Original Article

Demographic characteristics of burn injuries refer to burn center of Northern of Iran

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Abstract

Context: Burns and associated injuries are considered as the most severe types of trauma leading to multiple disabilities. Hence, obtaining information from the burn-related demographic variables is also of particular importance. The consequences of the burn include mortality, high hospital costs, and mental and emotional health problems.

Aims: The current study was conducted to determine the demographic information affecting the mortality rate among burn patients in Burn Center of Mazandaran University of Medical Sciences (Sari, Iran).

Settings and Design: This is a cross-sectional analytical study done in 2016.

Materials and Methods: This retrospective study was conducted using the medical records of 629 patients hospitalized in the Burn Departments and BICU of the Burn center of Mazandaran University of Medical Sciences (Sari, Iran) in 2015. All participants were included through the headcount technique.

Settings and Design: This is a cross-sectional analytical study done in 2016.

Statistical Analysis Used: Mean, standard deviation (SD), and Probit regression and logistic regression were used for statistical analysis. The data were analyzed using the Spearman correlation coefficient and Chi-square test through the SPSS version 16.

Results: The mean age of participants was 32.95 (SD = 22.17) years old. There were 93 patients (18.4%) aged below 5 years. The mean length of hospital stay was 13.69 ± 12.78 days. The majority of fatal burn injuries (77%) occurred at home. In this study, the lethal area 50 was obtained as 66.7%. A significant correlation was observed between demographic variables (age and educational attainment) and consequences of burn injuries.

Conclusion: Considering the relationship between the effects of burns on age and educational level, investment in promoting awareness among people at different levels is recommended to prevent relevant incidents as an effective and necessary measure.

Keywords: Burns, Death, Demography

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INTRODUCTION

Burns and associated injuries are considered the most severe types of trauma leading to multiple disabilities, complications, mortality, high hospital costs, and mental and emotional health problems.[1,2] Burn-induced injuries may have different severity and incidence in terms of demographic factors such as age, gender, education status, marital status, and so on. Scientific evidence shows that burn injuries are more prevalent among children, often accompanied with devastating consequences.[3] Burns among children are more prevalent than other age groups in Iran, too.[4] Studies in a number of countries show that burns among young people are due to fire incidents. In these studies, the mortality rate varies from 33.5% to 54.8%.[5,6] The studies suggest that burns due to flames and hot fluids are more prevalent among the youth, women, and people with lower education, and mortality rates range from 27.9% to 34.4%.[7] Burning caused by hot and boiling fluids in toddlers, playing with matches in elementary school children, electric injuries in male adolescents and smoking and drinking alcohol in adults are directly involved in burn incidence,[8] all of which show the relationship between demographic factors and burn.

Socioeconomic status, as another demographic factor, appears to play an important role in burn injuries.[8] Studies show that the poor, compared to the affluent, are more prone to associated risks with such bad habits as smoking, drinking, stressful events, harboring suicidal thoughts, or committing suicide. Girls from poor families get married at an early age are deprived of studying or working outside home and thus are poverty stricken.[9] This can cause distress, stress, and lead to dangerous incidents such as burning. Farajolah concluded that 51% of women who committed self-immolation believed that their economic status was bad, and 31% of women burned were illiterate.[9]

Given the importance of studying the role of demographic factors in the occurrence of burns, the severity of injuries, and their consequences in the community according to the evidence referred to, the present study was conducted to determine the demographic factors affecting the death of the patients with burn injuries in Burn center of Mazandaran University of Medical Sciences (Sari, Iran) in 2015 so that using the results, short-term and long-term programs are designed and operationalized to prevent burns and reduce the incidence, complications, mortality, and costs of burns.

MATERIALS AND METHODS

This retrospective study was conducted on burn injuries of Burn center of Mazandaran University of medical sciences (Sari, Iran) in 2015. To collect the required data, we reviewed the medical records of the burn patients. The study population was 629 records of patients hospitalized in burn wards and BICU of Zare Psychiatry and Burn Center, where all patients were enrolled using census method. This is only general center for burn injuries in Mazandaran province. Patient records for second referrals (aim to assessment of injury) were excluded.

The data collection was performed using a form, which covered both demographic and burn-related data. The demographic data included the gender, marital status, education, age, place of residence, and province. Furthermore, the burn-related data entailed burn history, burn season, addiction, self-immolation, burn percentage based on the Landau Bradow table (completed by the physician), hospitalization length, cause of burn, fatalities, and location of the incident. Its content validity was confirmed by ten experts from Mazandaran University of Medical Sciences.

Ethical considerations

Before the study, ethical approval was obtained from the Ethics Committee of the Mazandaran University of Medical sciences, Sari, Iran with ethical code R.mazums. rec.1396.H100. After obtaining the approval of the Health Deputy of the University, we coordinated with the hospital officials and informed them about the goals and details of the study. In addition, the patients' data were kept confidential.

Statistical analysis

Most variables have missing values. Before logistic regression, the missing values were estimated. SPSS 21, IBM, Armonk, NY, United States of America, was used for statistical analysis with the significance level (α) of 0.05. Frequency and percent were used to describe the qualitative data, and mean and standard deviation (SD) were used for quantitative data. Probit regression was used to calculate lethal area 50 (LA50) (a percentage of burn where 50% of patients die). Logistic regression was used to determine the factors affecting patients' death. Initially, the relationship between all variables with patients' death was examined separately using univariate logistic regression (using backward method). The variables with $P < 0.3$ were included in multivariate analysis.

RESULTS

According to Table 1, from 629 patients admitted to Burn center of Mazandaran University of medical sciences,

Table 1: Demographic and clinical data of patients and univariate logistic regression test

Variable	Values	All patients, *n* (%)	Died, *n* (%)	Survived, *n* (%)	Univariate test (*P*)
Gender	Males	438 (69.6)	43 (64.2)	395 (70.3)	0.3
	Females	191 (30.4)	24 (35.8)	167 (29.7)	
Marital status	Single	262 (42.1)	26 (38.8)	236 (42.4)	-
	Married	342 (54.9)	38 (65.7)	304 (54.7)	0.42
	Other	19 (3)	3 (4.5)	16 (2.9)	0.53
Age	0-19	179 (28.8)	12 (18.2)	167 (30)	-
	20-39	245 (39.4)	32 (48.5)	213 (38.3)	0.02
	40-59	117 (18.8)	9 (13.6)	108 (19.4)	0.5
	≥60	81 (13)	13 (19.4)	68 (12.2)	0.07
Education	Illiterate	173 (34.6)	18 (34.6)	155 (34.6)	-
	Elementary	87 (17.4)	13 (25)	74 (16.5)	0.17
	Until diploma	204 (40.8)	20 (38.5)	184 (41.1)	0.08
	University education	36 (7.2)	1 (1.9)	35 (7.8)	0.2
Place of residence	Urban	416 (67.6)	48 (73.8)	368 (66.9)	0.26
	Rural	199 (3.24)	17 (26.2)	182 (33.1)	
Province	Mazandaran	411 (65.3)	25 (37.3)	386 (6.87)	0.001
	Other	218 (34.7)	42 (62.7)	176 (31.3)	
Burn history	Has	17 (2.7)	0	17 (3)	0.001
	Does not have	607 (97.3)	66 (100)	541 (97)	
Burn season	Spring	198 (31.9)	28 (41.8)	170 (30.7)	-
	Summer	155 (25)	14 (20.9)	141 (25.5)	0.14
	Fall	155 (25)	14 (20.9)	41 (25.1)	0.14
	winter	112 (18.1)	11 (16.4)	101 (18.3)	0.27
Burn degree	Second degree	21 (3.4)	0	21 (3.8)	-
	Third degree	943 (6)	0	43 (7.7)	0.99
	Second and third degree	557 (89.7)	65 (97.5)	492 (88.5)	0.99
Addiction	Has	160 (26.6)	16 (25.8)	144 (26.7)	0.95
	Does not have	441 (73.4)	46 (74.2)	395 (73.3)	
Self-immolation	Yes	21 (3.4)	9 (14.3)	12 (2.2)	0.001
	No	581 (96.6)	54 (85.7)	527 (97.8)	

438 (69.6%) were males, and 54.9% of them were married. The mean age of the patients was 32.95 (SD = 22.17) years.

During the study, 67 patients (10.7%) died, of whom 7 were at the first 24 h of admission. Among the dead patients, 59.7% were affected by extensive burns, 17.7% shock septicemia, 8.1% respiratory arrest, and 14.5% due to other factors. Mean duration of hospitalization was 13.69 (SD = 12.78) days. Of these, 197 (31.4%) were hospitalized for <1 week, 230 (36.6%) were 8–14 days, and 201 (32%) were more than 2 weeks. The mean burn percentage was 20.9% ± 22.55%. Of these, 413 (66.8%) individuals had a burn percentage of <20%, 117 (18.9%) individuals 20%–40%, 55 (8.9%) individuals 40–70, and 33 (5.3%) more than 70%.

Burns caused by boiling water (27.1%) and explosion (24.1%) were the most common cause of burns among the patients. Among dead patients, explosion with 39.4% and flame with 33.3% were the main causes of burns. Burning at home with 67.6% was an accident-prone place for burning. In fatal cases, burning at home with 77% had the highest frequency. In this study, LA50 was 66.7%.

Logistic regression was used to determine the factors affecting the death of patients. Initially, the relationship between all variables with patients' death was examined

Table 2: The coefficients of significant variables in multivariate logistic regression analysis

Variable	Value	B	SE	Wald	P	Exp(B)
Age	0-19	-	-	-	-	-
	20-39	0.67	0.052	1.61	0.20	1.95
	40-59	1.02	0.61	2.76	0.09	2.78
	≥60	1.50	0.59	6.39	0.01	4.49
Education	Illiterate	-	-	-	-	-
	Elementary	−0.53	0.55	0.91	0.34	0.59
	Until diploma	−1.01	0.49	4.11	0.04	0.37
	Academic	−2.30	1.15	4.01	0.04	0.1
Burn percentage	-	0.068	0.008	67.58	0.0001	1.07

Jamshidi N, Abbaszadeh A, Najafi Kalyani M. Effects of video information on anxiety, stress, and depression of patients undergoing coronary angiography. Pak J Med Sci 2009;25:9015. SE: Standard error

separately using univariate logistic regression. Based on Table 2, all of the factors (age, education, and burn percentage) were related to patients' death.

DISCUSSION

In this study, most of the patients were men (69.6%), which is consistent with the maximum (58.8%) obtained in the studies by Mogharrab *et al*.,[5] Samimi *et al*.,[10] Wasiak *et al*.,[11] Gupta *et al*.,[12] Yavuz *et al*.,[13] Farrokh-Eslamlou *et al*.,[14] and Emir Alavi *et al*.[4] Emir Alavi *et al*.[1] attributed this increase to the higher risk taking of men. Mogharrab *et al*.[5] attributed this to more activities of men. However, studies such as studies by Saberi *et al*.,[15] Haisheng *et al*.,[16]

and LaL *et al*.[17] have shown that the incidence of burns in women is more than that of men. However, according to the present study, there were no significant relationships between gender and burn. The results of Amir Alavi *et al*.[1] also confirm this.

The results of the present study showed a significant relationship between age and burn percentage. This is consistent with the results of Gupta *et al*. They figured out that most cases of second- and third-degree burns were seen in people of 12 years of age and less, and in both age groups, first- and second-degree burns were seen more than grade-three burns.[12] In the present study, the highest rate of burns was in the age group of 20–39 years, and the age group under 20 years was in the next rank. However, among the elderly, it was much less frequent. This is somewhat similar to that of Mogharrab *et al*. They concluded that the burn rate at older ages was lower than other age groups, which can be attributed to no observation of the safety issues and protection of the elderly in the family environment and the lower number of elderly people in comparison with other ages in the community.[5] The results of Farrokh-Eslamlou *et al*. showed that the probability of burn-caused death decreases significantly with the increase in women's age.[14]

There was a significant relationship between education level and burn percentage. In this regard, Amir Alavi *et al*. found a significant relationship between the level of education of patients and the burn consequences so that the rate of death of victims with university education was negligible compared to the illiterate adults. They stated that only 2.9% of patients hospitalized with burns had university education, and most of them had high school diploma or were illiterate.[2] However, the results of Mogharrab *et al*. contradicted this. They did not exactly found the relationship between education and burn percentage, but that they stated the most frequent causes of burns in patients with high school education as oil and petrol flame, patients with diploma and associate's education gas blast, patients with primary education or illiterate hot liquids, and patients with a bachelor's degree and higher with electricity.[5] Samimi *et al*. reported the fathers' education level in 92% and mothers' education in 94% of the burnt children under the diploma.[10]

The results of the present study showed that most patients with burns (54.9%) were married, which is consistent with the results of the study by Farajolah.[9] According to them, divorce and threatening with divorce, spouse addiction, forced marriage, and infertility are all marital risk factors that increase the rate of self-immolation among married women.[9] Mogharrab *et al*. found that most people admitted to the burn ward were single and attributed this to the high incidence of burns in children and adolescents.[5] However, the present study found no significant relationship between marital status and burn consequences.

The mean duration of hospitalization was 13.69 (SD = 12.78) days. The mean duration of hospitalization in Mogharrab *et al*. was 11.64 ± 12.4 days.[5] This was reported 11.5 days in Gupta JL *et al*. hospitalization time spectrum was from <1 day to 60 days. The mean duration of hospitalization was 11.2 days in people over 12 years of age and 11.5 days in individuals of 12 years and younger with no significant differences in the statistical analysis.[12] The mean burn percentage of the patients was 20.9% ± 22.55%. LaL S *et al*.[17] found that 31.7% of patients had 90% and higher burns, 11.5% had 79%–70%, and 2.6% had 19%–10%.[17] Saberi *et al*. showed that the percentage of total body burn was 30%–50%.[15] Rezaei *et al*. reported the percentage of burns over 75% in over two-thirds of the deaths.[18] Samimi *et al*. found that the level of burn in 58 patients was <21%, in 32 patients was 22%–43%, and in 10 patients was 44%–65%.[10]

Burns caused by boiling water (27.1%) and explosion (24.1%) were the most common cause of burns among the patients. Gupta *et al*. showed that most patients with burns (20.8%) were injured by boiling water or hot food, with the majority of cases occurring in men.[12] Saberi *et al*. stated the most common type of burn in children as contact with hot objects, flames, and hot liquids and flame in adults.[15] In the study of Amir Alavi *et al*., the most common cause of burn was hot liquids.[1] Studying the patients with burns by Samimi *et al*. showed that 66% of burns occurred due to boiling water.[10]

Burning at home with 67.6% made home a burn-prone place for patients. In death cases, burns at home were 77% as the highest frequency. The results of Amir Alavi *et al*. showed that most of burning accidents (81.3%) occurred at home. They reported the high incidence of burn at home due to high burns in women and children and unemployed men living at home.[1] The results of this study are consistent with the findings of Saberi. According to Emir Alavi *et al*., the kitchen is the most common place of children's burns everywhere,[4] which confirms the results of the present study. In this study, LA50 was 66.7%. In the study of Vasei *et al*., LA50 was determined to be 52.38%, which was related to thermal burn. They also found that this index is slightly lower in

women than in men.[19] The potential limitations of this study are based on the lack of community and reliance on patient records.

CONCLUSION

The results showed that demographic factors such as age and education may have an effective role in the consequence of burns. The highest rate of burns was in middle-aged people with low education. Thus, presenting education programs at the community level (home, school, and work environment) is essential for informing to prevent the occurrence of unpleasant incidents leading to burn and to promote safety is suggested.

Conflicts of interest
There are no conflicts of interest.

Authors' contributions
N.mohseni moalem kolaei and A. Hossein Nattaj contributed in the conception and design of this manuscript, Final approval of the version to be published, the analysis and interpretation of data and revising it critically for important intellectual content, agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved, M. Aarabi and A. jafari rad contributed in the analysis and interpretation of data and revising it critically for important intellectual content, Ghasemi Atheni, M, Amini Manesh, M Azizi Khalkheili and F Roozbeh contributed in the acquisition of data, E. Abedini preparation of the first draft of the manuscript, M Ghajar contributed in the drafting of manuscript. All the authors read and approved the final copy of the manuscript.

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