 11.5, Chicago, IL, USA). Pearson statistic test was used to determine correlation.

## Results

In this study, 639 patients (48.36% female and 51.64% male) with burn injuries admitted to our unit were enrolled. The incidence rate of burn hospitalization was 21.2 per 100.000 during this period. Almost 31.8% of the admissions were in the 16-25 year age group. Pediatric (<5 years) and geriatric (>65 years) burns were 21.6% and 3.2%, respectively. Burning with flame, the most common cause of burning, accounted for 36.4% of admissions

in males and for 43.6% in females. The mortality rate was 25.9%. The percentage of patients who had more than 40% BSA burn was 30.9%. Patients with >40% BSA burn had a mortality of 76.7%. The mean BSA burn was 33.8% in males and 25.2% in females. Admissions from Urmia were the most among the cities of the province. Mean duration of hospitalization was 7.76 days. Most cases of burn occurred from October 22 to November 20 (10.95%) and from Jun 21 to July 21 (9.54%). Fifty percent of burn cases were from Urmia district. In males, the most common cause of burn was flame (36.4%), followed by hot fluids (32.4%), and chemical materials (15.1%), whereas in females, the most common cause was flame (43.6%) followed by hot fluids (31.6%), and electricity (15.9%) (Table 1).

The mean age for all burn patients was 23.6 years with a range from under 1 to 83 years old. The male to female ratio was 1.05:1. The majority of the burns (31.7%) occurred in 16-25 year age group followed by 0-5 year age group (20.6%) and 26-35 year age group (14.2%). Table 2 shows the distribution of the number of burns in different age groups in males and females.

The range of the percentage of TBSA burn varied from 1% to 100% with a mean of 32.3%±1.84% (Table 3). The mean length of stay of patients was 7.76

**Table 1:** Distribution of patients by gender and type of burning

Gender	Age group (year)	Cause of burn No. (%)				Total No. (%)	
		Hot fluids	Electricity	Flame	Hot surfaces		
Male	0-5	35 (67.3)	0 (0.0)	6 (11.5)	6 (11.5)	52 (100)	
	6-15	12 (30.7)	4 (10.3)	44 (51.3)	14 (5.1)	39 (100)	
	16-25	22 (19.4)	8 (7)	44 (39)	14 (12.9)	113 (100)	
	26-35	12 (27)	4 (8.6)	18 (39)	4 (8.6)	8 (17.3)	46 (100)
	36-45	10 (24)	2 (4.5)	22 (52.3)	2 (4.5)	6 (14.3)	42 (100)
	46-55	10 (47.6)	1 (4.7)	4 (19)	3 (14.2)	3 (14.2)	21 (100)
	56-65	3 (42.8)	0 (0)	2 (28.5)	2 (14.2)	1 (14.2)	8 (100)
	>65	3 (30)	0 (0)	4 (40)	2 (20)	1 (10)	10 (100)
	Total (%)	107 (32.4)	19 (5.7)	120 (36.4)	34 (10.3)	50 (15.1)	330 (100)
	Female	0-5	60 (71.4)	0 (0)	16 (19.4)	2 (2.3)	6 (7.2)
6-15		5 (13.5)	2 (5.4)	19 (51.3)	3 (8.1)	8 (21.3)	37 (100)
16-25		10 (11.1)	4 (4.4)	60 (66.6)	4 (4.4)	12 (13.3)	90 (100)
26-35		6 (13.3)	1 (2.2)	23 (51.1)	1 (2.2)	14 (31.1)	45 (100)
36-45		4 (18.1)	1 (4.5)	9 (41)	3 (13.6)	5 (22.7)	22 (100)
46-55		3 (25)	0 (0)	4 (33.3)	3 (25)	2 (16.7)	12 (100)
56-65		5 (45.5)	0 (0)	2 (18.8)	3 (27.2)	1 (9)	11 (100)
>65 (%)		3 (37.5)	0 (0)	2 (25)	2 (25)	1 (12.5)	8 (100)
Total (%)		96 (31.6)	8 (2.6)	135 (43.6)	21 (6.8)	49 (15.9)	309 (100)

**Table 1:** Distribution of Patients by Age and Gender

Age (years)	Number of patients No. (%)		Total No. (%)
	Male	Female	
0-5	54 (16.4)	84 (27)	138 (21.6)
6-15	37 (11.3)	38 (12.4)	75 (11.8)
16-25	112 (34)	90 (29)	202 (31.8)
26-35	46 (14)	44 (14.2)	90 (14.1)
36-45	41 (12.5)	22 (7)	63 (9.8)
46-55	21 (6.4)	11 (3.6)	32 (5)
56-65	8 (2.4)	10 (3.2)	18 (2.8)
>65	10 (3)	11 (3.6)	21 (3.2)
Total	329 (100)	310 (100)	639 (100)

**Table 3:** Distribution of patients by Gender, age group and TBSA burned

Gen- der	Age group (Year)	Total body surface area No. (%)						Total
		0-10	11-20	21-40	41-60	61-80	81-100	
Male	0-5 (%)	26 (50)	16 (30.8)	5 (9.6)	4 (7.7)	0 (0)	1 (1.9)	52 (100)
	6-15 (%)	8 (20.5)	13 (33.3)	6 (15.4)	5 (12.8)	0 (0)	7 (17.9)	39 (100)
	16-25 (%)	14 (12.4)	16 (14.2)	27 (23.9)	11 (9.7)	14 (12.4)	31 (27.4)	113 (100)
	26-35 (%)	9 (19.6)	8 (17.4)	8 (17.4)	10 (21.7)	6 (13)	5 (10.9)	46 (100)
	36-45 (%)	10 (23.8)	10 (23.8)	9 (21.4)	8 (19)	2 (4.8)	3 (7.1)	42 (100)
	46-55 (%)	5 (23.8)	6 (28.6)	2 (9.5)	2 (9.5)	3 (14.3)	3 (14.3)	21 (100)
	56-65 (%)	1 (14.3)	3 (42.9)	1 (14.3)	0 (.0)	1 (14.3)	1 (14.3)	7 (100)
	>65 (%)	3 (30)	1 (10)	2 (20)	1 (10)	1 (10)	2 (20)	10 (100)
Total		76 (23)	73 (22.1)	60 (18.2)	41 (12.4)	27 (8.2)	53 (16.1)	330 (100)
Female	0-5 (%)	36 (42.9)	30 (35.7)	12 (14.3)	4 (4.8)	1 (1.2)	1 (1.2)	84 (100)
	6-15 (%)	15 (40.5)	8 (21.6)	4 (10.8)	5 (13.5)	4 (10.8)	1 (2.7)	37 (100)
	16-25 (%)	27 (30)	18 (20)	13 (14.4)	8 (8.9)	13 (14.4)	11 (12.2)	90 (100)
	26-35 (%)	18 (40)	10 (22.2)	5 (11.1)	3 (6.7)	3 (6.7)	6 (13.3)	45 (100)
	36-45 (%)	7 (31.8)	3 (13.6)	5 (22.7)	2 (9.1)	1 (4.5)	4 (18.2)	22 (100)
	46-55 (%)	5 (41.7)	3 (25)	1 (8.3)	1 (8.3)	2 (16.7)	0 (0)	12 (100)
	56-65 (%)	5 (55.6)	0 (.0)	2 (22.2)	1 (11.1)	1 (11.1)	0 (0)	9 (100)
	>65 (%)	4 (40)	4 (40)	1 (10)	0 (0)	1 (10)	0 (0)	10 (100)
Total		117 (37.9)	76 (24.6)	43 (13.9)	24 (7.8)	26 (8.4)	23 (7.4)	309 (100)

days (range=1- 60 days) and 21.7% of them stayed more than 10 days in hospital. The mean BSA in patients with third-degree burns was significantly higher than that in second-degree burns ( $P<0.001$ ). There was a significant correlation between the mean BSA, burn depth and the burn type ( $P=0.005$ ). That is, the increase of burn surface causes more depth. Twenty six percent of patients (male and female) died because of their burns. Female mortality was 20.4% and male mortality was 31.3%. Case fatality rate for patients with  $<40\%$  of TBSA burn and  $\geq 40\%$  TBSA burn were 4.9% and 76.7%, respectively. The highest proportion of monthly variation occurred in November (11%), followed by July (9.6%) and March (9.3%),

respectively. There was also a significant and direct correlation between the level of literacy (low to high) and mean BSA ( $P=0.05$ ), although this correlation was not uniformly linear. No statistically significant correlation was found between the level of literacy and cause of burn ( $P=0.5$ ).

### Discussion

The first purpose of this study was to report the epidemiology of burn injuries and their etiologic factors. The overall death and hospitalization due to burn injuries in West Azerbaijan province were 5.5 and 21.6

per 100,000, respectively. In Kordestan Province, these rates were 4.5 and 13.5 and in Fars Province 4.6 and 13.4 per 100,000 person-years.<sup>4,5</sup>

Mortality rate in our study in male and female patients with TBSA $\geq$ 70% was 89.6% and 85.7%, respectively. This result is consistent with other studies.<sup>6,7</sup> The most incidence rate of burns was observed in 16-25 year age group, because of insufficiencies of security preparations in workplaces and houses.

Females were burned nearly as frequently as males (1:1.05). Some studies have reported different results.<sup>8,9</sup> However, there are other studies that are consistent with our findings.<sup>9-12</sup> In industrialized countries, the sex distribution of burn cases differs, where males generally have a significantly higher risk. This might be explained by the higher incidence of industrial and recreational burns among males in such countries.<sup>13,14</sup>

In our review, flame was the most common cause of burns in adults, being followed by scald. This agrees with what is found in several studies.<sup>4,11,13,14</sup> This may be explained by the fact that kerosene and gas are the most frequent fuels in houses and workplaces in Iran. On the other hand, scalds were the main type of burn among children that agrees with other studies.<sup>13,15,16</sup> It may be related to densely populated families, physical environment of houses, child neglect, and child's inclination for touching things.

Ahuja et al. reported that almost 80% of admissions were in the 16-65 year age group and proportion of pediatric and geriatrics burns was 17.1% and 3.1%.<sup>17</sup> Our study showed that 64.5% of patients located in 15-65 year age group and proportions of pediatric and geriatrics were 33.3% and 3.2%, respectively. Our study revealed that low incidence of burn in >65 years age group has also been reported in other studies conducted in India,<sup>18</sup> Pakistan,<sup>19</sup> Zimbabwe,<sup>8</sup> Iran,<sup>20</sup> Kuwait,<sup>21</sup> and Egypt.<sup>22</sup>

In spite of this finding, flame was found to be the

most frequent agent of burn injuries in our study (59.7), unlike reports from Japan<sup>23</sup> and Nigeria.<sup>24</sup> In our study, scalds mostly affected >5 year age group (66%) and flame affected adults but scald is the most common cause of burn in countries like Denmark and Singapore.<sup>25,26</sup>

In summary, the highest incidence rate of burn was in 16-25 age groups. It is necessary to implement programs for health education relating to prevention of burn injuries by means of broadcast flashes on mass media like television or radio, showing risk situations and teaching self-care methods in workplaces and homes together with epidemiological data about burn accident and sentences to call attention to prevent burn accidents. The implementation of an educational program for burn prevention and first aids has been proven to be useful in stopping the burning process, reducing post burn hyperthermia and pain and morbidity. Policy makers should evaluate the need for a specific burn unit. Burn prevention programs in Urmia should be reassessed to determine their efficacy and if they target the high risk populations. Culturally appropriate burn prevention programs should target each population group accordingly. Parents of infants should be exposed to prevention programs in an effort to reduce scald injuries. Prevention programs for the population are implemented before the winter months.

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**Conflict of interest:** None declared.

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