

Pediatric burns in Western Saudi Arabia

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ABSTRACT

الأهداف: إجراء دراسة تحليلية مقطعية للعوامل الديموغرافية لإصابة الأطفال بالحروق، وأسبابها، والأنماط السريرية، وعواقب الإصابة بمثل هذه الحروق.

الطريقة: أُجريت هذه الدراسة المقطعية في مستشفى النور التخصصي بمكة المكرمة، المملكة العربية السعودية خلال الفترة من يناير 2008م إلى ديسمبر 2010م. وقد استهدفت الدراسة 459 طفل تعرض للإصابة بالحروق وتم تنويمه في المستشفى خلال هذه الفترة.

النتائج: لقد كان متوسط عمر المرضى المشاركين في الدراسة 5.97 عاماً، وكانت نسبة الذكور إلى الإناث 1.5:1، وكان السبب الأكثر شيوعاً هو الحرق نتيجة التعرض للسوائل الساخنة بنسبة تمثل 81.7%. وكان حوالي 92.8% من المرضى حروقهم تغطي 25% من إجمالي مساحة سطح الجسم أو أقل. وكان متوسط الإقامة في المستشفى 9.51 يوماً. وعولج نحو 92% من المرضى تحفظياً دون تدخل جراحي.

خاتمة: أظهرت هذه الدراسة بأن الأطفال في عمر أقل من 5 سنوات معرضون بنسبة أكبر لخطر الإصابة بالحروق. ولوحظ أيضاً أن عدد حالات التنويم تزداد كل عام لذا فنحن نؤكد على ضرورة إنشاء برنامج وقائي فعال قائم على أسس علمية.

Objective: To conduct a cross-sectional analysis of the demographical, etiological, clinical pattern, and the outcome of pediatric burn injuries.

Methods: A cross-sectional study of 459 pediatric burn patients admitted to Al-Noor Specialist Hospital in Makkah, Saudi Arabia from January 2008 to December 2010 were evaluated using a structured questionnaire.

Results: The mean age was 5.97, and the male to female ratio was 1.5:1. The most common cause was scalding (81.7%). Approximately 92.8% of patients had burn injuries involving 25% of the total body surface area, or less. The mean hospital stay was 9.51 days. Approximately 92% of patients were treated conservatively.

Conclusion: Toddlers are at high risk of having scald burns. We also noted the number of admissions is increasing every year. Therefore, an effective scientific-based prevention program is required.

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Burn injuries are one of the most demoralizing and damaging injuries. These injuries inflict an extensive burden on patients, families, and society. Various surgical procedures, long period of hospital stay, and intensive medical care are often required for burn victims.¹ Since children, (considered as human being below the age of 18)² are still developing, they are more susceptible to physical and emotional harm. The emotional and physical scars can last a lifetime. Prevention remains the cornerstone in the management. Since the etiopathological factors in burn injuries vary considerably in different communities, careful analysis of the epidemiological features in each community is needed before establishing preventive measures. According to the World Health Organization (WHO) most recent data, burn injuries in East Mediterranean Region (EMR), Saudi Arabia is included; remain one of the leading causes of morbidity and mortality among all injuries.³ Burn injuries are a major challenge in the developing countries.⁴ The incidence in the EMR was 187 per 100,000 per year. In America, the incidence was 19 per 100,000 per year.⁵ The WHO estimates that 310,000 people died in fires in 2004 across the world. The EMR showed a mortality rate of 5.6 deaths per 100,000, which was higher than the global mortality rate, 4.8 per 100,000 per year. The WHO estimates that

29,000 deaths occurred in the EMR only.⁵ The aim of this study is to analyze demography, etiology, clinical pattern, and the outcome of pediatric burn injuries in Makkah, Saudi Arabia. In addition, to identify the most affected age group, most common causes of burn among children and adolescent, and help to establish a government-approved national injury prevention strategy related to child and adolescent burn prevention.

Methods. A cross sectional study reviewing pediatric burn cases from January 2008 to December 2010 who were admitted to the burn unit in Al-Noor Specialist Hospital. Al-Noor Specialist Hospital has a capacity of 570 beds including 10 beds reserved for critical burn patients. It is the only hospital with a burn unit in Makkah city and its suburbs. Makkah city is the capital of Makkah province located 73 km (45 mi) inland from Jeddah, Saudi Arabia in a narrow valley at a height of 277 m (909 ft) above sea level. The population of Makkah city and its suburbs is approximately 1600000 according to the latest statistics.⁶ Makkah is the holiest city on earth for Muslims. More than 13 million Muslims visit Makkah annually, including 5 million who perform the Hajj (pilgrimage).⁷

Out of 806 admissions, 459 were in the pediatric age group. The criteria for admission in Al-Noor Hospital as well as in this study is to: 1) admit any patient with second degree burn involving more than 15% of the total body surface area (TBSA), 2) third degree burn involving more than 5% of TBSA, 3) burns of the face, neck, feet, hands, and perineum, 4) electrical injuries or burn patients with associated injuries. A structured questionnaire was developed to include the following data: demographic data, type of burn injury, percentage of burn, affected part of body, time of injury (Hajj seasons: the period from the first of Zhu Al-Qa'dah to the 30th of Zhu Al-Hejja according to Hijri calendar), duration of hospital stay, management, outcome, and cause of death. Assessment of percentage body surface area was made according to Lund and Browder Charts⁸ and fluid resuscitation were given according to Parkland Formula⁹ (4 mL/kg body weight per percentage burn TBSA) with consideration of the fluid maintenance for each specific age group, half of the volume was given in the first 8 hours post burn, and the remaining was

given over 16 hours. The study was approved by the Institutional Review Board of the college. Permission to collect the data was taken from the Ministry of Health and the hospital.

Data entry and analysis were carried out using SPSS version 16 to calculate the mean, median, standard deviation, percentage, correlation between factors and appropriate test of significance.

Results. Of the 806 patients, 459 were included in the study (277 [60.3%] males and 182 [39.7%] females). The male to female ratio was 1.5:1. There were 333 Saudis (72.5%) and 126 (27.5%) non-Saudi. The mean age was 5.97 years, median was 4 years, and mode was 3 years. They were divided into 3 age groups: 240 (52.3%) were infants and toddlers less than 5 (group 1), 158 patients (34.4%) were pre-school and early school children 5-11 years (group 2) and 61 (13.3%) were adolescents aged between 12-18 years (group 3). The nationality distribution is shown in Table 1.

There is no statistical significant difference between age and gender in both Saudi and non-Saudi groups ($p=0.157$ and $p=0.685$). The relationship between patient age, gender, and nationality is shown in Table 2.

Among all admissions 12 (3.6%) were admitted twice, while 3 (0.9%) were admitted thrice. The number of admissions in 2008 was 142, 2009 was 146, and 2010 was 171. The highest number of admissions according to season was in summer, which was 148, followed by 133 admissions in spring. The lowest was in winter. The analysis of the etiological factors showed that scald represents the major etiological factors, which accounted for 375 cases (81.7%), followed by flame (63 [13.7%]), electrical (8 [1.7%]), and others (13 [2.8%]) which includes chemical, contact, and inhalation injuries. Ninety-two percent in the infants and toddlers group had scald injury, the percentage decreases to reach 49.2% in teenagers and adolescents, while observation is reversed in flame burn ($p<0.0001$). The distribution of the type of burn according to age groups is shown in Table 3.

Approximately 92.8% of patients had burn injury involving 25% TBSA or less. The mean was 13.23, and the range was from 1-100%. The scald burn has a higher probability of involving more body surface area ($p<0.0001$). The mean is 9.51, and the median is 6 days for hospital stay. The highest category was between 6-10 days representing 130 (28.3%) in-patients. The relationship between TBSA and hospital stay is statistically significant, which indicates patients with higher TBSA tend to have longer hospital stay ($p<0.0001$) (Figure 1).

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Four hundred and twenty (91.5%) patients were treated conservatively, while 39 (8.5%) were treated operatively. Three hundred and forty-four (74.9%) patients improved with appropriate treatment, while 87 (19%) patients were discharged against medical

advice (DAMA), and 19 (4.1%) patients have escaped. The overall mortality was 7 patients (1.5%). The single most important cause of death was septicemia leading to cardiopulmonary arrest.

Table 1 - Patient distribution according to their nationalities included in a study of burn patients in Makkah, Kingdom of Saudi Arabia.

Nationality	Frequency (%)
Saudi	333 (72.5)
Pakistani	30 (6.5)
Burmese	14 (3.1)
Nigerian	14 (3.1)
Egyptian	11 (2.4)
Yemeni	10 (2.2)
Other	47 (10.2)
Total	459 (100)

Table 2 - Relationship of age, gender, and nationality of burn patients included in a study in Makkah, Kingdom of Saudi Arabia.

Nationality	Age (years)			Total	P-value
	<5	5-11	12-18		
<i>Saudi</i>					0.157
Male	99	63	32	194	
Female	74	52	13	139	
Total	173	115	45	333	
<i>Non-Saudi</i>					0.685
Male	45	29	9	83	
Female	22	14	7	43	
Total	67	43	16	126	

Discussion. This study presents data illustrating the patterns of burns in patients admitted to the major burn center in Makkah. Our goal is to use these data to highlight areas that require further exploration to help guide future injury prevention practices in this city.

In our study, the frequency of all pediatric admissions caused by burns in Makkah increased approximately by 20.4% between 2008 and 2010. This increase was mainly in the infants and toddler age group (age 0-4), while in the other 2 age groups, the admission frequency decreased. This increase may be attributed to the increase in birth rate in the whole Saudi population, as well as the increase in the awareness of the parents regarding hospital care provided to burn patients. This finding is consistent with several other studies.¹⁰⁻¹² However, Elberg reports from Denmark¹³ showed a downward trend with a better burn prevention program. The male to female ratio was 1.5:1, which is comparable to other local studies,^{10,11} and lower than the ratio in the United State (2.4:1 male to female).¹⁴ The male predominance could be related to the fact that boys are more involved in more physical activities that are more likely to cause burns. The non-Saudis constitute 27.5% of the total pediatric burn admissions,

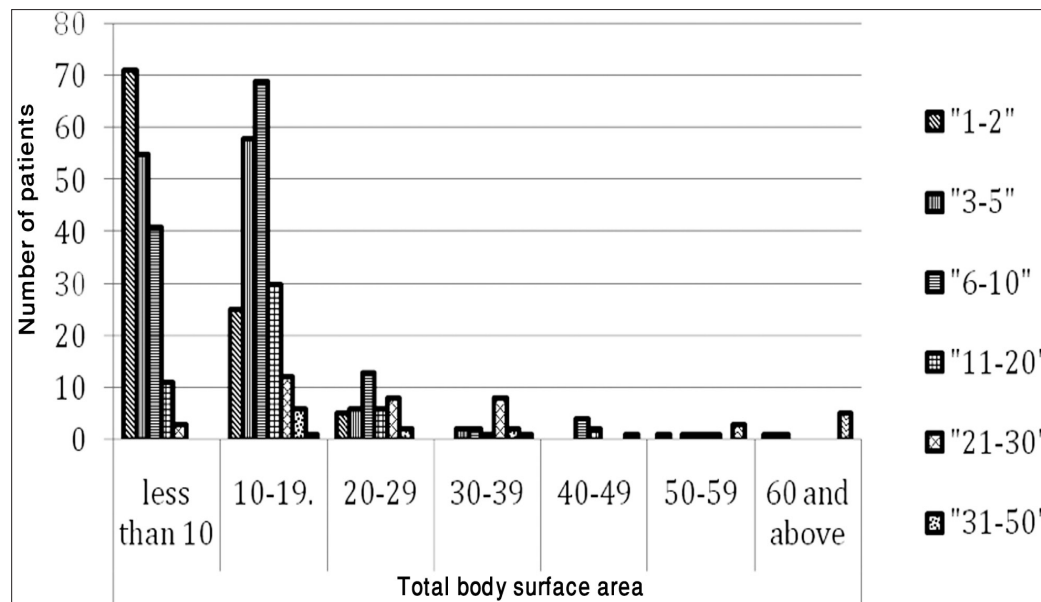


Figure 1 - The relationship between the duration of hospital stay and the percentage of body surface area burned. Values on the right (1-50) represents the number of days for each category of patient stay.

a finding consistent with Larsen's study.¹⁵ This is due to the high percentage of non-Saudis in this region, which is approximately 33.2% of whole Makkah population. This high percentage is because Makkah is the holy city for Muslims to visit and stay. However, other studies in the neighboring regions showed low non-citizen admissions.^{11,16,17}

Our results show that the most affected age group was infants and toddlers less than 4 years. This could be due to longer stay at home, high activity, and inability to protect themselves. In addition, young children in our society lack adequate supervision due to the large family units and lack of domestic safety measures. In contrast to other local^{11,12} and international studies¹⁰ the highest admissions were in summer, and the lowest were in winter. This is probably due to increase children activity in summer vacation. The admissions of the Hajj season were 64 admissions, which are lower comparing to the mean non-Hajj season, which were 79 admissions. This is due to that the Al-Noor Hospital as well as other Makkah hospitals in Hajj season become emergency hospitals. Approximately 83.2% of pediatric burn patients had TBSA less than 20%. This percentage is slightly higher than other studies.^{12,18,19}

Reviewing the etiology of burns in our study, the most common cause was scald that constitute of 81.7%, followed by flame 13.7% which is comparable to other studies.^{11,12,15-17,19-22} The high frequency of scald burns in the younger age group is due to their mobility and lack of awareness of the consequences of their actions. Hence, as the child's age increases the frequency of flame injury rises. This rise could be related to their experimenting with matches, lighters, and fireworks. This result matches other studies.^{11,16,22} The mean hospital stay was 9.51 and median was 6 days, which is similar to Al-Shehri's study,¹⁶ but lower than Tang et al's²² study. The highest category was between 6-10 days representing 130 (28.3%) inpatients, which is similar to other studies.^{12,16,19} Factors affecting hospital stay were age and management. Surgical management causes the patients to stay longer in the hospital.

Most patients (91.5%) were treated conservatively. This high percentage is due to the finding that most admitted patients had no surgical indications. Regarding patients' outcome, approximately 344 patients responded well with treatment. Approximately 87 (19%) patients were discharged against medical advice; this is similar to el Danaf et al²³ and higher than Ali's study which was 10%.¹¹ In Saudi Arabia and neighboring countries, there is a language barrier between foreigner physicians and patients. Despite the

use of translators, this poses a communication problem reported by Larsen et al,¹⁵ who found that 20% of his patients were discharged against medical advice. Furthermore, a lack of confidence in physicians and their treatment is a social and cultural problem that lead to high percentage of discharges against medical advice.^{15,23} The mortality rate was 1.5, which is lower compared to other studies.^{12,18,19} The low mortality in this study is due to dominance of young patients and mild burns that carry low mortality compared to severe burns. Approximately 19 (4.1%) patients escaped from hospitals. This is most likely that those patients are illegal residents in Saudi Arabia.

As this study is cross-sectional, some of the desired information could not be reached and discussed, such as the exact causative agents, the mechanism of the injury, degree of burn, and presence of child negligence.

This is the first epidemiological study that analyzes burn injury among admitted pediatric patients in Makkah, Saudi Arabia. The study found that the susceptibility of children to burns increases with developmental achievements, such as independent mobility, exploratory behavior, and hand-to-mouth activity. The susceptibility declines after the age of 4. The common source of injury was scald. The duration of hospital stay was significantly increased in patients with higher TBSA. A well-equipped burns unit is necessary to provide adequate care for this group of patients. This is increasingly more relevant with the rising number of admissions. On the other hand, most of admissions had TBSA lower than 19% and approximately 49% of the patients were discharged in less than 5 days. These 2 facts suggest that most patients do not require an intensive care.

At present, the Intensive Burns Unit is being used for the treatment of superficial burns patients who are most likely do not need that care, or being admitted to another department where they are occupying the beds of other patients in need, and it is harder to provide the proper care for these patients. Therefore, the development of a separate new burn ward that requires fewer nursing staff with the use of appropriate medical care may be more cost-effective in the long term for treating superficial burns. However, establishing an effective study-based prevention program is the mainstay of managing burn patients. This preventive program should be community-based, insisting on strict safety measures concerning the sources of burns. Since this is only a preliminary study, further studies are needed to provide a base for an ideal prevention plan and improve the quality of care delivered to burns patients.

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