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Original Article

The length of stay and cost of burn patients and the affecting factors

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Abstract: Background: Burn trauma is a significant health problem that has physical, psychological, and economic reaction on affected patients. Burn patients have different length-of-stay (LOS) due to the complexity of the injury itself. This study aimed to find factors affecting the LOS and cost of burn patients (2017-2018) in Guilan province, north of Iran. Materials and methods: This cross-sectional study includes all 899 hospitalized burn patients who were admitted for the first time (first visit). Data about cost, LOS, and demographic variables were extracted from the hospital registry system. Data were analyzed using t-test, ANOVA, and Linear regression by SPSS 22 software. Results: Nearly 62% of the burn patients were male, and 38% were female. Hot liquid or vapor were the leading causes for burns hospitalization (n = 345; 39.07%). The majority of patients (n = 465; 52.31%) were at level three of burn (total thickness). The upper limb that included head, neck, shoulder, back, hand (45.44%), lower limb (38.25%), multiple or total body (11.36%) were the most organs that were affected by burning. Direct medical costs for patients varied from 0 to 18,550 US$, which was 1489 US$ on average. Patients' length of stay ranged from 1 to 47 days, which was 3.22 days on average. Conclusion: The result showed Adverse consequences burned hot liquid and hot steam burns most common reason that it is important to take preventative methods for this type of patient. Improved patients with the third level cost more and stay longer. Other factors such as underlying disease, urbanity, used antibiotics, sex, and insurance coverage can also be decisive. The burnt percentage also has a direct and significant relationship with medical costs and length of stay. Insurance organization has a direct and significant relationship with the length of stay. Also there was a direct relationship between multiple burns and the patients' length of stay and hospitalization costs.

Keywords: Burn, length of stay, patients, cost, hospitalization, injuries

Introduction

Health systems are trying to improve population health cost-effectively. On the other hand, some diseases such as traumas cause many deaths and disabilities and increase healthcare costs. These diseases related to socioeconomic factors [1] make health systems far from their objectives. Trauma is one of the leading causes of death across the globe [2].

Burn traumas cause significant pain and are responsible for over 195000 deaths annually [2, 3]. Burn traumas impose a significant social and economic burden on countries [1, 4-8]. According to the World Health Organization (WHO), over 95% of fire-related burns occur in low and middle-income countries (LMIC) [9].

Various studies have shown that acute burn patients require a high length-of-stay (LOS) in the hospital, leading to huge costs of care and significant physical, psychological, and economic reactions on the burned survivor and their families [10-12]. According to the 2017 National Burn Repository Annual Report, the

most common burn injury type was fire/flame and scalds, accounting for 76% of cases reported [13]. Some risk factors increase LOS and medical costs of burn patients, including gender, age, size, depth of burn, and inhalational injury [10-14]. Treatment of burn injuries is expensive and requires specialized staff, advanced technology, and medical equipment [15]. From an administrative point of view, longer LOS has been associated with low quality of care; hence, burn centers are at risk for decreased reimbursement for services provided [16]. Decreasing LOS is a policy aim for many health systems and is thought to show performance [17]. Assessed patient data at the Ross Tilley Burn Centre in Toronto, Canada, reported a mean stay of 18% with a length exceeded of stay of two days and more [18].

Higher LOS will result in higher hospitalization costs in many cases [19, 20]. Therefore, LOS and hospitalization costs are highly correlated. The health policymakers who are trying to reduce health system costs should be aware of cost drivers.

Studies about the cost of illness provide a holistic view and valuable information for policymakers, planners, and hospital managers in the health sector. It could also be helpful regarding the implantation of the preventive program to reduce burn [21]. Therefore, in this study, we aimed to evaluate the LOS and costs of burned patients and the associated factors. The present research results will help policymakers and managers find the factors that affect higher LOS and hospital costs in burned patients.

Materials and methods

The present study was a descriptive and analytical study performed on the hospital information system's data (HIS). The study population includes all discharged burn patients admitted to the Velayat hospital for the first time (first visit) in Guilan province during 2017 and 2018. The hospital is located in the northern parts of Iran.

In the study period, 1,024 burned patients were hospitalized in the hospital. We include the patients who were admitted for the first time. The patients who were referred to other hospitals or admitted for the second or more time were excluded from the study. According to inclusion and exclusion criteria, 889 patients were included in the study, and their data related to the study aim were extracted from the HIS.

Using a form that was designed in MS excel, we gathered demographic data, including gender, age, location, insurance, and previous diseases. Data on burn such as burn grade, burnt organ, burn factor, and antibiotic use. We consider LOS and paid cost as the dependent variable, and the related data were extracted. The LOS was calculated based on admission and discharge date in days. If the patients were transferred to another hospital, excluded from the study since we could not calculate the complete LOS. The hospital costs were calculated based on patiets hospital bill which may be paied directly by the patients or third parties such as insurance organization. The bills ware paied on Iranian Rials which changed into US dollars based on formal exchange rate.

All the patients or their family members filled and signed a consent form for the research project on their data, when they were admitted to the hospital. We checked the consent form of the patients before gathering the data. all the data were anonymous and identifiable data were not extracted. The study protocol was also approved by the ethics committee of the Guilan University of Medical Sciences (registration code: IR.GUMS.REC.1397.510).

Normal distribution of quantitative variables was checked using Kolmogorov Smirnov test. Data were analyzed using Spearman correlation and compare mean test, including one-sample t-test and Anova to find the relation between demographic and therapeutic and burnt variables with direct medical costs and length of stay. Since all variables have significant relation with direct medical costs and length of stay, they were entered into two linear regression models separately. Direct medical costs and length of stay were considered as dependent variables in regression models. The box-cox method was used to normalize the data. The independence of errors was also assessed through the Durbin-Watson test and the existence of a linear coefficient through the tolerance factor and the variance inflation factor. The statistical significance level of the tests was considered to be $P<0.05$. Data analysis

Table 1. Demographic variable distribution with burn injuries in Gilan province, between 2017-2018

Variables	Frequency	Percent
Gender		
Female	339	38.13
Male	550	61.87
Urbanity		
Rural	596	67.04
Urban	293	32.96
Antibiotics prescription		
No antibiotic	689	77.50
Use antibiotic	200	22.50
Previous Disease		
No disease	476	53.54
yes	413	46.46
Grade of burn		
Unknown	57	6.41
Second	367	41.28
Third	465	52.31
Burnt organ		
Head & neck	44	4.95
Upper limb (head, neck, shoulder, back, hand)	404	45.44
Lower limb (knee, thigh, foot, knee, button)	340	38.25
Multiple organs or total body	101	11.36
Burn Factor		
Fire or flame	236	26.73
Hot water or vapor	345	39.07
other	302	34.20
Insurance		
No insurance	49	5.52
Social Security Insurance	373	42.00
National Health Insurance	400	45.05
other	66	7.43
Discharge status		
Recovery	814	91.56
Discharge against physician advise	33	3.71
Death	42	4.72

was performed using SPSS version 22 and STATA version 11.

Results

Descriptive results

A total of 889 burn patients were included in this study. Nearly 61.9% of the burnt patients were male, and 38.1% were female. More than two-third of the patients lived in rural areas (n = 596; 67.04%). Hot liquid or vapor was the main cause for burns hospitalization (n = 345; 39.1%). The majority of patients (n = 465; 52.3%) had a three-degree (total thickness) burn. The most common injured organs were the upper limb that included head, neck, shoulder, back, hand (45.4%), lower limb (38.2%), multiple organs or total body (11.4%), and head and neck (4.9%). Direct medical costs for patients varied from 0 to 18,550 US$, which was 1489 US$ on average. Patients' length of stay ranged from 1 to 47 days, which was 3.36 days on average.

In this study, 845 injured patients were insured, and 5.5% were uninsured. From all included patients, 814 patients (91.6%) were recovered and discharged, 42 patients (4.7%) were dead, and 33 patients (3.7%) were discharged against physician advice. The demographic and clinical and characteristics of burnt patients in **Table 1**.

Analytic results

The relation of demographic and clinical variables with direct medical cost and LOS which was tested using t-test, Anova, and Spearman correlation is shown in **Table 2**. As it shows, all demographic variables have a significant relationship with direct medical cost and LOS except age. Male patients significantly have more direct medical costs (p-value = 0.035) and LOS (p-value = 0.088) than the female ones. Rural patients have an average of 1239.46$ direct medical cost, which is significantly higher than the urban ones (p-value = 0.011), the same as le LOS (p-value = 0.003). Uninsured patients have more and LOS (3.95 days on average; p-value = 0.027) than insured patients. Their direct medical cost (1545.91 US$ on average) was higher than other patients, but it was not significant. Age has a positive and significant relationship with direct medical cost (coefficient = 0.138; p-value <0.001) and LOS (coefficient = 0.144; p-value <0.001).

Table 2. The relation between demographic variables and direct medical costs, length of stay, and burnt percentage

Demographic Variables	Categories	Direct Medical Cost Mean ± SD	*P*-value	LOS Mean ± SD	*P*-value
Gender	Male	1433.49 ± 1770.53	0.035	3.22 ± 3.9	0.088
	Female	1188.25 ± 1549.11		2.77 ± 3.32	
Urbanity	Rural	1239.46 ± 1584.57	0.011	2.73 ± 3.4	0.003
	City	1544.42 ± 1880.4		3.68 ± 4.3	
Insurance	Social security	1240.7 ± 1463.8	0.433	2.67 ± 2.95	0.027
	National health insurance	1412.1 ± 1765.48		3.3 ± 4.02	
	Other insurance (66)	1315.05 ± 1544.2		2.85 ± 2.84	
	Not insured (49)	1545.91 ± 2665.02		3.95 ± 6.29	
Age	Correlation coefficient	0.138	0.000	0.144	0.000

As results of the t-test, Anova, and Pearson showed there is a correlation between clinical and burn variables (**Table 3**). The patients who did not use an antibiotic (689 patients) had less direct medical cost (954.8 US$ on average) and less LOS (2.2 days on average), which were statistically significant (*p*-value = 0.000). Patients with previous have significantly higher direct medical costs (1475.85 US$; *p*-value = 0.025) and LOS (3.43 days; *p*-value = 0.004). The patients who were discharged when they were recovered relatively have lower direct medical costs (1237.9 US$ on average) and lower length of stay (2.81 days on average), which was statistically significant (*p*-value = 0.000). According to the burn grade, patients at the third grade have higher medical costs (1729 US$ on average) and LOS (3.84 days on average), which was statistically significant *(p*-value = 0.000). Multiple organs or total body burnt was responsible for most of the average direct medical costs of 2428.79 US$ and the average LOS of 5.32 days, which was significant statistically (*p*-value = 0.000). Most of patients were burnt by hot water or vapor (345 patients), but they had the lowest average medical costs (990.7 US$ on average), and LOS (2.33 days on average), which was statistically significant (*p*-value = 0.000). The burnt percentage also have a direct and significant relationship with medical costs (*p*-value = 0.492) and LOS (*p*-value = 0.431).

The regression model revealed that higher direct medical cost had relation with living in urban areas (coefficient = 0.138), being older (coefficient = 0.007), using antibiotic (coefficient = 0.881), death (coefficient = 0.254), higher burn degree (coefficient = 0.091 for second and coefficient = 0.214 for third degree), multiple total body burn (coefficient = 0.036), and higher purn percentage (coefficient = 0.476). As well, higher LOS was in relation with living in urban areas (coefficient = 0.481), using antibiotics (coefficient = 3.390), higher burn degree (coefficient = 0.063 for second and coefficient = 0.077 for third degree), multiple total body burn (coefficient = 0.135), and higher purn percentage (coefficient = 0.133) (**Table 4**).

Discussion

The purpose of this study was to determine the magnitude of the main factors contributing to the cost and length of stay of patients admitted for burns. In this study, we reported most of the patients were recovered from the burn (91.5%), and 42 patients (4.7%) died. This rate was reported at 6.9% in Rotterdam Burn Centre, Netherland, and 5.6% in the United States [22]. However, another study performed between January 2006 and December 2011 in the burn centers of Rotterdam and Beverwijk showed a lower rate of mortality among burn patients, which was 3.2 [23]. While it should be considered that mortality in burn patients highly depends on burn variables, it could be concluded that in most studies, the mortality rate is between 3 to 8 percent.

In our study, the mean LOS was 3.22 days, while in a study at the Washington University Burn Centre, it was 16.3 days [24]. The lower TBSA could explain this LOS in our study in comparison to American research. As we found,

Table 3. The relation between therapeutic and burnt variables and direct medical costs, length of stay, and burnt percentage

Therapeutic and burnt variables	Categories (Number)	Mean of Direct Medical Cost ± SD	*P*-value	Length of Stay Mean ± SD	*P*-value
Using antibiotic	Yes (200)	2666.8 ± 2557.86	0.000	5.9 ± 5.6	0.000
	No (689)	954.8 ± 1070.5		2.2 ± 2.4	
Previous disease	Yes (413)	1475.85 ± 1823.7	0.025	3.43 ± 4.257	0.004
	No (476)	1222.07 ± 1562.84		2.71 ± 3.13	
Discharge status	Recovered (814)	1237.9 ± 1465.5	0.000	2.81 ± 3.24	0.000
	Discharge against physician advise (33)	1298.39 ± 2388.82		3.39 ± 5.04	
	Death (42)	3350.26 ± 3267		7.38 ± 7.10	
Burnt level	First (57)	377.69 ± 291.8	0.000	1.17 ± 0.53	0.000
	Second (367)	995.4 ± 1139.12		2.32 ± 2.5	
	Third (465)	1729.8 ± 2022.5		3.84 ± 4.45	
Organ	Head and neck (44)	799.12 ± 976.54	0.000	2.25 ± 2.95	0.000
	Upper limb (404)	1256.55 ± 1718.44		2.8 ± 3.54	
	Lower limb (340)	1185.63 ± 1235.3		2.77 ± 2.94	
	Multiple total body (101)	2428.79 ± 2554.95		5.32 ± 5.7	
Burnt Factor	Fire (236)	1719.7 ± 2066.6	0.000	3.69 ± 4.4	0.000
	Hot water or vapor (345)	990.7 ± 1152.77		2.33 ± 2.61	
	Other factors (302)	1432.8 ± 1823.1		3.34 ± 4.08	
Burnt percentage	Correlation coefficient	0.492	0.000	0.431	0.000

Table 4. the regression model for factors related to direct medical cost and LOS

variables	Direct medical cost		LOS	
	Coef.	95% CI	Coef.	95% CI
Gender (male)	-0.080	-0.191; 0.029	-0.030	-0.469; 0.530
Urbanity (city)	-0.138	-0.251; -0.027	-0.481	-0.980; -0.019
Age	0.007	0.004; 0.010	0.008	-0.006; 0.022
Insurance (without insurance)	NI	NI		
Social security			-0.160	-1.119; 1.187
National health insurance			-0.097	-0.648; 0.883
Other insurance (66)			-0.186	-1.256; 1.121
Using antibiotic (No)	0.881	0.746; 1.015	3.390	2.791; 3.987
Previous disease (No)	0.001	-0.014; 0.017	0.038	-0.107; 0.030
Discharge status (Recovered)				
Discharge against physician advise	0.026	-0.130; 0.181	0.064	-0.304; 0.176
Death	0.254	0.102; 0.546	0.639	-0.964; 0.313
Burnt level (first)				
Second	0.091	0.096; 0.279	0.063	0.013; 0.195
Third	0.214	0.025; 0.403	0.177	0.016; 0.269
Organ (Head and neck)				
Upper limb	0.013	-0.254; 0.246	0.018	-0.246; 0.170
Lower limb	0.009	-0.309; 0.188	0.017	-0.244; 0.166
Multiple total body	0.036	0.020; 0.149	0.135	0.022; 0.117
Burnt Factor (Fire)				
Hot water or vapor	-0.122	-0.261; 0.018	-0.028	-0.113; -0.006
Other factors	-0.043	-0.094; 0.180	-0.009	-0.108; 0.086
Burnt percentage	0.476	0.019; 0.880	0.133	0.112; 0.154
Constant	6.106	5.755; 6.456	1.306	-0.179; 2.793
Prob>F	<0.0001		<0.0001	
R-squared	0.477		0.340	
Adj R-squared	0.470		0.330	

NI: Not inserted in the regression model.

LOS was affected by urbanity, insurance type, using antibiotic, having previous disease, discharge status, burnt level, organs, burnt percentage, and burnt factor. A study in Portugal in 2012 found that age and the percentage of burned body surface were associated with hospital stay [25]. Another study conducted in Pakistan in 2013 reported that the hospital stay was related to the age and sex of the patient, in addition to the cause of the burn, TBSA, body parts affected, and inhalation injury [26].

We found that the total costs of burn injuries were influenced by treatment components, which were influenced by patient demographics and clinical characteristics. Sex, severity, and cause influenced the main cost components of medication of antibiotic, previous disease, discharge status, burnt level, organ, and burnt factor. Direct medical costs for patients were 1489 US$ on average. These findings are inconsistent with published articles. In a study by Sahin et al., it was 15,250 US$ [27]. and other studies produced different total costs [28-30]. The results of our research show that Direct medical costs for patients are relatively low compared to studies in other countries. The cost of treatment and burn care is higher in high-income countries. In these countries, expensive advanced equipment and technologies are used to treat and care for patients. Also, the salaries of hospital staff in these countries are much higher than in middle- or low-income countries.

Determining the payer status is another critical component of cost studies. Every country has its own social insurance system. Hospital reimbursement for burns treatment is different from country to country. Even within one country, different insurance systems can reimburse different amounts for the total hospitalization of burn patients. In our study, uninsured patients have more direct medical cost and length of stay than insured patients. The burnt percentage also have a direct and significant relationship with medical costs and length of stay. Insurance organization have a direct and significant relationship with LOS.

The gender distributions of burns patients significantly differ between countries. Some studies have reported a high incidence in a female preponderance [31-33]. However, other studies have reported a male preponderance [34, 35]. Our data showed a clear male preponderance (550, 61.9%). Regarding patient gender, it was found to have no significant effect on LOS in our study and the study by Bartosch et al. [25], while Khaliq et al. found males to have a longer LOS [26].

We found a relationship between LOS and urbanity. Sixty-seven percent of patients included in this study were from the rural site and lowest socioeconomic category, which has been associated with worse health status and increased susceptibility to injury and hospitalization, lower standards of healthcare provision, greater complications, and increased costs. However, Previous studies indicate that populations with lower socioeconomic status who live in rural communities are more vulnerable to burn injuries [36-38].

Most patients who used antibiotics have a higher direct medical and high length of stay, which were statistically significant. These findings are consistent with the Ahuja study [39]. The cost of medications, especially antibiotics (53.6%), was proportionally high in the Ahachi study [40].

Most of the patients have no previous disease, which resulted in lower medical costs and length of stay, which was statistically significant. These results are also emphasized in the literature [41, 42]. Most of the patients were discharged when they were recovered, which relatively have lower direct medical costs and lower length of stay, which was statistically significant.

According to the burnt level, most patients were at the third level, which has higher medical costs and length of stay, which was statistically significant. This is similar to the finding from the study by AbdelWahab et al. [43]. The cost of burns treatment has been shown to correlate well with the severity of the injury [44]. Extensive injuries are more difficult to manage. Deep wounds, when managed conservatively, take longer to heal. When such wounds are managed surgically, procedures may sometimes need to be staged.

Patients were admitted with a combination of several burn organs, commonly involving an upper limb, lower limbs, and multiple organs, or

total body burnt was responsible for most of the average direct medical and the average length of stay, which was significant statistically. These results are also emphasized in the literature.

In our study, most patients were burnt by hot water or vapor, but they had the lowest average medical costs and length of stay, which was statistically significant. The most common cost of treating a burn was related to fire burns. This finding was in agreement with that reported by Eser and et al. [45].

The burnt percentage also has a direct and significant relationship with medical costs and length of stay. This is considerably higher for those with burns > 20-25% TBSA, exponentially increasing as the percentage TBSA increases [46].

Also, there was a direct relationship between multiple burns and the patients' length of stay and the patient's cost of hospitalization. This is similar to the finding from the study by Haikonen et al., but most severe injuries cost over EUR 400000 to treat [47] that The cost of the patients in our study was 2428.79 US$. Since, in this study, underlying diseases and the use of antibiotics and age conditions have also been considered in this specialized burns center.

The main limitation of this study was missing data in some variables, such as degree of burn, burning agents, and the incompleteness of some variables. The data of these patients were excluded from the study.

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Disclosure of conflict of interest

None.

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References

[1] Sengoelge M, El-Khatib Z and Laflamme L. The global burden of child burn injuries in light of country level economic development and income inequality. Prev Med Rep 2017; 6: 115-120.

[2] Haikonen K, Lillsunde PM, Lunetta P and Kokki E. Economic burden of fire-related deaths in Finland, 2000-2010: Indirect costs using a human capital approach. Burns 2016; 42: 56-62.

[3] Ali S, Hamiz-ul-Fawwad S, Al-Ibran E, Ahmed G, Saleem A, Mustafa D and Hussain M. Clinical and demographic features of burn injuries in Karachi: a six-year experience at the burns centre, civil hospital, Karachi. Ann Burns Fire Disasters 2016; 29: 4.

[4] Karimi H, Motevalian SA, Momeni M and Ghadarjani M. Financial burden of burn injuries in iran: a report from the burn registry program. Ann Burns Fire Disasters 2015; 28: 310-314.

[5] Latifi NA, Karimi H, Motevalian SA and Momeni M. Economical burden of burn injuries in a developing country. J Burn Care Res 2017; 38: e900-e905.

[6] Hop MJ, Wijnen BF, Nieuwenhuis MK, Dokter J, Middelkoop E, Polinder S and van Baar ME. Economic burden of burn injuries in the Netherlands: a 3 months follow-up study. Injury 2016; 47: 203-210.

[7] Jin Y, Ye PP, Deng X, Yang L, Wang Y, Er YL, Wang W, Gao X, Ji CR and Duan LL. Burn-related burden among Chinese population from 1990 to 2013. Zhonghua Liu Xing Bing Xue Za Zhi 2017; 38: 767-771.

[8] Zuraik C, Sampalis J and Brierre A. The economic and social burden of traumatic injuries: evidence from a trauma hospital in Port-au-Prince, Haiti. World J Surg 2018; 42: 1639-1646.

[9] World Health Organization. A WHO plan for burn prevention and care. 2008.

[10] Taylor SL, Sen S, Greenhalgh DG, Lawless M, Curri T and Palmieri TL. Real-time prediction for burn length of stay via median residual hospital length of stay methodology. J Burn Care Res 2016; 37: e476-e482.

[11] Zuo KJ, Medina A and Tredget EE. Important developments in burn care. Plast Reconstr Surg Glob Open 2017; 139: 120e-138e.

[12] Ford CG, Manegold EM, Randall CL, Aballay AM and Duncan CL. Assessing the feasibility of implementing low-cost virtual reality therapy

during routine burn care. Burns 2018; 44: 886-895.
[13] Chen YY, Chen IH, Chen CS and Sun SM. Incidence and mortality of healthcare-associated infections in hospitalized patients with moderate to severe burns. J Crit Care 2019; 54: 185-190.
[14] Lundy JB, Chung KK, Pamplin JC, Ainsworth CR, Jeng JC and Friedman BC. Update on severe burn management for the intensivist. J Intensive Care Med 2016; 31: 499-510.
[15] Klein MB, Hollingworth W, Rivara FP, Kramer CB, Askay SW, Heimbach DM and Gibran NS. Hospital costs associated with pediatric burn injury. J Burn Care Res 2008; 29: 632-637.
[16] Porter ME. What is value in health care. N Engl J Med 2010; 363: 2477-2481.
[17] Borghans I, Heijink R, Kool T, Lagoe RJ and Westert GP. Benchmarking and reducing length of stay in Dutch hospitals. BMC Health Serv Res 2008; 8: 220.
[18] Dolp R, Rehou S, McCann MR and Jeschke MG. Contributors to the length-of-stay trajectory in burn-injured patients. Burns 2018; 44: 2011-2017.
[19] Horowitz JA, Jain A, Puvanesarajah V, Qureshi R and Hassanzadeh H. Risk factors, additional length of stay, and cost associated with postoperative ileus following anterior lumbar interbody fusion in elderly patients. World Neurosurg 2018; 115: e185-e189.
[20] Neifert SN, Lamb CD, Gal JS, Martini ML, Nistal DA, Rothrock RJ, Gilligan J, Maron SZ and Caridi JM. Later surgical start time is associated with longer length of stay and higher cost in cervical spine surgery. Spine (Phila Pa 1976) 2020; 45: 1171-1177.
[21] Rezaei S and Kazemi Karyani A. Factors associated with length of stay and hospital charges among pediatric burn injury in Kermanshah, West of Iran. Int J Pediatrics 2015; 3: 403-409.
[22] Bloemsma GC, Dokter J, Boxma H and Oen IM. Mortality and causes of death in a burn centre. Burns 2008; 34: 1103-1107.
[23] Dokter J, Felix M, Krijnen P, Vloemans JF, Baar ME, Tuinebreijer WE and Breederveld RS. Mortality and causes of death of Dutch burn patients during the period 2006-2011. Burns 2015; 41: 235-240.
[24] Lundgren RS, Kramer CB, Rivara FP, Wang J, Heimbach DM, Gibran NS and Klein MB. Influence of comorbidities and age on outcome following burn injury in older adults. J Burn Care Res 2009; 30: 307-314.
[25] Bartosch I, Bartosch C, Egipto P and Silva Á. Factors associated with mortality and length of stay in the Oporto burn unit (2006-2009). Burns 2013; 39: 477-482.
[26] Khaliq MF, Noorani MM, Siddiqui UA, Al Ibran E and Rao MH. Factors associated with duration of hospitalization and outcome in burns patients: a cross sectional study from Government Tertiary Care Hospital in Karachi, Pakistan. Burns 2013; 39: 150-154.
[27] Sahin I, Ozturk S, Alhan D, Acikel C and Isik S. Cost analysis of acute burn patients treated in a burn centre: the Gulhane experience. Ann Burns Fire Disasters 2011; 24: 9.
[28] Anami EH, Zampar EF, Tanita MT, Cardoso LT, Matsuo T and Grion CMC. Treatment costs of burn victims in a university hospital. Burns 2017; 43: 350-356.
[29] Onarheim H, Jensen SA, Rosenberg BE and Guttormsen AB. The epidemiology of patients with burn injuries admitted to Norwegian hospitals in 2007. Burns 2009; 35: 1142-1146.
[30] Hemington-Gorse SJ, Potokar TS, Drew PJ and Dickson WA. Burn care costing: the Welsh experience. Burns 2009; 35: 378-382.
[31] Tekin R, Yolbas I, Dal T, Okur MH and Selçuk CT. The evaluation of patients with burns during fifteen years period. Clin Ter 2013; 164: 385-389.
[32] Padovese V, De Martino R, Eshan MA, Racalbuto V and Oryakhail MA. Epidemiology and outcome of burns in Esteqlal Hospital of Kabul, Afghanistan. Burns 2010; 36: 1101-1106.
[33] Haik J, Liran A, Tessone A, Givon A, Orenstein A and Peleg K. Burns in Israel: demographic, etiologic and clinical trends, 1997-2003. Isr Med Assoc J 2007; 9: 659-662.
[34] Kobayashi K, Ikeda H, Higuchi R, Nozaki M, Yamamoto Y, Urabe M, Shimazaki S, Sugamata A, Aikawa N and Ninomiya N. Epidemiological and outcome characteristics of major burns in Tokyo. Burns 2005; 31: S3-S11.
[35] Iqbal T, Saaiq M and Ali Z. Epidemiology and outcome of burns: early experience at the country's first national burns centre. Burns 2013; 39: 358-362.
[36] Mashreky SR, Rahman A, Svanström L, Khan T and Rahman F. Burn mortality in Bangladesh: findings of national health and injury survey. Injury 2011; 42: 507-510.
[37] Peck MD. Epidemiology of burns throughout the world. part i: distribution and risk factors. Burns 2011; 37: 1087-1100.
[38] Bailey M, Sagiraju H, Mashreky S and Alamgir H. Epidemiology and outcomes of burn injuries at a tertiary burn care center in Bangladesh. Burns 2019; 45: 957-963.
[39] Ahuja RB and Goswami P. Cost of providing inpatient burn care in a tertiary, teaching, hospital of North India. Burns 2013; 39: 558-564.
[40] Ahachi C, Fadeyibi I, Abikoye F, Chira M, Ugburo A and Ademiluyi S. The direct hospitalization cost of care for acute burns in Lagos, Nigeria:

a one-year prospective study. Ann Burns Fire Disasters 2011; 24: 94.
[41] Thombs BD, Singh VA, Halonen J, Diallo A and Milner SM. The effects of preexisting medical comorbidities on mortality and length of hospital stay in acute burn injury: evidence from a national sample of 31,338 adult patients. Ann surg 2007; 245: 629.
[42] Bagheri M, Fuchs PC, Lefering R, Grigutsch D, Busche MN, Niederstätter I, The German Burn Registry, Schiefer JL. Effect of comorbidities on clinical outcome of patients with burn injury - an analysis of the German burn registry. Burns 2021; 47: 1053-1058.
[43] AbdelWahab M, Sadaka M, Elbana E and Hendy A. Evaluation of prognostic factors affecting lenght of stay in hospital and mortality rates in acute burn patients. Ann Burns Fire Disasters 2018; 31: 83.
[44] Wheeler JR, Van Harrison R, Wolfe RA and Payne BC. The effects of burn severity and institutional differences on the costs of care. Med Care 1983; 1192-1203.
[45] Eser T, Kavalci C, Aydogan C and Kayipmaz AE. Epidemiological and cost analysis of burn injuries admitted to the emergency department of a tertiary burn center. Springerplus 2016; 5: 1411.
[46] Ahn CS and Maitz PK. The true cost of burn. Burns 2012; 38: 967-974.
[47] Haikonen K, Lillsunde PM and Vuola J. Inpatient costs of fire-related injuries in Finland. Burns 2014; 40: 1754-1760.