

Epidemiological aspects of burning in both outpatient and hospitalization settings; a cross-sectional study

Mohammad Saeed Taheri^{1*}, Kamran Aghakhani¹, Azadeh Memarian¹, Seyed Mohammad Javad Fatemi¹, Maryam Vahidian²

¹Department of Forensic Medicine, Rsoul-e-Akram Hospital, Iran University of Medical Sciences, Tehran, Iran

²Islamic Azad University, Tehran Branch, Tehran, Iran

Correspondence to:

Mohammad Saeed Taheri, Email: dr.mstaheri@yahoo.com

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Abstract

Introduction: Burn injury is a unique trauma with life-threatening events and high morbidity. Burn injury has been identified as an important public health problem.

Objectives: The present study aimed to characterize the epidemiological aspects of burn injuries in patients attended as outpatient or inpatients in an Iranian referral center.

Patients and Methods: This cross-sectional study retrospectively reviewed 1000 records of burn injuries including 890 outpatient records and 110 inpatient cases. The study checklist was completed by reviewing the baseline characteristics including demographic data and the information on burning injuries.

Results: Half of the patients in both outpatient and inpatient groups (52.1% and 55.6% respectively) were in the age range of 20 to 50 years. Regarding gender, 55.1% in the first group and 31.0% in the inpatient group were male. In patients who attended as outpatient, the most common majority of burn injuries were categorized in second-degree burnings that mostly occurred at home. The most frequent zones of the body suffered from burning include upper and lower extremities.

Conclusion: The efficiency of our findings can create opportunities for reducing prevalence of burning and also to control potential risk factors for burning leading to decrease in costs of burning management.

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Introduction

Burn injury is a unique trauma with life-threatening events with high morbidity. Burn injury has been identified as an important public health problem (1,2). The overall incidence of burning has been estimated to be about 1% of burden of disorders and ranked as the fourth disabling injuries (3). It also consists of a majority of attendances to emergency wards (1). Burning not only can physically disable the patient in daily activities, but also may lead to severely impaired psychological conditions and social relationships (5-7). Several factors have been introduced to increase in the prevalence of burning and its severity including low socioeconomic level, illiteracy, and overcrowding (8-10). Regarding its related mortality and morbidity, the main factor predisposing the injured patients to death is infections by different bacterial species (11-15).

Objectives

Unfortunately the reported studies had been limited in terms of different epidemiological

Core tip

In a study on 1000 patients with burning, we found, the most common causes of burning were burning with boiling water followed by hot materials and hot foods. The majority of burn injuries were categorized in second-degree burnings that mostly occurred at home in the age range of 20 to 50 years.

aspects of burning because of collecting data were retrospective or they are short-term studies with small sample sizes, or they are studies from industrialized populations (16-18). Therefore, data from the available studies cannot be extrapolated to whole of the world. Hence, the present study aimed to assess the epidemiological aspects of burn injuries in patients attended as outpatient or inpatient in an Iranian referral center.

Patients and Methods

Study design

This cross-sectional study retrospectively reviewed 1000 records of burn injuries including 890 outpatient records and 110 inpatient cases from April 2015 to March

2017. The study checklist was completed by reviewing the baseline characteristics including demographics (gender, age, education level and occupational status) and the information on burning injuries (zone of burning, degree and percentage of burning, etiology of burning, and time of burning).

Ethical issues

The research followed the tenets of the Declaration of Helsinki. To keeping ethical principles, names of the patients were not pointed in the checklists. Ethics approval was also obtained from Iran University of Medical Sciences and ethics committee (# IR.IUMS.REC.1394.9311223005). This study was conducted as a residential thesis of Mohammad Saeed Taheri in Iran University of Medical Sciences (Thesis# 2259).

Statistical analysis

For statistical analysis, results were presented as mean \pm standard deviation (SD) for quantitative variables and were summarized by absolute frequencies and percentages for categorical variables. Normality of data was analyzed using the Kolmogorov-Smirnoff test. Categorical variables were compared using chi-square test or Fisher's exact test when more than 20% of cells with an expected count of less than 5 were observed. Quantitative variables were also compared with t test or Mann-Whitney U test. For the statistical analysis, the statistical software SPSS version 16.0 for Windows (SPSS Inc., Chicago, IL) was used. Accordingly, *P* values of 0.05 or less were considered statistically significant.

Results

The mean age of patients attended as outpatient and those who were inpatients was 31.15 ± 21.14 (range from 1 to 93 years) and 21.81 ± 20.94 years (range from 1 to 81 years) respectively. Half of the patients in both groups (52.1% and 55.6% respectively) were in the age range of 20 to 50 years. Regarding gender distribution, 55.1% in the first group and 31.0% in hospitalized patients groups were male.

In patients who attended as outpatient, the most common causes for burning was burning with boiling water followed by hot materials and hot foods (Table 1). In this group, the majority of burn injuries were categorized in second-degree burnings accounted for 89.6% of cases that mostly occurred at home. The frequency of first, second and third-degree of burning was 1.5%, 88.6% and 2.4% in men and 3.1%, 87.4%, and 3.6% in women without difference between the two genders (*P* = 0.95). Additionally, first, second and third-degree of burning were found in 1.7%, 88.5% and 2.1% in patients younger than 20 years, 3.3%, 89.4% and 2.1% in those patients ranged 20 to 50 years and 1.1%, 84% and 5.3% in those who older than 50 years with no difference between age subgroups (Table 2).

The mean percentage of burning was $2.95 \pm 2.92\%$ (2.87

Table 1. Characteristics of burning in study population

Variable		No. (%)
Cause of burning	Hot liquids	533 (59.9)
	Hot materials	167 (18.6)
	Electrocution	25 (2.8)
	Explosion	33 (3.8)
	Sun burn	13 (1.4)
	Molten materials	83 (9.3)
Zone of injury	Fire flame	36 (4.0)
	Upper extremities	315 (35.4)
	Lower extremities	228 (25.6)
	Both extremities	30 (3.37)
	Trunk	72 (8.0)
	Trunk and extremities	53 (6.0)
	Face	67 (7.52)
	Face and extremities	84 (9.4)
	Face, trunk and extremities	33 (3.7)
	Whole body	5 (0.57)
Degree of burning	Genital tract	3 (0.34)
	First-degree	23 (2.6)
	Second-degree	804 (89.6)
	Third-degree	21 (2.3)
	First and second-degree	26 (3.2)
Place of burning	Second and third-degree	18 (2.3)
	Home	738 (82.2)
	Workplace	64 (7.3)
	Street	67 (7.7)
	Clinic	3 (0.6)
	Playground	18 (2.2)

$\pm 2.51\%$ in the patients younger than 20 years and $3.16 \pm 3.35\%$ in those who ranged 20 to 50 years that was the highest in the age range of 20 to 50 years. Additionally, the percentage of burning was $3.20 \pm 3.17\%$ in men and $2.64 \pm 2.49\%$ in women that was higher in men than in women (*P* = 0.002) (Table 3).

The most frequent zones of the body suffered from burning include upper and lower extremities (Table 1). In both genders, burning occurred mostly at home (75.6% in men and 89.2% in women, *P* = 0.001). Additionally, in all age subgroups, burning occurred mainly at home without difference between different age groups (Table 4). Burning also mostly occurred in the months of August (16.3%) and September (10.4%) (Figure 1).

In patients who were inpatient, the percentage of burnings were categorized as 1 to 9% in 34.0%, 10 to 19% in 31% and 20 to 29% in 12% of cases. The burning mostly involved upper extremities to wrist in 20.0% and then hands in 17.2% of patients. Burnings in hospitalized group occurred mostly in the months of March (14.0%) and June (11.0%) (Figure 2).

Discussion

Burning injuries are the common forms of trauma leading disabilities, morbidity and even mortality along with high financial load as well as psychological and behavioral problems (19). Establishing professional centers for

Table 2. Mean degree of burning in outpatient condition

Variable		First-degree	Second-degree	Third-degree	First and second-degree	Second and third-degree
Age (y)	<20	1.7%	88.5%	2.1%	4.9%	2.7%
	20-50	3.3%	89.4%	2.1%	2.1%	1.9%
	> 50	1.1%	84.0%	5.3%	4.8%	3.7%
Gender	Men	3.6%	87.4%	3.1%	3.6%	1.6%
	Women	1.5%	88.6%	2.4%	3.3%	0.4%

Table 3. Mean of burning in outpatient condition

Variable		Mean \pm SD	Minimum	Maximum
Age (y)	<20	2.87 \pm 2.51	0.20	16
	20-50	3.16 \pm 3.35	0.20	39
	> 50	2.49 \pm 2.07	0.25	11
Gender	Men	2.64 \pm 2.49	0.25	25
	Women	3.20 \pm 3.17	0.20	39

burning in each region can result in planning basic and the epidemiological investigations. Importantly, the mortality rate and potential risk factors for burning are widely different in the countries that can be affected by cultural, personal, and social factors (20). Hence, we aimed to assess epidemiological aspects of burning in Iran. Based on our results, burning was predominant in men as compared with women that is comparable with two other studies in other regions in the country (21,22). It is an important point that self-immolation as a source of burning was found more in women than in men. According to some studies, admitted women had lower socioeconomic level because of self-immolation. They also had lower educational level and were mostly housekeeper (23). The similar finding was found in the Indian population, however self-immolation is revealed more in men among European nations (24). In a study performed in northern Iran, self-immolation was reported more in men than in women (25).

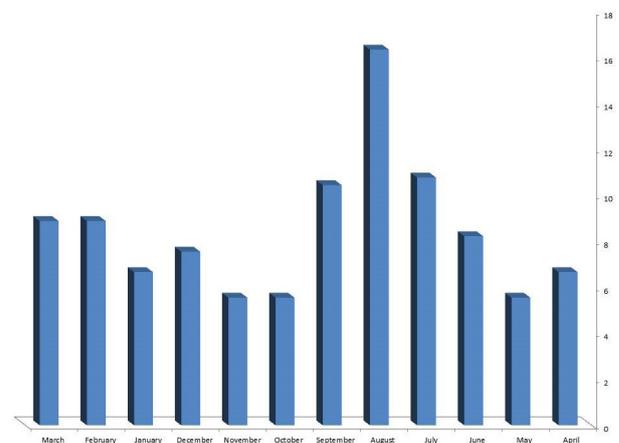
As shown in the present survey among patients attended as outpatient, more than half of the burnings were reported among those who aged 20 to 50 years that was similar to the previous report from eastern Iran (26). Furthermore, burning by hot liquids especially among male children was also reported in Turkey (27), Singapore (28), and also in western Iran (29). In fact, burning in young children is more among males compared to females due to more audacity in boys than in girls (30). It can be very important because of higher psychological load of burning in children than in adults (31,32).

Table 4. Place of burning in outpatient condition

Variable		Home (%)	Workplace (%)	Street (%)	Clinic (%)	Playground (%)
Age (y)	<20	91.6	2.1	5.2	0.0	1.0
	20-50	75.0	12.0	8.7	0.4	3.1
	> 50	86.2	2.1	8.0	2.1	1.1
Gender	Men	75.6	11.4	9.7	0.4	2.4
	Women	89.2	2.2	4.9	0.9	2.0

Another point in our study was the place of burning that was mostly happened at home which was comparable with a study conducted in northern Iran (21). In a similar study conducted in Bangladesh, 93% of burnings occurred at home especially among young children (33). Therefore, training the mothers for preventing these burnings among children to stay away from heating devices is very necessary for reducing the prevalence of burning among children.

In our study, the dominant cause for burning among outpatient settings was hot water and in hospitalized settings was acid-induced burning. In various studies, burning by hot water is the prominent cause among children in eastern regions of Iran (20,25,34). However the most common reason for burning among children in western Iran was burning with flames (35,36). In some countries such as Turkey, Bangladesh, and Southern Africa, the dominant cause for burning was flaming (37, 38). It seems that the cause for burning is different in men and women while burning with hot water was more frequent in Turkish men (39), which was contrary with people of western Iran (40).

**Figure 1.** The frequency of burning according to the months in outpatient setting.

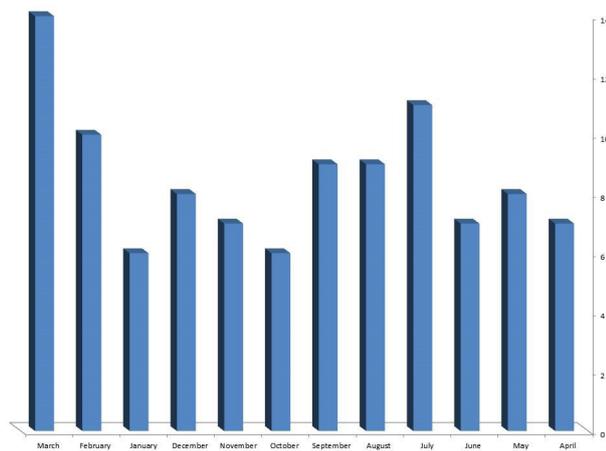


Figure 2. The frequency of burning according to the months in hospitalized setting.

In our study, higher percentage of burning was found in middle ages when compared to older ones. Moreover, a direct association between age and degree of burning was found. In a similar study in Egypt (41), third-degree of burning was rarely found in children. Furthermore, among those who referred in outpatient settings, more appearance burnings were revealed in warm months. However, in hospitalized patients, burning occurred more in cold months. Interestingly, in some countries such as China, Hong Kong, or Egypt, burning was more seen in the cold season (42).

Regarding organs involved by burning, the extremities were more affected especially among children. However this predominance remained in higher ages. It was also found in other similar studies from different regions (43).

Conclusion

The efficiency of these findings can create opportunities for reducing the prevalence of burning and also control potential risk factors for burning leading decrease in costs of the management of burning. Moreover, our findings could be potentially influenced by cultural, social, economic, and geographical characteristics of each region.

Limitations of the study

Our study has several limitations; 1) having no intervention; 2) the type of cross-sectional study and 3) these results might not be valid for patients throughout the world.

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Authors' contribution

MST and MV conceived the study and contributed reagents and tools. MST and KA performed the experiments. AM and AMJF analyzed the data and drafted the final manuscript. All authors read, revised, and approved the final manuscript.

Conflicts of interest

There were no points of conflicts.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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This study was conducted as a residential thesis of Mohammad Saeed Taheri in Iran University of Medical Sciences (Thesis# 2259).

References

- Jayaraman V, Ramakrishnan KM, Davies MR. Burns in Madras, India: an analysis of 1368 patients in 1 year. *Burns*. 1993;19:339–44.
- Leistikow BN, Martin DC, Milano CE. Fire injuries, disasters and costs from cigarettes lights, a global overview. *Prev Med*. 2000;31:91–9.
- Peck MD. Epidemiology of burns throughout the world. Part I: distribution and risk factors. *Burns*. 2011;37:1087–100.
- Wilkinson E. The epidemiology of burns in secondary care in a population of 2.6 million people. *Burns*. 1998;24:139–43.
- Barret JP, Gomez P, Solano I, Gonzalez-Dorrego M, Crisol FJ. Epidemiology and mortality of adult burns in Catalonia. *Burns*. 1999;25:325–29.
- Groohi B, Alaghebandan R, Rastegar L. Analysis of 1089 burn patients in a province of Kurdistan, Iran. *Burns*. 2002;28:569–74.
- Mohammadi AA, Amini M, Mehrabani D, Kiani Z, Seddigh A. A survey on 30 months' electrical burns in Shiraz University of Medical Sciences Burn Hospital. *Burns*. 2008;34:111–3.
- Zeitlin R. Late outcome of paediatric burns - scarred for life. *Ann Chir Gynaecol*. 1998;87:80.
- Zeitlin RE, Jarnberg J, Somppi EJ, Sundell B. Long-term functional sequelae after paediatric burns. *Burns*. 1998;24:3–6.
- Zeitlin RE. Long-term psychosocial sequelae of paediatric burns. *Burns*. 1997;23:467–72.
- Rastegar A, Alaghebandan R, Akhlaghi L. Burn wound infections and antimicrobial resistance in Tehran, Iran: an increasing problem. *Ann Burns Fire Disasters*. 2005;18:68–73.
- O'dea ME. Influence of mycotrophy on native and introduced grass regeneration in a semiarid grassland following burning. *Restor Ecol*. 2007;15(1):149–55.
- Oncul O, Ulkur E, Acar A, Turhan V, Yenez E, Karacaer Z, et al. Prospective analysis of nosocomial infections in a burn care unit, Turkey. *Indian J Med Res*. 2009;130:758–764.
- Mehta M, Dutta P, Gupta V. Bacterial isolates from burn wound infections and their antibiograms: A eight-year study. *Indian J Plast Surg*. 2007;40:25–8.
- Rezaei E, Safari H, Naderinasab M, Aliakbarian H. Common pathogens in burn wound and changes in their drug sensitivity. *Burns*. 2011;37:805–807. doi: 10.1016/j.burns.2011.01.019.
- Grout P, Horsley M, Touquet R. Epidemiology of burns presenting to an accident and emergency department. *Arch Emerg Med*. 1993;10:100–107.
- Rajpura A. The epidemiology of burns and smoke inhalation in secondary care: a population based study covering Lancashire and south Cumbria. *Burns*. 2002;28:121–30.
- Ashworth HL, Cubison TC, Gilbert PM, Sim KM. Treatment before transfer the patient with burns. *Emerg Med J*. 2001;18:349–351.
- Mirmohammadi SJ, Mehrparvar AH, Jalilmanesh M, Kazemeini K, Delbari N, Mostaghaci M. An epidemiologic survey on burns in Yazd from 2008 till 2009. *Acta Medica Iranica*. 2012;50:70–5.
- Thombs BD, Bresnick MG. Mortality risk and length of stay associated with self-inflicted burn injury: evidence from a national sample of 30,382 adult patients.

- Crit Care Med. 2008;36:118-25. doi: 10.1097/01.CCM.0000293122.43433.72.
21. Brusselaers N, Monstrey S, Vogelaers D, Hoste E, Blot S. Severe burn injury in Europe: a systematic review of the incidence, etiology, morbidity, and mortality. *Crit care*. 2010;14:R188. doi: 10.1186/cc9300.
 22. Mathers C, Fat DM, Boerma JT. The global burden of disease: 2004 update. World Health Organization; 2008.
 23. American Burn Association. Burn incidence and treatment in US coll. Available from: <https://ameriburn.org/who-we-are/media/burn-incidence-fact-sheet>. Accessed 28 October 2018.
 24. Hosseini RS, Askarian M, Assadian O. Epidemiology of hospitalized female burns patients in a burn centre in Shiraz. *East Mediterr Health J*. 2007;13:113-8.
 25. Aghakhani K, Mohammadi S, Molanaei A, Memarian A, Ameri M. Epidemiologic study of scald burns in victims in Tehran burn hospital. *Tehran Univ Med J (TUMS)*. 2013;71:452-7.
 26. Herndon DN. *Total Burn Care*. Philadelphia: WB Saunders; 1996.
 27. Church D, Elsayed S, Reid O, Winston B, Lindsay R. Burn wound infections. *Clin Microbiol Rev*. 2006;19:403-34.
 28. Thombs BD, Bresnick MG. Mortality risk and length of stay associated with self-inflicted burn injury: evidence from a national sample of 30,382 adult patients. *Crit Care Med*. 2008;36:118-25.
 29. Kildal M, Andersson G, Fugl-Meyer AR, Lannerstam K, Gerdin B. Development of a brief version of the Burn Specific Health Scale (BSHS-B). *J Trauma*. 2001;51:740-6.
 30. Tavakkol M. Priorities of medical issues in terms of health care assistants and Drug Administration. *Teb o Tazkiyeh*. 2010;28:35. [Persian].
 31. Kendall HO, Kendall FP, Wadsworth GE. Muscles, testing and function. *Phys Med Rehabil*. 1973;52:43.
 32. Herndon D. Chapter 4: Prevention of Burn Injuries. *Total Burn Care*. 4th ed. Edinburgh: Saunders. 2012:46.
 33. Burns K, Christie A. Employment mobility or turnover? An analysis of child welfare and protection employee retention. *Child Youth Serv Rev*. 2013;35(2):340-6.
 34. Cohen JA, Bukstein O, Walter H, Benson SR, Chrisman A, Farchione TR, et al. Practice parameter for the assessment and treatment of children and adolescents with posttraumatic stress disorder. *J Am Acad Child Adolesc Psychiatry*. 2010;49:414-30.
 35. Ahmed M, Shah M, Luby S, Drago-Johnson P, Wali S. Survey of surgical emergencies in a rural population in the Northern Areas of Pakistan. *Trop Med Int Health*. 1999;4:846-57.
 36. Peck MD. Epidemiology of burns throughout the world. Part I: Distribution and risk factors. *Burns*. 2011;37:1087-100.
 37. Abeyasundara SL, Rajan V, Lam L, Harvey JG, Holland AJ. The changing pattern of pediatric burns. *J Burn Care Res*. 2011;32:178-84.
 38. Tompkins RG, Remensnyder JP, Burke JF, Tompkins DM, Hilton JF, Schoenfeld DA, et al. Significant reductions in mortality for children with burn injuries through the use of prompt eschar excision. *Ann Surg*. 1988;208:577-85.
 39. Pham TN, Kramer CB, Wang J, Rivara FP, Heimbach DM, Gibran NS, et al. Epidemiology and outcomes of older adults with burn injury: an analysis of the National Burn Repository. *J Burn Care Res*. 2009;30:30-6.
 40. Mirmohammadi SJ, Mehrparvar AH, Jalilmanesh M, Kazemeini K, Delbari N, Mostaghaci M. An epidemiologic survey on burns in Yazd from 2008 till 2009. *Acta Medica Iranica*. 2012;50:70-5.
 41. Amir Alavi S, Mobayen MR, Tolouei M, Noursalehi I, Gholipour A, Gholamalipour N, Mobayen AR. Epidemiology and outcome of burn injuries in burn patients in Guilan province, Iran. *Qom Univ Med Sci J*. 2013;7:35-41. [Persian]
 42. Mabrouk A, Maher A, Nasser S. An epidemiologic study of elderly burn patients in ain shams university burn unit, cairo, egypt. *Burns*. 2003;29:687-90.
 43. Chabi F. Survey of the burn status of self-inflicted female. *Jundishapur J Health Sci*. 2011;3:73-82.