

## ORIGINAL RESEARCH

## Independent Predictive Factors of Hospitalization in a North-West Burn Center of Iran; an Epidemiologic Study

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### Abstract

**Introduction:** A high-grade burn is one of the most devastating injuries with several medical, social, economic, and psychological effects. These injuries are the most common cause of accidental deaths after traffic injuries in both the developed and developing countries. Therefore, this research was aimed to determine demographic characteristics of patients with burn injury admitted to the emergency department and identify predictive factors of hospitalization. **Methods:** This is a cross sectional descriptive study, which is done in 20 March up to 20 September 2011 in emergency department of Sina Hospital, Tabriz, Iran. Patients' information including demographic characteristic, cause of burn, place of accident, anatomical areas burned, grading and percent of burning and disposition were gathered and analyzed using SPSS version 18.0 statistical software. Stepwise multivariate regression analysis was used for recognition of independent predictive factors of hospitalization in burned patients.

**Results:** One hundred and sixty patients were enrolled (54.4% female). The average age of those was 20.47±13.5 years. The prevalence of burn was significantly higher in ages under 20 years ( $p<0.001$ ). Lower limb (37.5%), head and neck (21.25%) and upper limb (17.5%) were three frequent site of burn. The most common cause of burns was boiling water scalding (34.4%). Home related burn was significantly higher than other place ( $p<0.001$ ). The most frequent percent of burn was <5% (46.25%). Finally, 50 (31.25%) cases hospitalized. Univariate analysis demonstrated that age under 20 years old ( $p=0.02$ ) female gender ( $p=0.02$ ), burning site ( $p=0.002$ ), cause ( $p=0.005$ ), place ( $p<0.001$ ), grade ( $p<0.001$ ), and percent ( $p<0.001$ ) was related to disposition of patients. Stepwise multiple logistic regression showed female gender (OR=3.52; 95% CI: 1.57-7.88;  $p=0.002$ ), work related burning (OR=1.78; 95% CI: 1.26-2.52;  $p=0.001$ ), and burning over 5 percent (OR=2.15; 95% CI: 1.35-3.41;  $p=0.001$ ) as independent predictive factors of hospitalization. **Conclusion:** The results of present study showed that burns injury are most frequent in age under 20 year old, lower limbs, with boiling water, and at home. In addition, the most frequent type and percentage of burned area were second degree and <5% of total body surface area, respectively. Among age under 20 years old, female gender, burning site, cause, place, grade, and percent only female gender, work related burning, and burning over 5% were detected as independent predictive factors of hospitalization.

**Key words:** Epidemiology; burn units; hospitalization; risk factors; emergency department

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### Introduction:

A high grade burn is one of the most devastating injuries with several medical, social, economic, and psychological effects (1). These injuries are the most common cause of accidental deaths after traffic injuries in both developed and developing countries (2). The patients with widespread burning damage die, but others suffer from prolonged recoveries (3). The survived patients require various operations with a

long-term hospitalization and readmission. Understanding the relationship between the host-environment and harmful agent can help designing preventive programs (4). Such injuries occur in specific geographic and demographic patterns (5, 6). In all age groups men had higher percentage of admission than women (2, 7). In some studies most of burn events appeared in children under 5 years (7, 8). Home was the most common place of the events and scalding as well



as flame the most frequent cause (2, 7-10). No burn study has yet been performed in the North-West of Iran. Therefore, this research was undertaken to determine demographic characteristics of patients with burn injury admitted to the emergency department of Sina Hospital, the burn center of North-West of Iran and identify populations at increased risk.

#### Methods:

This cross sectional study was done through 20 March to 20 September 2011 in the emergency department of Sina Hospital, Tabriz, Iran. Sina Hospital is a burning center of North-West of Iran and the only burning hospital of Tabriz. Data of patients attending the hospital with any burn injury were collected on a checklist included: patient characteristic, cause of burn, place of accident, disposition, anatomical areas, and grading and percent of injury. Burning grading was divided into I, IIa, IIb, III and IV degrees (11). Types of injuries included were boiling water, gas, electrical, oil, chemical and other burns were treated on an inpatient or outpatient basis in the hospital. The protocol of study was approved by ethical committee of Tabriz University of Medical Sciences. Authors were adhered to ethical principles of Helsinki declaration in all parts of study. Informed consent forms were fulfilled for all participants.

#### Statistical analysis

Data were analyzed using SPSS version 18.0 statistical software. Descriptions of qualitative and quantitative variables were respectively performed by frequency tables and calculation of mean± standard deviation. Chi-squared test was used to compare qualitative variables and independent t-test for quantitative. Univariate analysis was applied to evaluation of predictive factors of hospitalization. Stepwise multivariate regression analysis was used for recognition of independent predictive factors of hospitalization in burned patients. Statistical significance was defined as  $p < 0.05$ .

#### Results:

One hundred and sixty patients were enrolled (54.4% female). Table 1 shows baseline characteristics of studied patients. The average age of cases was  $20.47 \pm 13.5$  years. Most of the patients were under 20 years old (56.9%). The multinomial logistic regression showed a significant difference among burn prevalence in age groups ( $p < 0.0001$ ). Based on this analysis, the prevalence of burn was significantly higher in ages under 20 years ( $p < 0.001$ ). Lower limb (37.5%), head and neck (21.25%), and upper limb (17.5%) were three frequent sites of burn. Lower limb burn was significantly higher than other organs ( $p < 0.001$ ). The most common cause of burns was boiling water scalding (34.4%), followed by hot oil (16.9%) and gas contact (16.9%) ( $p = 0.001$ ). Seventy-three (45.6%) cases of burns occurred at home, 39 (24.4%) outdoors, and 30 (18.75%) workplace. Home related burn was significantly higher than

other places ( $p < 0.001$ ). Forty-nine (30.6%) patients have first-degree of burn, 67 (41.9%) second-degree, 36 (22.5%) third degree, and 8 (5.0%) fourth-degree. Multinomial logistic regression showed that the prevalence of second-degree burns were significantly higher than third degree ( $p = 0.003$ ) and fourth degree ( $p < 0.001$ ). The most frequent percentage of burn was  $< 5\%$  (46.25%) that is significantly more than 5-10% ( $p = 0.009$ ) and  $> 10\%$  ( $p = 0.002$ ). Finally, 50 (31.25%) cases were hospitalized. Table 2 shows the relation between disposition of patients and clinical and demographical variables. Univariate analysis demonstrated that age under 20 years old ( $p = 0.02$ ), female gender (39.1;  $p = 0.02$ ), burning site ( $p = 0.002$ ), burning cause ( $p = 0.005$ ), burning place ( $p < 0.001$ ), grade of burning ( $p < 0.001$ ), and the percent of burning ( $p < 0.001$ ) were related to disposition of patients. Stepwise multiple logistic regression showed female gender (OR=3.52;

**Table 1:** The baseline variable of studied patients

Variable	N (%)
<b>Age (year)</b>	
1-10	44 (27.5)
11-20	47 (29.4)
21-30	36 (22.5)
31-40	21 (13.1)
>40	12 (7.5)
<b>Gender</b>	
Male	73 (45.6)
Female	87 (54.4)
<b>Site of Burn</b>	
Lower limb	60 (37.5)
Head and neck	34 (21.25)
Upper limb	28 (17.5)
Thoraces	25 (15.6)
Back trunk	7 (4.4)
Abdomen	6 (3.75)
<b>Cause of burn</b>	
Boiling water	55 (34.4)
Oil	27 (16.9)
Gas	27 (16.9)
Electrical burning	23 (14.4)
Others	28 (17.5)
<b>Place of injury</b>	
Home	73 (45.6)
Work	30 (18.75)
Out door	39 (24.4)
Others	18 (11.25)
<b>Grade</b>	
I	49 (30.6)
II	67 (41.9)
III	36 (22.5)
IV	8 (5.0)
<b>Percent of burn*</b>	
< 5%	74 (46.3)
5-10 %	45 (28.1)
>10%	41 (25.6)

\* Total body surface area



**Table 2:** Relation of baseline variable of studied patients and disposition

Variable	Disposition		p-value
	Discharged	Hospitalized	
<b>Age (year)</b>			
1-10	34 (77.3)	10 (22.7)	0.02
11-20	28 (59.6)	19 (40.4)	
21-30	21 (58.3)	15 (41.7)	
31-40	15 (71.4)	6 (28.6)	
>40	12 (100.0)	0 (0.0)	
<b>Gender</b>			
Male	57 (78.1)	16 (21.9)	0.02
Female	53 (60.9)	34 (39.1)	
<b>Site of Burn</b>			
Lower limb	44 (73.3)	16 (26.7)	0.002
Head and neck	21 (61.8)	13 (38.2)	
Upper limb	21 (75.0)	7 (25.0)	
Thoraces	18 (72.0)	7 (28.0)	
Back trunk	0 (0.0)	7 (100.0)	
Abdomen	6 (100.0)	0 (0.0)	
<b>Cause of burn</b>			
Boiling water	45 (81.8)	10 (18.2)	0.004
Oil	12 (44.4)	15 (55.6)	
Gas	15 (55.6)	12 (44.4)	
Electrical burning	16 (69.6)	7 (30.4)	
Others	22 (78.6)	6 (21.4)	
<b>Place of injury</b>			
Home	61 (83.6)	12 (16.4)	<0.001
Work	13 (43.3)	17 (56.7)	
Out door	29 (74.4)	10 (25.6)	
Others	7 (38.9)	11 (61.1)	
<b>Grade</b>			
I	46 (93.9)	3 (6.1)	<0.001
II	33 (48.25)	34 (50.75)	
III	27 (75.0)	9 (25.0)	
IV	4 (50.0)	4 (50.0)	
<b>Percent of burn</b>			
< 5%	64 (86.5)	10 (13.5)	<0.001
5-10 %	21 (46.7)	24 (53.3)	
>10%	25 (61.0)	16 (39.0)	

95% CI: 1.57-7.88;  $p=0.002$ ), work related burning (OR=1.78; 95% CI: 1.26-2.52;  $p=0.001$ ), and percent of burning over 5% (OR=2.15; 95% CI: 1.35-3.41;  $p=0.001$ ) as independent predictive factors of hospitalization (Table 3).

### Discussion:

The results of present study showed that burn injuries are more common in age less than 20 years old, in lower limbs, with boiling water, and at home. In addition, the most frequent type and percentage of burned area were second degree and <5% of total body surface area, respectively. Among age under 20 years old, female gender, burning site, burning cause, burning place, grade of burning, and percent of burning only female gender, work related burning, and percentage of burning over 5% were identified as independent predictive factors of hospitalization.

Burns are one of the serious preventable events (12, 13). This study was the first research on burn injury in

the North-West of Iran. We focused on those patients who attended to the emergency department of Sina Hospital. The findings of present study revealed that most of burn patients were aged  $20.47 \pm 13.5$  years. The mean age of burn patients is different from 19 to 35 years in various studies. In most papers this age was reported between 21 and 23 years old (14). Generally, young adults are active both at home and at work and this may be susceptible them to hazardous situations. Most of cookers with 20-47years old are not expert, one of the reasons that this age group is more disposed to burn events. Because of social structure in our country, older people usually live with their family and thus their exposure to hazardous situations has been greatly reduced. This might be explained why they have low percentage of accidents in the present study. Females had higher incidence in this study as other ones (3, 15, 16) contrasts with others (17-21). It seems that some of factors such as culture and career have more effects on



**Table 3:** Independent predictive factors of hospitalization in studied patients

Variable	Odds ratio	95% confidence interval	P-value
Female gender	3.52	1.57-7.88	0.002
Work related burning	1.78	1.26-2.52	0.001
Percent of burning > 5 %	2.15	1.35-3.41	0.001

the gender predominance in burn injuries. Home was the most common sites of burns. Similar to most Iranian studies (14), the highest percentage of burning place in this research was at home as well. This findings are comparable to other reports from developing countries (22, 23). In developed countries because of safer cooking devices this results are lower than developing countries. Developed countries have more occupational burn events (24, 25). This study showed that the most common cause of burn is scalding like other studies (4, 7, 17, 19, 26-29) unlike other researches (2, 3, 8, 9, 30-33). Cooking and repairing the car radiator is more frequent cause of burning, occur with boiled water. In poor countries electricity and scalding are common causes of burn events (18). Burning under 5% is more common than other types (4), dissimilar to other studies (7-9, 17). Because patients are not in danger to have high grade and high percent burning illness, and of course outpatient is more frequent than disposition. In this study the most common anatomical area burned is lower limb unlike previous reports (7, 26). Since using boiled water either in cooking or repairing the car radiator is in standing position, the most common burning site is lower limb. Thus, for such cases it was suggested to change the life style and manage oil and heat resources of houses (34).

#### Conclusion:

The results of present study showed that burns injury are most frequent in age under 20 year old, lower limbs, with boiling water, and at home. In addition, the most frequent type and percentage of burned area were second degree and <5% of total body surface area, respectively. Female gender, work related burning, and percentages of burning over 5% were detected as independent predictive factors of hospitalization.

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#### Conflict of interest:

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All authors passed four criteria for authorship contribution based on recommendations of the International Committee of Medical Journal Editors.

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