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PREDICTORS OF IN-HOSPITAL MORTALITY OF BURNS IN BASRAH

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ABSTRACT

Background: Burn injuries are a significant public health concern, particularly in low-resource settings, with high morbidity and mortality rates. Understanding the demographic and clinical predictors of burn-related mortality is crucial to inform prevention strategies and improve healthcare responses. **Aim:** This study aimed to identify the predictors of in-hospital mortality among burn patients admitted to the burn unit in Basrah during the year 2010. **Methods:** A retrospective descriptive hospital-based study was conducted using medical records of all burn patients admitted in 2010. Data collected included sociodemographic factors (age, sex, marital status, educational level, occupation), burn characteristics (type, degree, total body surface area [TBSA%] affected), time to hospital admission, and time of admission. Frequencies and distributions of variables were analyzed to identify patterns related to mortality. **Results:** A total of 343 burn patients were admitted. Children under 15 years comprised the largest age group (31%), and females constituted 54.8% of cases. Most patients were non-employed, married, and had a low educational level. Over half of the burns occurred during winter and spring. Flame burns (80%), second-degree burns (58%), and TBSA involvement of 26–50% (30%) were most common. Notably, 58% of patients died in hospital, with higher mortality in females (67%), individuals aged 15–24 years (60%), and those with third-degree burns (95%). Mortality was also higher among patients with TBSA >50%, delayed hospital arrival (>1 hour), and those admitted during off-hours (14:00–7:59). **Conclusion:** Women, children, and socioeconomically disadvantaged individuals were more vulnerable to burn injuries. Flame burns, greater burn severity, and delayed care were key predictors of mortality. Regional strategies for prevention and improved burn care services in Basrah are urgently needed.

KEYWORDS: Burn injury, mortality predictors, TBSA, flame burn, delayed admission, Basrah.

INTRODUCTION

Burn injuries remain one of the leading causes of morbidity and mortality, particularly in low- and middle-income countries (LMICs), where access to specialized care may be limited and preventive measures underdeveloped.[1] Burns compromise the skin, which is the body's largest organ and a critical barrier against environmental hazards, pathogens, and dehydration. It plays an essential role in immune function, thermoregulation, and maintaining fluid and electrolyte balance. When this barrier is disrupted due to thermal injury, the patient becomes highly susceptible to infection, which is a primary cause of complications and death in burn victims.[2] Burns are among the most painful and complex injuries encountered in clinical settings. They occur suddenly and have the potential to result in devastating outcomes, including death, long-term disfigurement, and physical impairment.[3] Furthermore, burn injuries have significant psychological consequences. Studies show that more than half of patients hospitalized for burn injuries exhibit symptoms of moderate to severe depression within a month of discharge. Even two years after the injury, a substantial proportion—up to 43%—continue to experience mental health challenges. Notably, female patients tend to report higher depression scores compared to males.[4] Determining the cause of the burn is critical, as it may aid in assessing burn depth and guiding treatment strategies. One of the ongoing challenges in burn management is the control of bacterial colonization and invasive infections, which continue to be major complications, particularly in the post-acute phase of treatment.[2] The incidence of burn injuries varies widely across regions and cultures. In the United Kingdom, for instance, approximately 175,000 people seek emergency care for burns annually, with around 13,000 requiring

hospital admission and 1,000 experiencing severe burns necessitating fluid resuscitation. Children under 16 years of age account for about 50% of these cases.[5] In rural China, a reported 5% annual burn incidence has been observed among school-aged children.[6] A Turkish population-based study revealed a 10-year burn prevalence of 12.6%.[7] In Iraq, data from a study conducted in Sulaymaniyah estimated the annual burn incidence rate at 389 per 100,000 people across all age groups.[8] Despite the global burden of burns, there is a notable lack of local data from southern Iraq. Specifically, no prior research has been conducted on burn injuries in Basrah, and no official statistics exist on burn incidence or mortality in this region. In light of this gap, the present study was undertaken to assess the in-hospital mortality among burn patients in Basrah and to identify factors associated with fatal outcomes.

METHOD

This study was conducted at the burn unit of Alfayhaa General Hospital, the only facility in Basrah equipped to provide specialized care for burn injuries. The unit includes 12 beds for male patients and 12 beds for female patients, supported by a complete medical team including physicians, nurses, and auxiliary staff. The study employed a descriptive, retrospective, hospital record-based design and included all patients admitted to the burn unit with acute burn injuries from January 1 to December 31, 2010. Patients referred to other healthcare facilities or admitted for reconstructive surgeries related to previous burn injuries were excluded; eight such cases were identified and removed from the study. The final sample included 343 patients. Data were collected from archived patient records stored in the hospital's records section. Files were organized chronologically, which facilitated sequential data extraction. For each patient, the following information was abstracted: demographic details (name, age, sex, residence), socioeconomic characteristics (education, occupation, marital status), burn-related factors (type, total body surface area [TBSA], degree, time and season of burn, delay between burn and hospital admission, and time of hospital admission), medical history (e.g., diabetes, hypertension), and final outcome (discharged or deceased). Age was categorized into five groups: <15, 15–24, 25–34, 35–46, and >46 years. Residence was grouped into five geographic regions: East, West, North, South, and City Center. Burns were classified by type (flame, scald, electrical, chemical), TBSA percentage (0–25%, 26–50%, 51–75%, 76–100%), and degree (1st, 2nd, 3rd). Time to admission was classified as <1 hour, 1–2 hours, or >2 hours. Admission times were categorized as day (08:00–14:00) and off-hours (14:01–07:59). Data were entered into Microsoft Excel, cleaned, and transferred to SPSS version 15 for analysis. Descriptive statistics included frequencies, percentages, means, and standard deviations. Associations were tested using Chi-square or Fisher's exact tests, with a significance level set at $p < 0.05$. Logistic regression was performed to identify independent predictors of in-hospital mortality.

RESULTS

The majority of burn patients were under 35 years of age (80.7%), with children <15 years constituting 30.9%. Females made up a slightly higher proportion (54.8%) of cases. Most patients resided in the city center (60.9%), were married (49.6%), and had low educational attainment, with primary and intermediate levels being the most common. A significant proportion (65.6%) were non-employed. Most burns occurred in winter and spring (52.2%), with a notable 28% during summer. The majority (63.8%) reached the hospital within 1–2 hours, though over 70% were admitted during off-hours (14:01–7:59). Flame burns were the predominant cause (79.9%), and second-degree burns were most common (58%). Around 26.5% of patients had TBSA ≥76%. In-hospital mortality was high at 58%. Mortality was significantly associated with higher TBSA, third-degree burns, and flame burn type. These findings highlight the need for timely hospital access and targeted prevention in high-risk groups. As in table 1.

Table 1: socio-demographic characteristics, burn characteristics, and patient outcomes.

Variable	Category	No.	%
Age (years)	<15	106	30.9
	15–24	78	22.7
	25–34	93	27.1
	35–44	41	12.0
	≥45	25	7.3
Sex	Male	155	45.2
	Female	188	54.8
Residence	Center	209	60.9
	East	21	6.1
	West	46	13.4
	North	45	13.1
	South	22	6.4
Marital Status	Married	170	49.6
	Single	75	21.9
	Child	96	28.0

	Other	2	0.6
Education	Illiterate	15	4.4
	Primary	99	28.9
	Intermediate	72	21.0
	Secondary	47	13.0
	University	24	7.0
	Child	86	25.1
Occupation	Employed	28	8.2
	Non-employed	225	65.6
	Retired	2	0.6
	Child	88	25.7
Medical History	Negative	329	95.9
	Positive	14	4.1
Season of Burn	Winter	89	25.9
	Spring	90	26.3
	Summer	96	28.0
	Autumn	68	19.8
Time from Burn to Admission	<1 hr	117	34.2
	1–2 hrs	219	63.8
	>2 hrs	7	2.0
Time of Admission	08:00–14:00	101	29.4
	14:01–07:59	242	70.6
Type of Burn	Flame	274	79.9
	Scald	62	18.1
	Electrical	7	2.0
Degree of Burn	1st Degree	38	11.1

The analysis showed no statistically significant association between age and in-hospital mortality (p=0.290), though mortality was slightly higher in patients aged 15–34 years. In contrast, sex was significantly associated with outcome (p=0.001), with females experiencing a higher mortality rate (66.8%) compared to males (47.1%). Residence was not significantly associated with mortality (p=0.967), although slightly higher death rates were observed among patients from the East and South regions. As in table 2.

Table 2: Outcome by Age, Sex, and Residence.

Variable	Category	Died No. (%)	Alive No. (%)	Total	P-value
Age	<15	63 (59.4%)	43 (40.6%)	106	0.290
	15–24	47 (60.3%)	31 (39.7%)	78	
	25–34	55 (59.1%)	38 (40.9%)	93	
	35–44	20 (48.8%)	21 (51.2%)	41	
	≥45	14 (56.0%)	11 (44.0%)	25	
Sex	Male	73 (47.1%)	82 (52.9%)	155	0.001
	Female	125 (66.8%)	62 (33.2%)	188	
Residence	Center	122 (58.4%)	87 (41.6%)	209	0.967
	East	13 (61.9%)	8 (38.1%)	21	
	West	27 (58.7%)	19 (41.3%)	46	
	North	24 (53.3%)	21 (46.7%)	45	
	South	13 (59.1%)	9 (40.9%)	22	

There were no statistically significant associations between in-hospital mortality and marital status (p=0.647), education level (p=0.520), or occupation (p=0.179). Mortality rates were relatively similar across marital groups, with slightly higher deaths among children and married individuals. Patients with primary and secondary education had higher mortality compared to other education levels. Non-employed individuals showed the highest mortality (60.4%), but the difference was not statistically significant. These findings suggest that while socio-demographic factors may influence burn outcomes, they were not independently associated with mortality in this study. As in table 3.

Table 3: Outcome by Marital Status, Education, and Occupation.

Variable	Category	Died No. (%)	Alive No. (%)	Total	P-value
Marital Status	Married	98 (57.6%)	72 (42.4%)	170	0.647
	Unmarried	42 (56.0%)	33 (44.0%)	75	
	Child	57 (59.4%)	39 (40.6%)	96	
	Others	2 (100%)	0 (0%)	2	
Education	Illiterate	7 (46.7%)	8 (53.3%)	15	0.520
	Primary	61 (61.6%)	38 (38.4%)	99	
	Intermediate	41 (56.9%)	31 (43.1%)	72	
	Secondary	31 (66.0%)	16 (34.0%)	47	
	University	11 (45.8%)	13 (54.2%)	24	
	Child	48 (55.8%)	38 (44.2%)	86	
Occupation	Gov. Employed	13 (46.4%)	15 (53.6%)	28	0.179
	Non Employed	136 (60.4%)	89 (39.6%)	225	
	Retired	0 (0%)	2 (100%)	2	
	Child	50 (56.8%)	38 (43.2%)	88	

Mortality was highest in autumn (63.2%), but the seasonal difference was not statistically significant (p=0.776). Flame and scald burns showed significantly higher mortality rates (59.1% and 59.7%) compared to electrical burns (0%), with a significant association (p=0.007). A very strong correlation was found between mortality and TBSA% (p=0.000); all patients with TBSA >75% died, and 91.5% of those with 51–75% TBSA also died. Burn depth was also significantly associated with outcome (p=0.000), with a 95.3% mortality rate in patients with third-degree burns, indicating that burn extent and depth are critical predictors of death. As in table 4.

Table 4: Outcome by Season, Burn Type, TBSA%, and Burn Degree.

Variable	Category	Died No. (%)	Alive No. (%)	Total	P-value
Season	Winter	49 (55.1%)	40 (44.9%)	89	0.776
	Spring	52 (57.8%)	38 (42.2%)	90	
	Summer	55 (57.3%)	41 (42.7%)	96	
	Autumn	43 (63.2%)	25 (36.8%)	68	
Type of Burn	Flame	162 (59.1%)	112 (40.9%)	274	0.007
	Scald	37 (59.7%)	25 (40.3%)	62	
	Electrical	0 (0%)	7 (100%)	7	
TBSA%	≤25%	8 (8.9%)	82 (91.1%)	90	0.0001
	26–50%	46 (44.7%)	57 (55.3%)	103	
	51–75%	54 (91.5%)	5 (8.5%)	59	
	76–100%	91 (100%)	0 (0%)	91	
Degree of Burn	1st	2 (5.3%)	36 (94.7%)	38	0.0001
	2nd	96 (48.2%)	103 (51.8%)	199	
	3rd	101 (95.3%)	5 (4.7%)	106	

Delay in reaching the hospital was associated with higher mortality (71.4% for >2 hours), but the difference was not statistically significant (p=0.644). However, time of admission showed a significant impact (p=0.002), with patients admitted during off-hours (14:01–07:59) having a notably higher mortality rate (63.2%) compared to daytime admissions (45.5%). Medical history was not significantly associated with outcome (p=0.778), though patients with comorbidities had a slightly lower survival rate. These findings highlight the importance of timely and optimal care, especially during off-peak hours. As in table 5.

Table 5: Outcome by Time to Admission, Time of Admission, and Medical History.

Variable	Category	Died No. (%)	Alive No. (%)	Total	P-value
Time from Burn to Admission	<1 hr	65 (55.6%)	52 (44.4%)	117	0.644
	1–2 hrs	129 (58.9%)	90 (41.1%)	219	
	>2 hrs	5 (71.4%)	2 (28.6%)	7	
Time of Admission	08:00–14:00	46 (45.5%)	55 (54.5%)	101	0.002
	14:01–07:59	153 (63.2%)	89 (36.8%)	242	

Medical History	Negative Positive	193 (58.7%) 6 (42.8%)	136 (41.3%) 8 (57.2%)	329 14	0.778

DISCUSSION

This hospital-based retrospective study examined in-hospital mortality and associated risk factors among burn patients admitted to the only specialized burn unit in Basrah during 2010. As is often the case with retrospective analyses, the completeness and quality of medical records posed certain limitations. Notably, data regarding inhalation injuries—recognized in the literature as a critical predictor of burn mortality—were absent from patient files and thus excluded from the analysis.[8-10] This omission may have underestimated the role of respiratory compromise in mortality outcomes. In terms of age distribution, the majority (80.7%) of burn victims were under 34 years of age, aligning with findings from Sulaymaniyah, Iraq (74% under 35 years) and studies across the Eastern Mediterranean Region (EMR).[8,10,11] Children under 15 years constituted 30.9% of cases in this study, a figure supported by WHO data identifying children aged 5–15 years as a high-risk group.[12] The prevalence of pediatric burns can be linked to domestic exposure to unsafe cooking and heating equipment. Furthermore, 54.8% of burn admissions were female, consistent with patterns reported in Sulaymaniyah, Egypt (53%), and Iran (56%).[8,9,11] Cultural roles and increased exposure to cooking tasks, coupled with the incidence of self-harm among young women, likely contribute to this disparity. Socioeconomic factors also played a significant role. Most cases were from the central governorate, which is closest to the burn center. This may reflect both easier access to care and survival bias, as patients from remote regions may die route due to delayed medical intervention. The majority of burn victims were married and of low educational status, consistent with findings from Egypt and Iran.[9,11] These trends suggest that limited awareness of burn prevention and home safety may increase risk. Seasonal variation was also evident, with over half of the burns occurring in winter and spring, a pattern observed in other regional studies.[8,13,14] Inadequate safety measures involving kerosene heaters and poor home electrical infrastructure may explain these trends. Additionally, an unexpected peak in summer burns may be attributed to increased domestic fuel storage and generator use during periods of limited electricity supply. Delay in hospital presentation was common, with most patients arriving 1–2 hours' post-injury. Though this delay was not statistically significant in predicting mortality, other studies suggest that early medical intervention improves survival.[8] Admission during off-hours (14:01–7:59) accounted for 70.6% of cases and 63.2% of deaths, raising concerns about reduced care quality during these periods when specialized staff may be unavailable. The predominant type of burn was flame-related (79.9%), followed by scalds (18.1%) and electrical burns (2%). This distribution is consistent with studies from northern Iraq and EMR countries, where flame injuries frequently account for 41–76% of all burns.[11,15,16] TBSA was a critical determinant of outcome. While 30% of patients had burns covering 26–50% of body surface, 26.5% had TBSA over 75%, with nearly all such cases resulting in death. These findings echo results from Iran, where TBSA >50% was associated with mortality rates as high as 52%.[10] In our study, 91.5% of patients with TBSA >50% died, and all patients with TBSA >76% succumbed, affirming TBSA as a strong predictor of mortality. Third-degree burns were another major determinant of death, with 95.3% of deceased patients having full-thickness injuries. This is consistent with prior findings that associate deeper burns with higher mortality due to increased susceptibility to infection and fluid loss.[14,17] Female patients also had a higher mortality rate, in line with reports from Iran and Egypt, as well as EMR data, which indicated that 65% of fire-related deaths occurred among females.[9,11] Mortality varied by season, with autumn accounting for 63.2% of deaths. Possible explanations include difficulty in maintaining optimal ward temperature using inadequate air conditioning systems and increased seasonal respiratory infections. Multivariate regression analysis confirmed that the most significant predictors of in-hospital mortality were TBSA%, degree of burn, and season of burn—findings that are consistent with several regional studies.[11,13,15] These insights highlight the urgent need for improved burn prevention strategies, better infrastructure for emergency care, and enhanced record-keeping to guide future research and clinical decision-making.

CONCLUSION

Women and children under 15 years of age had the highest rates of burn injuries. The majority of affected individuals were married and unemployed. In-hospital mortality was notably high, particularly during the autumn season, and was most strongly associated with flame burns, burns involving more than 50% of the total body surface area (TBSA), third-degree burns, and delays of more than one hour in reaching the burn center.

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