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Epidemiological characteristics of burn injuries in Iraq: A burn hospital-based study

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ABSTRACT

This study was conducted to determine the epidemiological and clinical characteristics of burn injuries, estimate the case fatality rate for burn patients, and determine the main determinants of the associated death among burn patients who were admitted to Baghdad Burn Hospital, Medical City Teaching Hospitals, Baghdad, Iraq during 2015. This study involved a retrospective review of medical records of all burn patients who were admitted to Baghdad Burn Hospital in 2015. Data were collected using a special form and included information on demographic characteristics and burn characteristics and outcomes. A total of 676 patients with burn were included in this study, who constituted 75% of admitted patients. The remaining was admitted for treatment of old scars. About one third of patients (37.0%) aged 21–30 years, 67.1% were males, 34.8% were military personnel, and 60.7% of the patients had primary school education. About 71.6% of patients were burned by flame and 23.4% were burned by hot fluid. Half of patients had a second degree burns. Almost half of patients had 11–20% of their body surface area affected. About 13% of patients died, mainly due to multiple organs failure (53.3%), septicemia (44.4%), and shock (2.2%). In conclusion, young adults and children, males, and low educated patients represent the majority of admitted burn cases in Iraq. Flame and scalds were the most important causes of burn. More than one tenth of patients died mostly due to septicemia and multi-organ failure.

1. Introduction

Burns are among the commonest types of trauma worldwide and burn injury is one of the top leading causes of disease burden in many countries of the world [1]. According to the Global Burden of Disease Study 2013, fire and heat resulted in 35 million injuries, 2.9 million hospitalizations and 238,000 deaths [2]. About 90% of burns take place in low to middle income countries where important infrastructures that are need to prevent or reduce the severity of burns are lacking [3,4]. This had been attributed partly to overcrowding and unsafe cooking practices [5].

Burn death rates have been decreasing, mainly in high-income countries. Children from low- and middle-income countries have higher deaths rates from burns by seven times than those from high-income countries [5]. Mortality rates differ by gender, age and region [6]. The death rate due to burns is disproportionately higher for the elderly in comparison with the general population [7–9].

The vast majority of burn patients require medical attention and many of them suffer from severe morbidity or even death.

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Many factors including low socioeconomic status, poor life style, and social factors might contribute to high occurrence of burns [5]. Lack of facilities in hospitals and shortage of trained health professionals to deal with burn injuries have been shown to increase the morbidity and mortality [10].

In Iraq, burn injuries are the second cause for visiting emergency room after gun fire according to Iraq Injury Surveillance System (IISS), 2008. Still, there are limited studies tackling the epidemiology of burn particularly the socio-demographic risk factors. According to IISS, there were 6149 burn cases in Iraq during 2015. Most of the burn incidents occurred in domestic settings because of household appliances, inflammable agents at home, and clothing burns. The majority of burn injuries among children occurred at home as an accident. Thus, most of these injuries are preventable [5]. This study was conducted to determine the epidemiological and clinical characteristics of burn injuries, estimate the case fatality rate for burn patients, and identify the main determinants of death among burn patients who were admitted to Baghdad Burn Hospital, Medical City Teaching Hospitals, Baghdad, Iraq during 2015.

2. Methods

2.1. Study design

This study involved a retrospective review of medical records of all burn patients who were admitted to Baghdad Burn Hospital in 2015. Baghdad Burn Hospital is the biggest specialized hospital in Iraq for treatment of burn cases with 33 beds. It is part of the Medical City Complex that involved five other hospitals. This hospital (besides four burns wards in four public hospitals) serves the population of Baghdad, the Capital of Iraq with 8.4 million inhabitants that represent 21% of total Iraq population. The current practice of treating burn wounds involved starting topical and systemic antibiotics usually after day 3. Wound excision is usually practiced after 5–6 day of the incident, and the diagnosis of infection is mainly made on clinical basis. Wound swabs and blood culture are sometimes requested.

Official approval was obtained from the hospital administration prior to the data collection. Patients' medical records were obtained from the Department of Statistics in the hospital. All burn patients with different types and degrees of burn injuries were included in the study. Patients who were treated in the emergency department for minor superficial burns and those who were admitted for surgical treatment of old scars were excluded. Patients' information was kept anonymous.

2.2. Data collection

Data were collected using a special form that was designed by the researchers after thorough review of literature. It included information about demographic data, the etiology, type, and location of burn and percentage of body surface area affected based on Wallace rule of nines. The demographic data included age, sex, occupation, educational level. The causes of burn were classified into flame, hot liquid, electrical shock, oil, chemicals and inhalation [11,12].

The degree of burn was classified into first, second, third and mixed [13–15]. The outcome of the patients was classified into: discharge well, death, discharge on his responsibility, or referred to another hospital.

2.3. Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS IBM, version 20). Lethal Area fifty percent (LA50) (which is defined as the burn size lethal to 50% of patients) was calculated. It is an index that reflects quality of medical burn care [16]. Data were described using percentages. Chi-square test was used to test association between categorical variables. Binary logistic regression was used to determine the factors that are associated with mortality among burn patients. A p-value of less than 0.05 was considered statistically significant.

3. Results

3.1. Patients' characteristics

The total number of patients admitted to Baghdad Burn Hospital during 2015 was 900 cases. Of those, 676 (75.1%) were burn cases. The remaining 25% were admitted for surgical treatment of old burn scars. About one third of patients (37.0%) aged 21–30 years, 67.1% were males, 34.8% were military personnel, and 60.7% of the patients had primary school education (Table 1).

3.2. Causes and characteristics of burn

Table 2 shows the distribution of burn cases according to burn characteristics. About 72% of patients were burned by flame

Table 1 – The socio-demographic characteristics of 676 patients with burn.

Variable	n	%
Age group (years)		
≤10	180	26.6
11–20	80	11.8
21–30	250	37.0
31–40	110	16.3
41–50	38	5.6
>50	18	2.7
Gender		
Female	223	32.9
Male	453	67.1
Occupation		
Military	235	34.8
Child	141	20.9
Housewife	125	18.5
Unemployed	116	17.2
Employed	43	6.4
Student	16	2.4
Educational level		
Illiterate	127	18.8
Primary school	410	60.7
Secondary school	106	15.7
High school	19	2.8
College	14	2.1

Table 2 – Distribution of 676 patients with burn according to burn characteristics.

Variable	n	%
Cause of burn		
Flame	484	71.6
Hot fluid	158	23.4
Electrical shock	17	2.5
Oil	12	1.8
Chemicals	3	0.5
Inhalation	2	0.3
Degree of burn		
Second degree	339	50.1
Third degree	249	36.8
Mixed	88	13.0
Percentage of body surface area (BSA)		
≤10	105	15.5
11–20	344	50.9
21–30	86	12.7
31–40	50	7.4
41–50	27	4.0
>50	64	9.5
Place of burn		
Home	391	57.9
Street	210	31.1
Work	75	11.1

and 23.4% were burned by hot fluid. Half of patients had a second degree burns. Almost half of patients had 11–20% of their body surface area affected. In 54.9% of patients, burn occurred in the house. Two thirds (66%) of the burn injuries occurred during winter and spring seasons.

3.3. *Burn outcomes*

The LA50, BAUX 50 and the Point of Futility were 45, 102 and 133, respectively. About three quarter (76.3%) of patients discharged well, 13.3% died, 8.3% left the hospital on their own responsibility and 2.1% were referred to another hospital. The main causes of death were multiple organs failure (53.3%), septicemia (44.4%), and shock (2.2%). The distribution of deaths according to socio-demographic characteristics is shown in Table 3. Death rates were the highest among females, age group of 31–40 years, and housewives. Patients with complications had the highest death rate of 84.7%. The death rate increased significantly with increased percentage of body surface area affected by burn. Patients with second and mixed degrees of burn had significantly higher proportion of death. The death rate differed significantly according to the place of burn being highest in burns occurred at homes. Burns occurred in winter or spring were also associated with higher death rate compared to those occurred in other seasons.

The multivariate analysis of factors associated with death among burn patients showed the following significant factors: female gender (OR=4.5; 95% confidence interval (CI): 2.8–7.3), age>30years (OR=1.2; 95% CI: 1.1–1.4), >30% of body surface area affected (OR=2.1; 95% CI: 1.4–3.0), unemployed (relatives to employed) (OR=5.1; 95% CI: 2.3–7.7), and third or mixed degree burn (OR=7.3; 95% CI: 4.1–9.3).

Table 3 – The death rate among patients with burns according to socio-demographic and burn characteristics.

Variables	Death		Alive		Total	P-value
	n	%	N	%		
Age groups						0.002
1–10	14	7.8	166	92.2	180	
11–20	9	11.3	71	88.8	80	
21–30	36	14.4	214	85.6	250	
31–40	23	20.9	87	79.1	110	
>40	8	14.3	48	85.7	56	
Sex						0.001
Female	57	25.6	166	74.4	223	
Male	33	7.3	420	92.7	453	
Occupation						
Child & student	15	9.6	142	90.5	157	0.001
Employed	1	2.3	42	97.7	43	
Housewife	44	35.2	81	64.8	125	
Military	14	6.0	221	94.1	235	
Not employed	16	13.8	100	86.2	116	
Education						0.293
Illiterate	11	8.7	116	91.3	127	
Primary school	58	14.1	352	85.9	410	
Secondary school or higher	21	15.1	118	84.9	139	
Complication						0.001
Yes	50	84.7	9.0	15.3	59	
No	40	6.5	577.0	93.5	617	
Degree of burn						0.001
Second degree	3	0.9	336.0	99.1	339	
Third degree	64	25.7	185.0	74.3	249	
Mixed	23	26.1	65.0	73.9	88	
Percentage BSA						0.001
≤30	4	0.7	531.0	99.3	535	
31–40	12	24.0	38.0	76.0	50	
41–50	17	63.0	10.0	37.0	27	
>50	57	89.1	7.0	10.9	64	
Place of burn						0.001
Home	69	17.6	322.0	82.4	391	
Street	14	6.7	196.0	93.3	210	
Work	7	9.3	68.0	90.7	75	
Season						0.001
Winter	42	18.6	184.0	81.4	226	
Spring	39	17.7	181.0	82.3	220	
Summer	7	5.9	111.0	94.1	118	
Autumn	2	1.8	110.0	98.2	112	

4. Discussion

Burn injury is a major public health problem in terms of morbidity, disability, mortality, and financial burden in many developing countries. Although burn injuries occurred in all age groups, about one third of the cases occurred among young adults (aged 21–30 years). This finding is explained by that about one third of patients were military personnel who contracted burn in the battle field of the current war in Iraq by means of improvised

explosive devices, or other munitions besides accidental injuries. Children aged less than 10 years was the second most affected age group. In some countries like Turkey, about one half of burn cases occurred among children aged less than six years [17]. In another study in Japan, about 38% of burn cases were children, 2.5% were elderly patients over 60 years [18].

In agreement with other studies, house was the most common place for burn injury. One study showed that the majority of burn incidents occurred at home and more precisely in the kitchen [19]. The proportion of burn occurred in the street was also high and this is mostly contracted during explosions plaguing Iraq, particularly in the capital.

Male patients were more predominant than females and this might be due to high admission of military personnel as a result of current war. Studies conducted in other countries showed varied results [20]. In a study in rural areas of India, 80% of all burn cases were females [21]. In Iran, 99% of self-burning cases were females [22]. Another study showed that majority of burn cases was males [23].

In the current study, flame was the most common cause of burns, followed by scalds. The overwhelming majority of Iraqi families are using cooking gas rather than kerosene stoves. Scalding water household appliances, inflammable agents at home, and clothing burns are the common mechanism. The finding of this study is consistent with the Kobayashi study, 2005 in Japan that also showed flame and scalds burn constituted 46% and 32% of burn cases, respectively [18]. One study showed that flame burns and scalds were common in adults and children, respectively [18]. In 20 years' data in Brisbane, 56% of burns were caused by flame, 26% by scalds, and 2% by electricity [23].

About one third of the admitted cases in the current study occurred during winter. Using different heating systems particularly the ones using direct flame for warming the houses and the proximity of the children and other family members to flame might explain this finding [8].

About two thirds of the burn patients had burn affecting less than 20% of total body surface area (TBSA) and less than on sixth had more than 40% TBSA burn. Data from Brisbane study showed almost similar findings where 80% of patients had 20% TBSA burn, and only 3% patients had 41–60% TBSA burns. [23] The proportion of those having extensive burn in Iraqi patients is higher than that reported in other studies, again probably reflecting the explosions and burns in the battle.

Burn injuries produced a significant mortality. The case fatality rate in the current study was 13.5%. The reviewed studies showed different case fatality rates ranging between 3.1% to 18.7% [18,21,22]. Different level of care, infection control practices and efficient resuscitation may play a role behind the differences in case fatality rate. Multiple organ failure, sepsis and shock were the most important causes of death among Iraqi burn patients. Pulmonary Edema and pneumonia were among the important causes of death in other studies [19,20]. Unemployment was among the risk factors of death of burn patients. In certain occasions, the patients are requested to buy certain antibiotics and other supplies from the private pharmacies.

In conclusion, young adults and children, males, and low educated patients represent the majority of admitted burn cases in Iraq. Flame and scalds were the most important causes of burn. About one sixth of the total cases end with death mostly due to septicemia and multi-organ failure. Population education programs and school health programs should emphasize burn-related safety practices and immediate first-aid management of burns before arrival to hospital. Strengthening infection control practices in the hospital may help decreasing the hospital deaths. More in-depth studies are needed to cover other epidemiological and social factors like self-inflicted burns.

The current study has a number of limitations; first the causes of death were based on clinical findings using the notes of the treating surgeon on the patients' files to consider the most probable cause of death as the death certificates are not issued by the hospital, rather by the coroner office in the capital. Second, data on the length of stay in the hospital and the number of patients who had surgeries were not collected.

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