

Epidemiology and Mortality of Burns in the North of Iran

¹Ghasemali Khorasani, ²Seyed Jalal Hosseinimehr and ³Azadeh Eghbalian

¹Burn Center, Zare Hospital, Mazandaran University of Medical Sciences, Sari, Iran

²Faculty of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran

³Traditional Medicine Research Center, Mazandaran University of Medical Sciences, Sari, Iran

Abstract: The Mazandaran province is located in the Northern part of Iran. This province is surrounded by Alborz mountain ranges and it is difficult to transfer patients to the high level of medical care in capital of Iran. Zare' hospital is only a "Burn and Referral center" in the North of Iran. The population of Mazandaran province is about 3 million. The total number of patients in this study was 484 in 2006. Of course some of them were from other neighboring provinces. Among patients admitted to the center, 140 (28.9%) and 101 (21.9%) were young adult aged 21-30 years old and children under 10 years old, respectively. The incidence rate of burn hospitalization was 11.6 per 100,000 persons living in Mazandaran province. Kerosene was the most common etiology of burns (45.7%). Thirty seven percent of patients constituted more than 30% burn surface. The hospital stay duration was with a range of 1-93 days. The majority of patients stayed 8-30 days in hospital (61.2%). The overall mortality rate was 28% (20.6% for male and 41% for females). Most of burned patients required surgery for more than three times (60%). With regard to high rate mortality and burn surface area for reducing incidence of burns, it is necessary to train people by preventive program through public media.

Key words: Burn, epidemiology, mortality, medical care, incidence rate, Mazandaran, Iran

INTRODUCTION

Burn injury is a major component of injuries worldwide. Burn injury is a medical problem in the developing countries and an economic and social burden on the national health services, then patients must be cared more in hospitals. Epidemiological studies that determine the magnitude and risk factors are prerequisite for planning prevention measures and burn care facilities (Nega and Lindtjøn, 2002; Bouter *et al.*, 1989). Burn injuries still produce a significant morbidity and mortality in Iran (Panjeshahin *et al.*, 2001).

There is not any information about the epidemiology of burn injuries in the north of Iran. North of Iran has a different geographical area compared to other area in Iran. This area is surrounded by Alborz mountains ranges. It is difficult to transfer patients to capital of Iran due to dangerous and long roads. Then patients must be delivered to burn center in the North of Iran only. The aim of this study is to analyze the epidemiological characteristics of burned patients in Mazandaran province, the central province in the North of Iran. The burn center of Zare' hospital is the oldest and the only referral burn center. This hospital has 42 beds for acute burns and 35 beds for post-burn reconstructive surgery. While the burn center admits acute burned patients from

other neighboring province (Gilan, Golestan and Semnan), but the vast majority of patients are from Mazandaran Province.

MATERIALS AND METHODS

A retrospective descriptive study was carried out for all the burn victims, pediatric and adult, hospitalized in 2006 in the Zare burn center hospital in Mazandaran Province in the North of Iran. No patient was excluded from the study. Plastic surgery was done in this hospital for some patients.

The variables of interest characteristic were obtained from the clinical histories and admissions as well as discharge records from admission book in the burn unit. Patient characteristics (e.g., age and gender) causes, severity of injuries, duration of stay in hospital, time of surgery, etc were recorded. Data input, analysis and tabulation were performed using SPSS for Windows version 13.

RESULTS

Age and gender: A total of 484 patients with burn injury were admitted to referral Zare' burn center in 2006 year. Table 1 shows the age frequency of patients. The highest

Table 1: Gender distribution by age groups

Age group (years)	Male	Female	Total (%)
<10	72	29	101(20.9)
11-20	62	27	89 (18.4)
21-30	86	54	140 (28.9)
31-40	36	25	61 (12.6)
41-50	29	13	42 (8.7)
51-60	15	7	22 (4.5)
61-70	4	8	12 (2.5)
71-90	7	10	17 (3.5)
Total	311 (64%)	173 (35.7%)	484

Table 2: The cause's distribution of burns

Type	No. patients (%)
Boiling water	88 (18.2)
Kerosene	221 (45.7)
Gases explosion	79 (16.3)
Electrical	39 (8.1)
Chemical	8 (1.7)
Other	49 (10.3)

Table 3: Severity of burns according to sex of individual and age

TBSA%	No. patients			Children <10	Adults 21-30
	Male	Female	Total		
10	65	17	82 (16.9)	14	26
11-20	95	37	132 (27.3)	44	25
21-30	60	29	89 (18.4)	30	17
31-40	28	24	52 (10.7)	6	18
41-50	15	17	32 (6.6)	1	13
>50	46	49	95 (19.6)	6	41

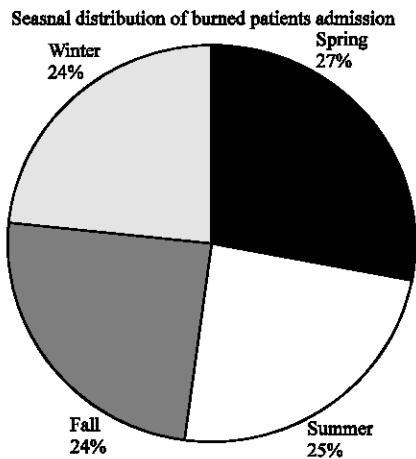


Fig. 1: Pie chart for seasonal distribution of burned patients' admission

frequency of hospitalized patients was 21-30 years old range (28.9% of patients) and children under 10 years of age who accounted for 20.9% of patients.

The study population consisted of 311 (64.3%) males and 173 (35.7%) females and overall male to female ratio was 1.8:1.

Residents: In 2006, 349 (72%) of 484 patients admitted to our burn center were from the local province

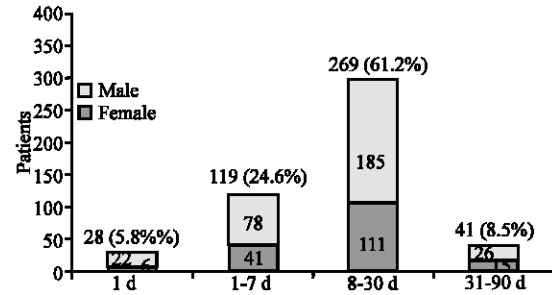


Fig. 2: Length of hospital stays of burned patients (days)

(Mazandaran) and 135 (28%) cases were from other neighboring province.

Seasonal variation: There was not a relationship between the incidence of burn injury and season (Fig. 1).

Etiology: The most frequent etiologic agent in the population being studied was kerosene (45.7%), followed by boiling water (18.2%) (Table 2). The most frequent etiologic agent in children under 10 year was hot liquid (64.4%), but the kerosene was most frequent agent of burn in the patients over the age of 10 (54%). Among the burned patients, 9 patients (2%) had attempted suicide (male: five, female: four). Kerosene was the only agent for suicide.

Severity of burns: The patients with different TBSA (Total Body Surface) percentage were categorized in group of 10% burning. Burn patients with 11-20% and over 50% TBSA made up the majority of admission, 27.3 and 20%, respectively (Table 3). The most frequent etiologic agent in the population with TBSA over 40% were kerosene (68%) and gas explosion (24%). The frequency injury of the body for single and multiple areas were 2.3 and 97.5%, respectively.

Hospital: The length of hospital stay ranged 1-93 days. Figure 2 shows hospitalized stay of burned patients. Most burn patients stayed at hospital for 8-30 days (61.2%). Sixty seven percent of those male patients were hospitalized for more than 8 days; it was 72% for female. The kerosene and gases explosion were the most frequent cases of burn for longer stay in hospital.

Number of operation: The surgical procedures were carried out for patients that required either single or multiple debridement and skin grafting. Following hospitalization, 389 (80%) of patients underwent surgery, while 59% requiring more than three operation (Table 4).

Table 4: Number of operation

Number	Patients (%)
No need operation	95 (20)
1	52 (10.7)
2	48 (9.9)
3	32 (6.6)
4	51 (10.5)
5	37 (7.6)
>5	169 (34.9)

Table 5: Distribution of died patients and mortality rate by age and gender

Age (years)	No. death/No. total (%)	No. death	
		Male	Female
<10	13/101 (12.8)	10	3
11-20	24/89 (27)	9	15
21-30	48/140 (34)	24	24
31-40	19/61(31)	8	11
41-50	7/42 (17)	2	5
51-60	5/22 (23)	4	1
61-70	7/12 (58)	1	6
71-90	13/17 (76)	6	7
Total (%)	136/484 (28)	64/311 (20.6)	72/173 (41.6)

Mortality: The overall mortality in this study population was 136 (28%) of total admission. Mortality was observed 20.6 and 41.6% for male and female, respectively. Fifty five percent of patients died to having over 50% TBSA (Table 5). Kerosene burns had the highest mortality rate. The mortality rate was 34, 31 and 45% for patients aged 21-30, 31-40 and over 50.

DISCUSSION

Since Zare' burn center is the only referral center for acute burn in the Northern of Iran, many burned patients are admitted to this hospital from neighboring provinces, but most of patients are from Mazandaran province. Our results showed male predominance of burn injuries during all of age groups, which suggest that males strongly exposed to risk of injury. This result is in agreement with several reports (Ansari-Lari and Akanan, 2003; Rastegar *et al.*, 2000; Saadat, 2005) but some reports showed females more than males (Groohi *et al.*, 2002; Panjeshahin *et al.*, 2001). Reports from other countries indicate that children are at the highest risk (Chien *et al.*, 2003; Kobayashi *et al.*, 2005) and Iran is (Saadat, 2005; Groohi *et al.*, 2002). Also most of female were housewives and mainly work at kitchen and encounter with stove. The results of the present epidemiological study revealed the highest incidence of burns among young adults (aged 21-30 years old); it calls for attention to implement preventive educational and environmental modification programs. The hot liquid is the most frequent agent of burn in several countries (Hoyos *et al.*, 2006; Song and Chua, 2005) but the most common cause of burns in

this study was kerosene burns followed by accidents involving boiling water. This observation is similar to studies reported by other in Iran (Groohi *et al.*, 2002; Panjeshahin *et al.*, 2001; Soltani *et al.*, 1998) Panjeshahin showed the flammable liquids included kerosene was the most common etiology of burns (Panjeshahin *et al.*, 2001) and it is due to high use of kerosene for cooking and heating in Iran.

Results of our study showed that the majority of burns affects large area of body, 83% of cases suffered more than 10% TBSA and 37% did exceed 30% TBSA which is close to reports by some investigations in Iran (Panjeshahin *et al.*, 2001; Rastegar *et al.*, 2000; Groohi *et al.*, 2002). Rastegar reported a retrospective study on 3341 burn patients hospitalized in a burn care center in Tehran. The mean age was 20.4 years and 43.5% of patients were children under 15 years old. The mean body surface burned was 30.6% (Rastegar *et al.*, 2000). Explanation could be that the burn centers are limited in number and located in the centers of provinces, so acute burned patients are transferred to these burn centers from others cities. Most patients referred had acute and extended burns. In this study, we found a significant association between kerosene burns and high burns which comply with other reports (Groohi *et al.*, 2002; Barret *et al.*, 1999). The overall case fatality rate in the Mazandaran province is 21.8% which is higher than some reports (Rastegar *et al.*, 2000) and lower than other reports from Iran (Panjeshahin *et al.*, 2001; Groohi *et al.*, 2002; Soltani *et al.*, 1998). The mortality rate was 19.6% in study was done in Tehran burn center (Panjeshahin *et al.*, 2001). The present data showed that the mortality rate is estimated 2.5 per 100,000 people in Mazandaran province. The several studies showed that mortality was between 3-15.4% of hospitalization burns in other countries (Chien *et al.*, 2003; Kobayashi *et al.*, 2005; Hoyos *et al.*, 2006; Song and Chua, 2005; Akerlund *et al.*, 2007; Mashlauskas *et al.*, 2004). The highest mortality rate reported by Panjeshahin *et al.* was 34.4% with fatality of 4.6 per 100,000 people in Fars province in the South West of Iran (Panjeshahin *et al.*, 2001). The high mortality rate among hospitalized patients in Iran may indicate a high rate of exposure to infection. High resistance of bacteria reported by other studies from Iran (Rastegar *et al.*, 1998, 2000; Rastegar and Alaghehba, 2000) may be one of the most important causes of high mortality in burned patients in Iran. Since, the burn center is a referral center, patients had severs burn referring to this hospital and patients with no acute burn were admitted to local hospital in their city.

Burn treatment is a combination of wound management, surgery and rehabilitation. This study

shows that majority of burn patients required surgery more than three times, because they had severer burns among other patients. This may result in long hospitalized stay (70% patients stayed more than 8 days) and the increase of secondary infection as well as the increase of medical care costs and psychological effects.

Mortality rate among females is about 1.12 times as great as among males, this agrees with other reports (Panjeshahin *et al.*, 2001; Soltani *et al.*, 1998). It suggests the higher rate of severing burn in females in comparison to males (39% of females and 18% males suffered from burn more than 50% TBSA).

CONCLUSION

In conclusion, the study results provide the epidemiological situation for burned patients admitted to the only burn center in the Northern part of Iran. Young adults aged 21-30 and children under 10 years are two groups identified to be at high risk of receiving burn injuries. The high mortality rate was observed in patients. The main cause of burns was kerosene. Therefore, it is necessary to implement a program for health education in relation with prevention of burn focusing on the use of kerosene for cooking and heating particularly for females at home. Public prevention program for cooking and heating is associated with the reduction of the risk of burns, especially for young adults. This study help to promote acknowledge of health system manager to pay more attention to burn center and equip burn center, of course, health systems have to provide more suitable care burn to reduce secondary infection induced in hospitalized patients particularly *Pseudomonase aeruginosa*.

REFERENCES

- Akerlund, E., F.R.M. Huss and F. Sjoberg, 2007. Burns in Sweden: An analysis of 24538 cases during the period 1987-2004. *Burns*, 33: 31-36.
- Ansari-Lari, M. and M. Askarian, 2003. Epidemiology of burns presenting to an emergency department in Shiraz, South Iran. *Burns*, 29: 579-581.
- Barret, J.P., P. Gomes and I. Solano, 1999. Epidemiology and mortality of adult burns in Catalonia. *Burns*, 25: 325-329.
- Bouter, M.L., P.G. Knipschild and J.L. Van Rijn, 1989. How to study the epidemiology of burn injure; The epidemiological approach. *Burns*, 15: 162-166.
- Chien, W.C., L. Pai and C.C. Lin, 2003. Epidemiology of hospitalized burns patients in Taiwan. *Burns*, 29: 582-588.
- Groohi, B., R. Alaghebandan and A. Rastegar Lari, 2002. Analysis of 1089 burn patients in province of Kurdistan, Iran. *Burns*, 28: 569-574.
- Hoyos Franco, M.A., N.C.J. Gonzales and M.E.M. Diaz, 2006. Epidemiological and clinical profile of burn victims hospital universitario San Vicente de Paul, Medellin, 1994-2004. *Burns*, 32: 1044-1051.
- Kobayashi, K., H. Ikeda and R. Higuchi, 2005. Epidemiology and outcome characteristics of major burns in Tokyo. *Burns*, 31: 3-11.
- Mashlauskas, K., R. Rimdeika and Z. Saladzinskas, 2004. The epidemiology and treatment of adult patients with hand burns in Kaunas university of medicine hospital in 1985, 1995, 2001 and 2002. *Medicina (Kaunas)*, 40: 620-626.
- Nega, K.E. and B. Lindtjon, 2002. Epidemiology of burn injuries in Mekele town, northern Ethiopia: A community based study. *Ethio. J. Health Dev.*, 16: 1-7.
- Panjeshahin, M.R., A. Rastegar Lari and A.R. Talei, 2001. Epidemiology and mortality of burns in the south West of Iran. *Burns*, 27: 219-226.
- Rastegar Lari, A., R., Alaghebandan and R., Nikui, 2000. Epidemiological study of 3341 burns patients during three years in Tehran, Iran. *Burns*, 26: 49-53.
- Rastegar Lari, A., H., Bahrami Honar and R. Alaghebandan, 1998. Pseudomonas infections in Tohid burn center, Iran. *Burns*, 24: 637-641.
- Rastegar Lari, A. and R., Alaghebandan, 2000. Nosocomial infections in an Iranian burn care center. *Burns*, 26: 737-740.
- Saadat, M., 2002. Epidemiology and mortality of hospitalized burn patients in Kohkiluye va Boyerahmad province (Iran): 2002-2004. *Burns*, 31: 306-309.
- Soltani, K., R., Zand and A., Mirghasemi, 1998. Epidemiology and mortality in Tehran, Iran. *Burns*, 24: 325-328.
- Song, C. and A. Chua, 2005. Epidemiology of burn injuries in Singapore from 1997-2003. *Burns*, 31: 18-S26.