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Factors Associated With Length of Stay and Hospital Charges among Pediatric Burn Injury in Kermanshah, West of Iran

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Abstract

Introduction

Although there is a consensus that the economic burden of burn injury is high, but few studies have conducted about cost of burns injury among pediatric in developing countries. We explored the main factors influencing on hospital costs and length of stay (LOS) associated with pediatric burns injury in Kermanshah, Iran.

Methods and Material

We performed a review of medical records from 105 pediatric burn (16 years and younger) admitted to burn center at Imam Khomeini Hospital in Kermanshah, Iran. Univariate and logistic regressions were employed to identify the main factors affecting hospital costs and LOS associated with pediatric burn injury. Also, the data analysis was done by Stata statistical software.

Results

The results showed the overall mean hospital costs and LOS was 9,853,758 IRR and 7.5 days, respectively. Also, the LOS, gender and Burn Body Surface (BBS) were identified as the main independent predictor of costs and the cause of burn, BBS and age were the main factors affecting LOS.

Conclusion

This study highlights that the independent predictors affecting hospital costs and LOS associated with pediatric burn injury in Kermanshah. Also, our study indicates the BBS was the main factors affecting hospital costs and LOS for the study population.

***Key words*:** Hospital charges, Length of stay, Kermanshah, Pediatric.

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Introduction

Burn injuries are a serious public health problem and one of the most causes of deaths related to the injury in the first two decades of life over the world (1, 2). The burn injuries can be imposed mortality, disability and losing resources for patients, health sectors and government (3, 4). Previous studies have shown that the approximately 5 % of hospital admission and 1 % of the total burden of disease is related to burn injuries (5, 6). A study by Finkelstein et al. showed an about 3,922 deaths; 24,519 hospitalized injuries; and more than 745,000 non-hospitalized injuries due to burn and fires occurred in United State in 2000 (7). Treatment of burn injuries is expensive and requires specialized staff, advanced technology and medical equipment. In addition, the costs of burn injury, both patients and society, can be multidimensional, substantial and for years after the initial burns may be continue (8).

It has been accepted the cost of burn injuries in pediatric population is high. The total cost of burn injuries in pediatric population (0-19 years) was estimated about $2.1 billion (9). Despite the importance of this issue and the losing a large amount of resources in the health sector, a few study associated with hospitalization or long term cost burn have been conducted in Iran (3), although some studies have been conducted in developed countries (7, 8, 10-12). Studies about cost of illness provide a holistic view and useful information for policy makers, planner and hospital's manager in health sector and it also could be helpful regarding to implantation of preventive programme to reduction of burn. So, the purpose of present study was investigated to the analysis cost of burn and its determinant among pediatric burn injuries in Kermanshah, the capital of Kermanshah Province, for the year of 2011.

Methods and Materials

This was a retrospective and analytical study. We performed a review of medical records from 105 patients (16 years and younger) admitted to the burn center at Imam Khomeini Hospital in Kermanshah, in West of Iran, between from 21 March 2010 to 21 March 2011 and explored the relationship between demographic patients and injury characteristics with hospital costs and LOS. This burn center is the only referrals center for the all burn in the province. The information about age, gender, burned body surface (BBS), season of burn, outcome of burn, length of stay (LOS) and hospital costs were collected. As the cost data were highly skewed in nature, for bivariate analysis we used from non-parametric tests such as Mann-Whitney U-test and Kruskal-Wallis tests. Also, logistic regression model we used to identify the main determinant of hospital cost and LOS of burn injury. As similar to the other studies, the median of hospital costs (6,654,510 Iranian Rial (IRR)) was considered as cut-off point and are divided to the high vs. low costs(13-16) (13-16). The amounts of costs were reported in IRR [1dollar=15,000 Iran Rials (IRR) at the time of the study]. Also, the statistical analysis was performed using Stata software V.12 and p-value<0.05 was considered statistically significant.

Results

In this study, of all subjects, 59 % were boys and the boy to girl ratio was 1.4 (62 boys and 43 girls). The mean and median age was 5.65 and 4 years with standard deviation 4.8 years. The mean, median and standard deviation of hospital costs for the whole study population were 9,853,758, 6,654,510 and 9,253,943 IRR. The empirical analysis showed that the main cause of burn was hot liquids (60 % of burn injuries). The mean of age, burn body surface (BBS) and LOS was 5.65 years, 23 % and 7.5 days, respectively. Also, the mean cost per hospitalization day and per BBS % was 131,383 and 428,424 IRR, respectively. Being girls (p=0.001), BBS % (p=0.005) and LOS (0.002) were found to be significantly associated with hospital costs. Also, there were not significant associations between age, cause of burn, degree of burn and season of burn with hospital costs among study population (P>0.05)(Table.1).

Table1: Baseline characteristics and total charges of hospitalization among pediatric burn injury

Variables	N	Mean hospital costs (IRR)	Median hospital costs (IRR)	Standard deviation (IRR)	P_value
Gender					
■ boy	62	7,595,386	5,503,344	6,821,683	0.001*
■ girl	43	13,110,014	8,792,104	11,228,448	
Age					
■ ≤ 4	61	9,926,179	6,708,410	10,107,643	0.7*
■ > 4	44	9,753,355	6,653,909	8,129,080	
BBS					
■ ≤ 18	55	7,956,435	9,079,661	9,078,495	0.005*
■ > 18	50	9,079,661	9,078,495	11,897,634	
LOS					
■ ≤ 5	55	7,836,217	5,544,009	8,616,034	0.002*
■ > 5	50	11,996,527	9,441,745	9505318	
Cause of burn					
■ flame	37	11,685,421	8,792,104	11,681,247	0.34*
■ others	68	8,829,326	7,919,732	7,919,732	
degree of burn					
■ 2	54	10,289,462	9,336,421	7,236,700	0.32*
■ 3	51	9,357,530	9,232,254	6,246,081	
Season of burn					
■ spring	24	10,287,641	7,529,960	6,681,354	
■ summer	23	8,388,231	6,830,303	6,852,065	0.45**
■ autumn	28	10,796,742	5,902,410	12,789,932	
■ winter	30	9,738,990	6,218,365	9,030,742	

*Mann-Whitney U- test; **Kruskal-Wallis test

Relationship between baseline characteristics and hospital LOS in days for the whole study population is shown in (Table. 2). Results showed that the LOS was

significantly influenced by BBS (p=0.002) and cause of burn (p=0.006). Also, there was not a significant relationship between gender, age, degree of burn and season of burn with LOS among all patients included in our study.

Table 2: Baseline characteristics and LOS of hospitalization among pediatric burn injury

Variables	N	Mean LOS (day)	Median LOS (day)	Standard deviation (day)	P_value
Gender					
■ boy	62	6.9	5	8.08	0.16*
■ girl	43	8.3	6	7.4	
Age					
■ ≤ 4	61	5.36	4	5.26	0.015*
■ > 4	44	9.15	5.5	9.36	
BBS					
■ ≤ 18	55	4.74	4	4.09	0.002*
■ > 18	50	10.6	7.5	9.61	
Cause of burn					
■ flame	37	10.18	6	10.02	0.006*
■ others	68	6.08	5	5.87	
degree of burn					
■ second degree	54	5.62	5	4.10	0.25*
■ third degree	51	9.5	5	10.03	
Season of burn					
■ spring	24	9.95	6.5	10.17	
■ summer	23	4.82	5	3.35	0.26**
■ autumn	28	6.89	5	7.9	
■ winter	30	8.3	6	7.6	

*Mann-Whitney U- test; **Kruskal-Wallis test

The results of logistic regression model for hospital cost and LOS of pediatric burn are shown in (Table 3 and 4), respectively.

The variables of gender, LOS and BBS for cost of hospitalization and the variables of cause of burn and BBS for LOS were entered into the logistic regression model.

These variables were selected based on the results from the bivariate analysis. In the final logistic regression model, the being girls [odd Ratio (OR) = 2.1, p = 0.009], BBS more than 18 % (OR = 3.4, p = 0.000) and the LOS more than 5 days (OR = 1.63, p = 0.027) were statistically significant determinants of high hospital costs.

Table 3: Results of multiple logistic regression analyses of high costs v low costs for pediatric burn injury

Variables	Odd Ratio (OR)	95% Confidence interval		P-value
		Lower	Upper	
Gender				
■ boy	1	-	-	0.009
■ girl	2.1	0.88	4.90	
BBS				
■ ≤ 18	1	-	-	0.000
■ > 18	3.4	1.40	8.2	
LOS				
■ ≤ 5	1	-	-	0.027
■ > 5	1.63	0.674	3.93	

Logistic regression model for LOS showed that the age, extent of burn body surface (BBS) and cause of burn were the main determinant of the high LOS in the whole of study population.

Table 3: Results of multiple logistic regression analyses of high LOS v low LOS for pediatric burns injury

Variables	Odds Ratio (OR)	95% Confidence interval		P-value
		Lower	Upper	
Age				
■ ≤ 4	1	-	-	0.04
■ > 4	1.5	0.91	3.33	
BBS				
■ ≤ 18	1	-	-	0.000
■ > 18	5.1	2.22	12.08	
Cause of burn				
■ flame	1.9	0.54	4.02	0.002
■ others	1	-	-	

Discussion

Studies have been revealed that injury account for 15 % of all medical cost in the first two decades of life (7, 8, 17). In addition, the costs of burn injuries – especially among pediatric – both with the initial hospitalization and follow-up can be substantial. An estimated that the total cost associated with pediatric burn injuries was about $ 2.1 billion per years in USA (17). However, although it is difficult to estimate the actual cost of burn injuries, but there is a consensus that the costs related to the burn care are high (18). In 2011, four hundred and one patients related to the burn injury were admitted in Imam Khomeini Hospital Burn Center, Kermanshah-Iran, during the study period. Of these, one hundred and five patients were ages 16 years and less that in this study in terms of hospital cost and LOS were analyzed. The most of patients were boys (59 %), the most cause of burn was hot liquids (60 %) and the average of age was 5.6 years which is consistence with studies conducted in Washington (8), Pakistan(19) and Iran (20). The mean total cost of hospitalization in our study was 9,853,758

IRR, the average LOS was 7.5 days and the mean of BBS was 23 %. The length of stay per 1 % BBS was 3 that in other studies it was two days (5).

The total cost of treatment for all pediatric patients in the study population was 1,034,644,590 IRR. The mean total cost of hospitalization in our study was 9,853,758 IRR, the average length of stay was 7.5 days and the mean of BBS was 23 %. In addition, the mean cost per hospitalization day and per BBS % was 1,313,833 and 428,424 IRR, respectively. Ahn et al. in Australia founded that mean cost per 1 % burn and 1 day hospital stay was AU$ 6,263 and AU$ 3,677, respectively (18).

The results of univariate and logistic regression analysis showed that the extent of BBS was the main factor affecting on hospital costs and LOS associated pediatric burn injury. The hospital costs and LOS in patients with BBS more than 18 % were 3.4 and 5.1 time higher than in compared to patients with BBS less than 18 %. Also, the results of univariate analysis showed that the hospital costs were significantly influenced by gender (being girl), extent of BBS and LOS. Few studies about determinant of cost of pediatric burn injuries have been conducted in other countries. Klein et al. found the extent of burn was the most significant factors affecting hospitalization costs (8).

Also, univariate analysis for LOS showed that there was a strong correlation between BBS, age and cause of burn with LOS. The average of LOS flame burn was 10.2 days, while it was 6 days for other causes. Karami Matin et al. (3), (21) and Sahin et al. (5) demonstrated that there was a significant correlation between LOS and cause burn. Ahn et al. in performed a review of 20 patients in a burn center in an Australian context in 2012. In their study the LOS and BBS % was considered as the most factors costs of burn care which is consistence with our finding (18). Yang and et al. concluded the depth of burn, area of burn independent predictors of LOS, whereas LOS, area of burn and blood transfusion were the main independent predictors of hospitalization costs (22). Only in their study, the study population was patients 3 years and less who had burn by scald; while in our study it was 16 years and less who had burn by all causes.

This study has some limitation. First, this study conducted in a single referral burn centre in Kermanshah city; therefore its generalization to other provinces is limited. Second, the costs are estimated from prospective of provider; so it was less than the true costs of pediatric burn. Third, informal costs, productivity loss, transportation, food and etc. are not considered.

Conflict of Interest: None

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