

Epidemiology of hospitalized burn patients during 5 years in Khuzestan province, Iran

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ABSTRACT

Background: Infection is one of the most common causes of complication in burn patients. A severe burn injury is not only a life-threatening problem for the burned patients, but it also may have serious financial effects on the patient and society.

Patients and methods: In a descriptive study, medical files of 6082 consecutive admissions for burn injury treated at Taleghani Burn Hospital over a five-year period were reviewed.

Results: The mean age of patients was 22.4±16.9 years and overall male to female ratio was 1.25. Burns were more common during winter (33.6%) ($p<0.001$). Fire accident was the most common cause in all age groups (66.1%), except subjects aged less than 10 years. The percent of TBSA for burned patients ranged between 1% and 100% with a mean of 38.7±29.8%. There was a correlation between TBSA percentage and age ($r=0.18\%$). The mean and median hospital stay was 14 and 9 days, respectively, with a range of 1-311 days. There was a significant association between fire accident and hospital stay ($p<0.001$). Of 6082 patients, 486 deaths were recorded (8%). *E. coli* in urine culture and *Pseudomonas aeruginosa* in blood and wound culture were the most predominant isolated bacteria.

Conclusion: Preventive programs for reducing the risk of burns are needed. Furthermore, high percentage of TBSA and mortality and the presence of multi-drugs resistance bacteria are major concerns in our hospital.

Keywords: Burns, Mortality, Epidemiology, Total body surface area (TBSA).

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INTRODUCTION

Infection is one of the most common causes of complication in burn patients. A severe burn injury is not only a life-threatening problem for the burned patients, but it also may have serious financial effects on the patient and society. Almost two million people in United State suffer from burns annually (1). Patient factors such as age, extent of injury, and depth of burn in combination

with microbial factors such as type and number of organisms, enzyme and toxin production, and motility determine the likelihood of invasive burn infection. Mortality increases with the severity of the burn injury and with increasing age of the patient (2).

An epidemiological study can provide a highly representative picture of the epidemiology of burns patients such as various objectives information on burning agents and on the setting in which burns are most likely to occur. Although previous studies from different parts of Iran have been dealing

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mainly with either single hospital data (3,4) or specific group sampling, such as women or children (5,6), scanty epidemiological information concerning burns patients and the circumstances in which injuries were received at 160-bed Taleghani Burn Hospital in Ahwaz (southwest of Iran), was reported (7,8). Taleghani hospital welcomes patients from the western and eastern region of Khuzestan province.

The aim of this study was to analyze a 5-year experience in Taleghani Burn Hospital in Ahwaz, Iran.

PATIENTS and METHODS

For this descriptive study, medical files of 6082 consecutive admissions for burn injury treated at Taleghani Burn Hospital over a five-year period (August 2003 to August 2008), were reviewed. Although, patient registry in our hospital is not based on International Classification of Diseases (ICD), in this study patients were categorized according to ICD-10 system (9).

Initial data including gender, age, total body surface area (TBSA), cause of burn, and mortality were gathered at baseline.

Finally, the statistical package for social sciences (SPSS, version 13.0, SPSS Inc., USA) was used for data analysis.

RESULTS

A total of 6082 burn patients were treated at Taleghani Burn Hospital during the years 2003 and 2008, of whom 2693(44.3%) were female and 3389 (55.7%) were male, giving on overall male to female ratio of 1.25. The mean age of patients was 22.4 ± 16.9 years. As shown in table 1, the highest incidence rate was observed in subjects aged less than 10 years (27.4%), followed by 21-30-year old patients (24.1%). Females were older than males (23.3 vs. 21.7 years, $p < 0.05$) and mean age

distribution was significantly differed between genders ($p < 0.05$).

Burns occurred more commonly during winter, (33.6% of cases), followed by autumn (25.6%), spring (21%) and summer (19.6%). Our data showed a significant association between seasonal variation and burn ($p < 0.001$).

Table 1. Frequency (percentage) of burn patients according to age and sex

	Age group (year)					Total
	<10	10-20	21-30	31-40	>40	
Male	1037 (62.1)	697 (49.8)	799 (54.4)	386 (54.4)	470 (56)	3389 (55.7)
Female	632 (37.9)	700 (50.2)	668 (45.6)	323 (45.6)	370 (44)	2693 (44.3)
Total	1669 (27.4)	1397 (22.9)	1467 (24.1)	709 (11.6)	838 (13.7)	6082

Cause of burn: Results revealed that fire accident was the most common cause in all age groups (66.1%), except in subjects aged less than ten years, followed by hot fluids (25.8%), electric accident (5.9%), and other causes of burn (2.2%), such as chemical agent. However, in children aged less than 10 years hot fluid (71.5%) was the main cause of burn ($p < 0.05$). Meanwhile, there was no significant association between gender and cause of burn.

TBSA: The percentage of TBSA ranged between 1% and 100% with a mean of $38.7 \pm 29.8\%$. Approximately, one-half of patients had TBSA of 10-30% (table 2). We found a significant association between the mean of TBSA and sex (males: 31.7% and females 47.5%, $p < 0.001$). Meanwhile, a significant association was noted between the duration of hospital stay and percentage of TBSA, where patients with TBSA of 30-60% had a longer hospital stay ($p < 0.001$). Obviously, we found a significant association between mortality and percentage of TBSA, so that patients with TBSA of $>60\%$ were more commonly died ($p < 0.05$). Finally, there was a correlation between percentage of TBSA and age ($r = 0.18\%$).

Table 2. Percentage of total body surface area (TBSA) according to sex and age group*

TBSA (%)	Sex		Age group (year)				
	Male	Female	<10	10-20	21-30	31-40	>40
<10	666 (19.6)	252 (9.3)	325 (19.4)	154 (11)	171 (11.6)	92 (12.9)	156 (18.5)
10-30	1470 (43.3)	839 (31.1)	970 (58.1)	404 (28.9)	437 (29.7)	244 (34)	296 (35.2)
31-60	738 (21.7)	645 (23.9)	309 (18.5)	346 (24.7)	362 (24.6)	185 (26)	195 (23.2)
>60	515 (15.1)	957 (35.5)	65 (3.8)	493 (35.2)	497 (33.8)	196 (27)	193 (22.9)
Total	3389 (55.7)	2693 (44.3)	1669	1397	1467	709	840

* Numbers in parenthesis are percentage

Hospital stay: The mean and median of hospital stay was 14 and 9 days, respectively, with a range of 1-311 days. Patients aged 31-40 years had longer hospital stay. There was a significant association between fire accident and hospital stay ($p<0.001$). Eighty two percent of burned patients with more than 30 days hospital stay were burned by fire accident. The mean of hospital stay in females and males were 14.8 and 13.8 days, respectively ($p<0.05$). A positive significant correlation was observed between duration of hospital stay and percentage of TBSA ($p<0.05$) (table 3).

Table 3. Length of hospital stay according to sex and percentage of total body surface area (TBSA)*

Hospital stay (day)	Sex		TBSA (%)			
	Male	Female	<10	10-30	31-60	>60
<7	1066 (31.4)	875 (32.4)	429 (48.3)	535 (22.6)	176 (12.8)	745 (51.5)
7-14	1297 (38.2)	867 (32.1)	332 (37.3)	1187 (50.2)	380 (27.7)	325 (22)
15-30	671 (19.7)	563 (20.9)	105 (11.8)	464 (19.6)	455 (33.2)	212 (14.4)
>30	355 (10.4)	388 (14.4)	22 (2.4)	174 (7.3)	359 (26.2)	182 (12.4)
Total	3389	2693	888	2360	1370	1464

* Numbers in parenthesis are percentage

Mortality and outcome: Unfortunately, 161 males and 325 females died, giving an overall mortality rate of 7.9%. Deaths occurred more commonly among subjects aged 10-20 years ($p<0.05$) and among females as well ($p<0.05$).

Frequency of bacterial agent in clinical samples (urine, blood and wound): Totally, 4409 samples were evaluated for microbial culture, among which 2810 (63.7%) were culture positive. In urine samples, *Staphylococcus spp.*, *Enterobacter spp.* and *E.coli* had the same frequency (24.8%), followed by *P.aeruginosa* (14.2%), *Acinetobacter baumannii* (5.8%), and *Proteus spp.* (4.7%). In blood samples, the most common isolates were *P.aeruginosa* (41.1%), followed by *Staphylococcus spp.* (29.4%), *Enterobacter spp.* and *E.coli* (12.3%), *Acinetobacter baumannii* (3.6%), and *Proteus spp.* (1.2%). The isolates pattern in wound samples, however, had similarity to blood samples. *P.aeruginosa* was the most predominant isolates (51.4%), followed by *Staphylococcus spp.* (23.3%), *Enterobacter spp.* (12.6%), *E.coli* (8.6%), *Acinetobacter baumannii* (2.4%), and *Proteus spp.* (1.5%). Totally, the most predominant isolates in all samples was *P.aeruginosa* (47.7%).

DISCUSSION

Burn injuries constitute a major health concern with respect to morbidity and mortality, as well as cost of management particularly in developing countries. The present study demonstrated an overall male-to-female ratio of 1.25. Male predominance was in agreement with other studies (10,11). This reflects the preponderance of males in risk-taking activities at work and leisure but some studies reported the opposite (12,13).

Burn injuries occurred in 27.4% of subjects aged less than 10 years. This is more than Song and Chua's study and less than Ansari-Lari study where children made up 17.6% and 41.5% of burned patients, respectively (11,14).

The mean of TBSA was $38.7\pm 29.8\%$. This is higher than another report from Iran (11) and also other parts of the worlds (15,16). Fire accident was the predominant type of burn in adults and accounted for 66% of the burn cases. This was followed by hot fluids and electric accident

accounted for 25% and 5.9%, respectively. These findings are consistent with many other studies (17,18). Nevertheless, in children (less than 10 years old) scalds was the main cause of burn (75%) compared with other causes. The etiology of pediatric burn in our center was similar to some studies (8,19).

As many reported (20,21), in our study burn patients were referred more commonly during winter followed by autumn. In Ahwaz, where the study was conducted, there is no wide seasonal variation in climate, however, another study reported that summer was the most common season (21).

In the present study, the overall mortality rate among hospitalized burn patients was 8% which was higher than those reports from different parts of Iran (10,18) and other countries particularly in South-East of Asia that was reported by WHO (22). The highest rate of mortality was seen in 10-20 years age group compared with other age groups. This could be in part explained by the percentage of TBSA, since this age group had higher percentage of TBSA. We found burn injuries were more common in females than males, so females are more in danger, since the mean of TBSA in females (47.5%) is higher than males (31.7%).

The median and mean of hospital stay were 14 and 9 days, respectively, which are longer than other reports (18,23). On the other hand, the spectrum of infective agents varies with time and is unique to different hospitals. In previous study we have found either *P. aeruginosa* or *S. aureus* as the predominant organism (8), however, multi-drug resistant *A. baumannii* is rapidly emerging as an important pathogen in our center especially in intensive care units. This organism was also reported by some studies (24,25). *Acinetobacter spp.* were the most common bacteria grown from wound cultures. The presence of *Acinetobacter spp.* as normal skin flora, easy transmissibility and ability to remain viable in a hospital environment

due to its multi-drug resistant status and several other factors have been implicated in the increased incidence of nosocomial infections due to this organism (26).

A significant number of our burn patients were younger than 10 years. Preventive programs for reducing the risk of burns associated with cooking and eating are needed, especially for parents with young children. Furthermore, despite the lower number of female patients, percentage of TBSA, mortality rate and mean of hospital stay was more in females when compared with males. Better safety education, and regular servicing of gas appliances (particularly the ignition system) or their replacement by other means of cooking would reduce the risk. Finally, high mortality rate could be explained by old hospital building, insufficient personnel and great number of admitted patients, all of which seek further authorities attention.

In conclusion, our study provides an inclusive overview of hospitalized burn patients at Taleghani Burn Hospital. Children less than 10 years of age and adults aged 10-20 years are at risk groups. Hot substances such as boiling water, hot soup, etc. are the most common agents linked to scald injuries. Preventive programs for reducing the risk of burns are needed, especially for parents with young children.

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REFERENCES

1. Garner WL, Magee W. Acute burn injury. Clin Plast Surg. 2005;32(2):187-93.
2. Saadat M. Epidemiology and mortality of hospitalized burn patients in Kohkiluyeh-Boyer-Ahmad province (Iran): 2002-2004. Burns. 2005;31:306-9.
3. Groohi B, Alaghebandan R, Rastegar-Lari A. Analysis of 1089 burn patients in province of Kurdistan Iran. Burns. 2002;28:569-74.

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4. Maghsoudi H, Garadagi A, Jafary GA, Azarmir G, Aali N, Karimian B. Women victims of self-inflicted burns in Tabriz, Iran. *Burns*. 2004;30:217–20.
5. Lari A, Panjeshahin M, Talei A, Rossignol Annette M, Alaghebandan R. Epidemiology of childhood burn injuries in Fars province, Iran. *J Burn Care Rehabil*. 2002;23(1):39–45.
6. Amin M, Kalantar E. Bacteriological monitoring of hospital borne septicemia in burn patients in Ahwaz, Iran. *Burn Surgical Wound Care*. 2004;3:4–8.
7. Ekrami A, Kalantar E. Analysis of the bacterial infection in burn patients at Taleghani burn hospital in Ahwaz, Khuzestan province. *Iranian Journal of Clinical Infectious Diseases*. 2007;2(1):9–12.
8. Perm N, Rameshwar L, Ahmad N. Pediatric burns in Kuwait: Incidence and mortality. *Burns*. 2006;32:104–11.
9. The International Statistical Classification of Diseases and Related Health Problems. 10th Revision Version for 2007. Available at: <http://www.who.int/entity/classifications/icd/en>.
10. Ansari-Lari M, Askaian M. Epidemiology of burn presenting to an emergency department in Shiraz, South Iran. *Burns*. 2003;29:579–81.
11. Chien Chien W, Pai L, Lin C. Epidemiology of hospitalized burns patients in Taiwan. *Burns*. 2003;29:582–88.
12. Mzezewa S, Jonsson K, Aberg M, Salemark L. A prospective study on the epidemiology of burns in patients admitted to the Harare burn units. *Burns*. 1999;25:499–504.
13. Liu H, Khatri B, Shakya M, Richard M. A 3-year prospective audit of burns patients treated at the Western Regional Hospital of Nepal. *Burns*. 1998;24:129–33.
14. Song C, Chua A. Epidemiology of burn injuries in Singapore from 1997 to 2003. *Burns*. 2005;31(1):S18–26.
15. Frans FA, Keli SO, Maduro AE. The epidemiology of burns in a medical center in the Caribbean. *Burns*. 2008;34:1142–45.
16. Pegg P. Burn epidemiology in the Brisbane and Queensland area. *Burns*. 2005;31(Suppl. 1):S27–31.
17. Fernandes ME, Galves AL, Fernandes-Crehuet NJ, Gomes GE, Salinas MM. Epidemiology of burns in Malaga, Spain. *Burns*. 1997;23:323–32.
18. Lari AR, Alaghebandan R, Nikui R. Epidemiological study of 3341 burns patients during three years in Tehran, Iran. *Burns*. 2000;26:49–53.
19. Zeitlin R, Somppi E, Jarnberg J. Pediatric burns in Central Finland between the 1960s and the 1980s. *Burns*. 1993;19(5):418–22.
20. Panjeshahin MR, Lari AR, Talei A, Shamsnia J, Alaghebandan R. Epidemiology and mortality of burns in the South West of Iran. *Burns*. 2001;27:219–26.
21. Carroll M, Gough M, Eadie A, McHugh M, Edwards G, Lawlor D. A 3-year epidemiological review of burn unit admissions in Dublin, Ireland (1988–1991). *Burns*. 1995;21:379–82.
22. Hosseini S, Askarian M, Assadian O. Epidemiology of hospitalized female burns patients in a burn centre in Shiraz. *Eastern Mediterranean Health Journal*. 2007;13(1):113–18.
23. Chong G, Song C, Tan T, Kusumawijaja G, Chew K. Multi-variate analysis of burns patients in the Singapore Hospital Burns Centre (2003–2005). *Burns*. 2009;35:215–20.
24. Kaushik R, Kumar S, Sharma R, Lal P. Bacteriology of burn wounds—the first three years in a new burn unit at the Medical College, Chandigarh. *Burns*. 2001;27(6):595–7.
25. Ananthkrishnan A, Kanungo R, Kumar K, Badrinath S. Detection of extended spectrum beta lactamase producers among surgical wound infections and burns patients in JIPMER. *Ind J Med Microbiol*. 2002;18(4):160–5.
26. Sengupta S, Kumar P, Ciraj A, Shivananda P. *Acinetobacter baumannii*; an emerging nosocomial pathogen in the burns unit Manipal, India. *Burns*. 2001;27(2):140–4.