

# THE EPIDEMIOLOGY OF BURNS IN BASRA, IRAQ

## ÉPIDÉMIOLOGIE DES BRÛLURES À BASSORAH, IRAK

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**SUMMARY.** Burns are a major cause of morbidity and mortality worldwide and an important public health problem in Iraq. The current study was undertaken to describe epidemiological characteristics of hospitalized burn patients and investigate in-hospital mortality. The study was undertaken at the Al-Fayhaa Burn Centre in Basra City through analyzing hospital records of patients admitted to the centre for a new burn injury between January and December 2016. Data were extracted from all accessible files, entered into Epidata and analyzed in Stata. Hospital records of 367 patients with an age range of 1 month to 77 years and a male to female ratio of 1:2 were analyzed. One third of admissions were children aged 0 to 5 years: the most common mechanisms of injury were flame (51%) and scalds (41.7%). Total body surface area (TBSA) burnt ranged from less than 1% to 100%, with a median of 30.0% (IQR 18.0, 45.0). Length of hospital stay ranged from 0 to 5 months, with a median of 8 days (IQR 4, 12.5). In-hospital mortality was 22% and the independent factors for death were TBSA and suicidal burns. Burns remain a major public health problem in Basra, especially in children, and require sustained multi-disciplinary action for their prevention and management. Improving hospital records and computerizing them is essential for better assessment and follow-up of burn care practices.

**Keywords:** epidemiology, burn, Basra, Iraq

**RÉSUMÉ.** Les brûlures sont une cause majeure de morbidité et de mortalité dans le monde, et un important problème de santé publique en Irak. Cette étude a pour but de décrire les caractéristiques épidémiologique et la mortalité des patients hospitalisés pour brûlure. Elle a été conduite à partir des dossiers des patients hospitalisés en 2016 dans le CTB de l'hôpital Al Fayhaa à Bassorah. Les données recueillies ont été entrée dans Epidata et analysées par Stata. Les dossiers de 367 patients, âgés de 1 mois à 77 ans (1,2 hommes/1 femme) ont été étudiés. Un tiers des admissions concernaient des enfants de moins de 5 ans. Un flamme était en cause dans 51% des cas, un liquide dans 41,7%. La surface atteinte était de 1 à 100% (médiane 30%, intervalle interquartile 4-12,5). La mortalité hospitalière était de 22%, les facteurs de risque indépendants étant la surface et le suicide. Les brûlures, en particulier chez l'enfant, demeurent un problème majeur de santé publique à Bassorah. Elles nécessitent des actions pluridisciplinaires, préventives comme curatives. L'amélioration et l'informatisation des dossiers médicaux est essentielle à l'évaluation et l'amélioration des soins.

**Mots-clés:** épidémiologie, brûlure, Bassorah, Irak

### Introduction

Burns are a major cause of morbidity and mortality worldwide. Burn injuries are ranked fourth among acute injuries in the world.<sup>1</sup> They are one of the major causes of injury in the Eastern Mediterranean region, accounting for a considerable proportion of trauma-related presentations and admissions to emergency departments.<sup>2</sup> The WHO estimates that overall incidence of fire-related injuries is about 110 per 100,000 population globally,<sup>3</sup> and that over 300,000 people die every year from fire-related injuries.<sup>4</sup> Among non-fatal injuries, the management and care of burn patients is one of the most expensive, yet these injuries are more likely to affect poor and vulnerable people who are unable to afford treatment that is usually long-term.<sup>5</sup> Moreover, burns could be associated with disability, disfigurement and psychological outcomes, and considered as a social stigma, especially among females. Many burn victims

suffer from post-traumatic stress disorder.<sup>6</sup>

Mortality from burn injuries is 11 times higher in developing countries than in developed ones.<sup>7</sup> The pattern of injury by burn differs in high income countries (HICs) and low income countries (LICs), and the mortality rate above the age of 15 in HICs is twice as high in males than in females, while the reverse is true in LICs.<sup>7</sup> Burns are a common form of injury in Iraq. According to the latest report from WHO, there were about 6000 deaths in Iraq in 2015 from fire-related causes,<sup>8</sup> and 18,000 disability-related burns.<sup>9</sup> Studies conducted in the north of Iraq show that mortality among in-patient burns is approaching 30% and that females outnumber males.<sup>10,11,12</sup> The most common mechanism of injury in paediatric patients is reported to be scald,<sup>12</sup> while in adults it is flame.<sup>11,13</sup> Another study reporting on a 45-day experience of the Italian Red Cross in Baghdad shows similar results.<sup>14</sup> A recent community-based study carried out in Baghdad shows that burn incidence has increased in the

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post-invasion period, from 39 to about 117 per 100,000 persons, which could be related to an increasing number of cases of direct violence-related burns.<sup>13</sup> To our knowledge, and having searched local and international literature, there is currently no study on burns in Basra, Iraq. Acknowledging the problem in the Basra Governorate is important. The focus of this study is to describe epidemiology and outcome of patients admitted to the Al-Fayhaa Burn Centre in Basra City throughout 2016. Our aim is to give an insight into the extent of the problem in order to provide recommendations for prevention.

### Materials & Methods

The study was undertaken at the Al-Fayhaa Burn Centre, attached to the Al-Fayhaa General Hospital, which is the only centre in Basra City, and covers a population of about 3 million. In addition, the centre receives referral admissions from neighbouring cities including Amara, Nassirya and Samawa. The Burn Centre has 4 wards: two for adults (male & female), one for pediatrics, and one for critical cases (those with TBSA burnt of 60% and above); each ward has 6 beds, totalling 24 beds in the whole centre. The centre is run by two general surgeons and a group of interns and nurses. On admission, TBSA is calculated using the Lund-Browder chart; inhalation injury is diagnosed clinically. Fluid resuscitation, according to the Parkland formula, is initiated to maintain hemodynamic stability in the patients. Prophylactic antibiotic therapy is initiated and then modified according to the results of an antibiotic susceptibility test. Primarily, topical antimicrobial silver sulphadiazine is applied to the skin of the burn patient after the burnt area is cleaned. Subsequently the patients are followed up with daily dressing procedures, including skin debridement and dressing with antibiotic impregnated Vaseline gauze, in addition to specific super adhesive sterile pack (Biatin). Paracetamol and IV opioids are used as analgesic medications. Skin graft surgery is performed on patients who suffer from deep second and third degree burns. The study was approved by both the local health directorate and the Centre for Research and Development in Basra City. This study was a retrospective analysis of hospital records of all patients admitted to the Al-Fayhaa Burn Centre from 1<sup>st</sup> January to 30<sup>th</sup> December 2016. Outpatients and patients admitted for skin graft surgery were excluded. Admission to the burn centre follows the American Burns Association criteria, which are: TBSA burn of more than 15% for adults and 10% for pediatrics; burns involving the face or genitalia and burns associated with inhalational injury, in addition to electrical and chemical burns.<sup>15</sup> Data were collected from the patients' files at the Department of Statistics and entered on a daily basis during the 2-month period, using Epidata version 3.1. Data of 367 patients were transcribed. The data extracted included patient demographics, age, gender, residency, length of hospital stay, mechanism of injury, outcome, burn sites and total body surface area (TBSA). Descriptive and inferential statistical analysis was done using Stata version 13.0. Categorical variables were compared using chi-squared test; TBSA was not normally distributed; therefore, it was analyzed using non-parametric methods. P values of 0.05 and less were considered statistically significant.

### Results

There were three hundred and sixty seven records of pa-

**Table I** - Characteristics of burn patients admitted in 2016

Characteristics	Number	Percentage
Gender		
Male	201	54.8
Female	166	45.2
Residence		
Basra City	141	38.3
Outside Basra City	216	58.7
Other provinces	11	3.0
Age		
0 to 5 years	122	33.2
6 to 14 years	48	13.1
15 to 24 years	93	25.3
25 to 59 years	94	25.6
60 and over	10	2.7
Season of burn		
Winter	73	19.9
Spring	83	22.6
Summer	104	28.3
Autumn	107	29.2
Mechanism of burn		
Flame	181	51.0
Scald	148	41.7
Other	26	7.3
Outcome		
Recovery	230	62.8
Discharge against advice	52	14.2
Transferred to another hospital	2	0.6
Death in hospital	82	22.4
Intent		
Unintentional	242	82.0
Intentional	53	18.0
Total body surface area burnt (%)	Median: 30 IQR: 18.0, 45.0	
Length of hospital stay (days)	Median: 8 IQR: 4.0, 12.5	

tients admitted during 2016 for a new burn injury. *Table I* describes the characteristics of the study sample. Overall, there were more males than females (54.8% vs. 45.2%) with a male to female ratio of 1:2. The age of patients ranged from 1 month to 77 years, with a median age of 16 years (IQR 3.5, 31). One third of admissions were children aged 0 to 5 years, and 46.3% were children aged 0-14 years.

The most common mechanisms of injury were flame (51%) and scalds (41.7%). Fewer burn admissions occurred in spring than in other seasons. TBSA burnt ranged from less than 1% to 100%, with a median of 30.0% (IQR 18.0, 45.0). Length of hospital stay ranged from 0 to 5 months, with a median of 8 days (IQR 4, 12.5). In terms of outcome, 22.4% of the patients died in hospital.

#### *Mechanism of injury*

Overall, the most common mechanism of burns was flame, followed by scalds. Less common causes were electrical burns (4.5%), chemical burns (1.7%) and explosions (1.1%). In all patients, flame injuries were more common in females than males (54.4% vs. 48.2%) but this was not statistically significant ( $p=0.06$ ). In children aged 14 years and under, in both sexes

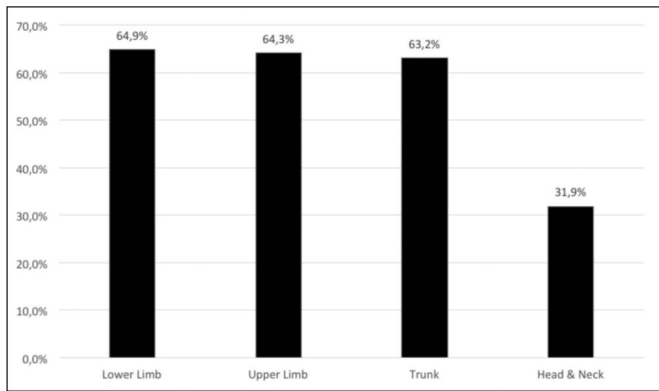


Fig. 1 - Site of burn injury.

the majority of burn injuries were scalds followed by flame burns, but there was no significant difference between males and females as far as children were concerned. However, when children (0-14 years) and adults (15 and over) were compared, there was a significant difference regarding cause of burn; while 73% of burns in children were caused by scald and 23.4% by flame, in adults this was reversed, with 75.5% of burns caused by flame and only 13.8% caused by scalds (P<0.001).

Site of burns

Most burns involved multiple body parts. The most common sites of injury were the lower and upper limbs, with 64.9% and 64.3% respectively, followed by the trunk with 63.2%. The head and neck were least affected, in 31.9% of patients (Fig. 1).

Burn size

Total body surface area (TBSA) burnt was not normally distributed, and ranged from less than 1% to 100% with a median of 30.0% (IQR 18.0, 45.0). Around 52% of patients had a burn size of 0-30% TBSA and 7.6% of patients had a TBSA of over 90%. Distribution of TBSA is shown in Fig. 2. Table II analyses median TBSA by different patient characteristics. There were significant associations between TBSA burnt and

Table II - Total body surface area burnt by gender, age group, type of burn and in-hospital mortality

	TBSA Median (IQR)	P value
Gender		
Male	30.0 (18.0, 50.0)	Z=-1.3, p=0.2*
Female	34.0 (17.0, 60.0)	
Age		
0 to 14 years	25.0 (16.0, 40.0)	$\chi^2=32.0, 3 \text{ df}, P<0.001^{**}$
15 to 24	41.0 (25.0, 70.0)	
25 to 59	35.0 (20.0, 70.0)	
60 and over	25.0 (14.0, 61.0)	
Cause of burn		
Flame	50.0 (27.0, 75.0)	$\chi^2=80.8, 2 \text{ df}, p<0.001^{**}$
Scald	22.0 (15.0, 31.0)	
Other	29.0 (15.0, 48.0)	
In-hospital mortality		
Survived	25.0 (15.0, 38.0)	Z=-12.3, <0.001*
Died	76.0 (60.0, 95.0)	

\*Mann-Whitney U test  
\*\*Kruskal-Wallis test for equality of populations

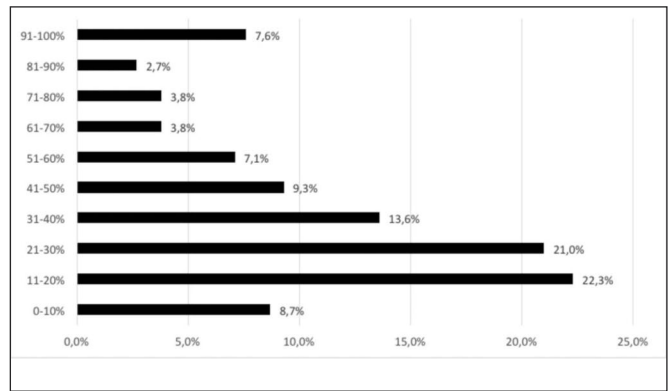


Fig. 2 - Burn size by 10 centiels of TBSA burnt.

age group, cause of burns and death. However, there was no significant association between TBSA and gender.

In-hospital mortality

Out of the 367 patients, 82 died in hospital, giving an in-hospital mortality of 22.3%. In-hospital mortality by quartiles of TBSA burnt is shown in Table III. In-hospital mortality in-

Table III - In-hospital mortality by total body surface area burnt

TBSA burnt	Number of patients	Number (%) died	P value
0 to 25%	158	1 (0.6)	$\chi^2 =196.8, \text{ df } 3, p<0.001$
25.1 to 50%	117	14 (12.0)	
50.1 to 75%	45	26 (57.8)	
75.1% and over	48	41 (87.3)	
Total	367	82 (22.3)	

Table IV - Crude odds ratios of mortality by various characteristics

Characteristics	Number of survivors	Number died	Odds ratio (95% CI)
Age			
0 to 14 years	152	18	Reference group
15 to 24 years	62	32	4.22 (2.2-8.1)
25 to 59 years	64	30	3.96 (2.06-7.61)
≥60 years	7	3	3.62 (0.86-15.25)
Sex			
Male	164	37	Reference group
Female	121	45	1.65 (1.01-2.7)
Mechanism of burn			
Flame	111	70	Reference group
Scald	140	8	0.91 (0.42-0.20)
Other	23	3	0.21 (0.6-0.71)
TBSA			
0-25%	157	1	Reference group
26-50%	103	14	21.4 (2.77-164.76)
51-75%	19	26	214.8 (27.6-1674.3)
76-100%	6	41	1072.8 (125.6-9161)
Intent			
Unintentional burn	226	16	Reference group
Deliberate self-harm	12	41	48.3 (28.3-109.5)
Season of injury			
Winter	60	13	Reference group
Spring	61	22	1.67 (0.77-3.6)
Summer	82	21	1.18 (0.55-2.5)
Autumn	81	26	1.48 (0.7-3.11)

**Table V** - The adjusted odds ratios for death for factors associated with in-hospital mortality (n=947)

Factors	Odds ratio (95% CI)	P value
TBSA		
0-25%	Reference group	
26-50%	16.6 (2.1-133.2)	0.008
51-75%	86.8 (9.2-819.6)	<0.001
76-100%	490.7 (39.5-6094)	<0.001
Burn intent		
Non-intentional burns	Reference group	
Intentional burns	7.6 (2.5-22.7)	<0.001
Season of burn		
Winter	Reference group	
Autumn	4.6 (1.1-20.7)	0.046
Log likelihood = -62.7, LR test $\chi^2=163.8$ , 7 df, P<0.001		

creased as TBSA burnt increased. Less than 1% of those with a TBSA burnt  $\leq 25\%$  died, while 87% of those with a TBSA  $> 75\%$  died. It is also important to note that mortality rate was 12% when TBSA was 25-50% and 58% when TBSA was 50-75%. Analysis of in-hospital mortality by different characteristics calculating univariate odds ratios is shown in *Table IV*. Compared to children aged 0-14, older ages had significantly increased odds ratios for death. Female gender, intentional burns and greater burn size were also associated with higher mortality risk.

When the above variables were entered into a multiple logistic regression model, only burn size, intentional burns and autumn season remained significant risk factors for death, as shown in *Table V*. Compared to a burn size of 0-25%, the odds ratio for death was 16.6 for a burn size of 26-50 and 87 for a burn size of 51-75%. Compared to non-intentional burns, the odds ratio for death in intentional burns was 7.6. Regarding the seasons, only autumn was significantly associated with a significantly higher risk of death, with an odds ratio of 4.6. The model explains 57% of variability in burn mortality.

## Discussion

The study analysed the records of 267 burn patients: there were more males than females (55% vs. 45%); this is consistent with other studies reported in the region,<sup>16,17,18</sup> but different to some previous studies in Iraq which reported a higher proportion of females.<sup>11,12,14</sup> This could probably be explained by the fact that there were more male children in our study. Boys in general, especially those under 6 years old, are usually playful and thus more exposed to stoves, fire places, hot kitchen appliances and hot liquid. However, the male/female ratio nearly equalizes at age 15-39 years. Review studies on low-income countries reported that the incidence of burns is higher in males of a younger age (under 12): after this age, the incidence increases in females.<sup>19,20</sup> This shift in gender pattern could be interpreted by females growing and having more responsibilities in the kitchen – a common tradition in eastern societies - making them more exposed to fire and hot liquids. Furthermore, self-immolation is a common phenomenon among adult females in the region,<sup>21,22</sup> but this was not always reported in patients' files because of denial due to social, religious and legal factors.

The majority of patients in our study (46%) were children under 14 years old, which is similar to other studies conducted in the region.<sup>17,18,20</sup> Our results, in general, indicate that both male and female children are at high risk of being affected by

burns, similar to long-term retrospective studies carried out in China,<sup>23</sup> Israel<sup>24</sup> and Oman.<sup>25</sup> Therefore, preventative measures should target this group in the future.

It is important to mention that more than half of the patients were from outside Basra City, which may be attributed to the higher population numbers living in districts and towns, poorer circumstances, more crowded families and generally greater exposure to sources of injury. While there is wide variability in burn season reported by previous studies,<sup>26,27,28</sup> our study shows that the highest number of burn admissions occurs in autumn and summer, which could be related to the occurrence of more severe burns during these seasons. Our findings show that the most common mechanism of injury in children (under 14) was scald due to hot fluids. This is similar to findings in previous Iraqi studies in Sulaimaniyah,<sup>12</sup> Mosul<sup>29,30</sup> and Baghdad,<sup>14</sup> suggesting that children tend to be more active and play around in the kitchen where they will be more exposed to boiling fluids. Although there were more boys than girls burnt in our study, the difference between girls and boys was not statistically significant.

On the other hand, our study reveals that flame is a common mechanism of injury in adult patients. Similar findings were reported in studies carried out in Iraq,<sup>10,11</sup> UAE,<sup>31</sup> Kuwait<sup>16,32</sup> and Iran.<sup>33</sup> This suggests that adults are involved more in fire-related work accidents in factories or at home while cooking, for example. A study conducted in Iran shows that there was a strong correlation between age and mechanism of injury in burnt patients,<sup>34</sup> which is similar to our findings. Burns mainly involved the upper and lower extremities, followed by trunk and least so the neck and head. One Turkish study<sup>26</sup> reports the same findings, but percentage of burns affecting the head and neck was higher than in our study, while another study states that the part most commonly burnt by hot liquid in paediatric patients is the lower extremities.<sup>35</sup> It appears that patterns of burning are related to the mechanism and circumstances of injury.

Regarding in-hospital mortality, in our study 87% of patients with TBSA of 75% and over died; however, the mortality rate was only 0.6% with TBSA  $< 25\%$ . In general the mortality rate in our study was 22%, which is lower than mortality reported in Sulaimaniyah and Baghdad City, but higher than what has been reported from neighbouring countries such as Iran with 8.9%,<sup>36</sup> Kuwait with 5.75%<sup>16</sup> and Saudi Arabia with 2.8%,<sup>27</sup> and nearly the same as in Jordan with 23%.<sup>37</sup> This high mortality ratio in our study was especially noteworthy for TBSA between 25-50%, which was 12%. With good wound care, intervention and infection control, death could be prevented in many of these patients. However, in our study the high mortality rate could be due to those factors as well as the presence of contaminated burns and patients being referred from other cities who arrive at the burn centre too late, after having developed complications. The immediate cause of death could not be ascertained from the files as this had been recorded in only a few of them, and the reasons given were septicaemia and inhalation injury. The overall high mortality rate included many self-inflicted cases in our study, and mortality in those cases tended to be due to the high TBSA% burnt.<sup>38</sup> Burn size and intentional burns were independent significant factors for mortality in our study, which is similar to other studies in the region.<sup>32</sup>

### Limitation of this study

This study was carried out retrospectively on patient hos-

pital records, which are normally incomplete and inconsistent. Some data were missing from patient files included in the study, and there were apparently files missing as well. According to the burn logbook, there were about 566 cases admitted to the burn centre during 2016, but the actual number of files that we found at the statistics department was only 267. It is obvious that a prospective study should be carried out in the future, precisely analysing the burden and characteristics of burn injuries in Basra.

### Conclusion

This study showed that, overall, more males were admitted and more burns were due to flame, while in children the most

common mechanism was scalds. Mortality was high and significantly associated with burn size and suicidal burns. High mortality requires special attention, especially in terms of following standard management protocols to ensure prompt and proper resuscitation, appropriate wound care, infection control, early surgery as indicated, and generally improving the quality of care for patients. Developing a burns registration system, improving hospital records, recording the cause of death and computerizing it is essential for ensuring quality of care. In terms of prevention, multidisciplinary action with awareness activities at mass media and family level may help in preventing childhood burns. Strengthening rehabilitation and psychosocial care for survivors is recommended to improve patient outcomes.

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