

Pattern of burns identified in the Pediatrics Emergency Department at King Abdul-Aziz Medical City: Riyadh

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Abstract

Objectives: The objective of the study was to report the incidence of pediatric burn injuries and describe the pattern and the trend of pediatrics burns seen in King Abdul-Aziz Medical City. **Materials and Methods:** Retrospective cross-sectional study. Data collected through chart review of pediatrics patients aged 1-month to 14 years who presented with a burn injury to the pediatric emergency department during the year 2013. Burn patients were divided into two groups based on the percentage of total body surface area (TBSA) burned: Either <10% or more than 10%. Variables were compared between the two groups to identify the risk factors associated with more than 10% body surface area involvement. **Results:** Burn incidence rate was 4.9 patients/1000/year. Children with burns on more than 10% TBSA accounted for 16% incidence (0.8/1000 emergency department patients). The burn injury severity ranged from 1% TBSA to 37%, with a mean of 5%. The proportion of male and female burn patients was 54.1% and 45.9%, respectively. Children between 1 and 3 years of age sustained the majority (48.6%) of burn injuries. Scald burns were found to be the most common cause of injury. Hot water and beverages were considered root for most of the scald burn injuries. As children advance in age, scald injury becomes less likely, and they are more obviously subjected to flame burn injuries. Burn injuries sustained at home were 35% compared to 2.7% occurring outside the home. None of the study variables were good predictors for severe burn injuries affecting more than 10% TBSA. **Conclusion:** The incidence and the severity of burn injuries remain high at the national level. Burn injuries continue to affect the pediatric population, predominantly, young children, which indicate the need for increasing parent educational programs and government regulations. Because we reported scald burns as the most common causes of burn injury, which are consistent with previous national reports, we recommend having legislation that focuses on scald burn prevention.

Key words: Burn, injuries, pediatric

INTRODUCTION

A burn is an acute traumatic event caused by nonpersisting injurious insult to the skin and tissues that cause damage

at the cellular level, followed by a healing process.^[1] The insult could be thermal, chemical, or electrical.

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The risk of burns varies according to the gender, age, geographic distribution, socioeconomic level, and other factors. Among the distribution of burns according to age, children aged from 0 to 4 years are at high risk because of their nature.^[2] In children, burns are the eleventh leading cause of mortality and the fifth most common cause of injuries not related to death. Those patients who survive may suffer major lifelong morbidity. According to the geographic distribution, boys living in the eastern Mediterranean region are at higher risk than boys in the same family income level in Europe.^[3]

The global prevalence is estimated to be 8/100,000 children who are hospitalized in the emergency department for burn treatment.^[4] A study was conducted in the United States of America from 1990 to 2006 on burn-related injuries. The burn injury prevalence in United States is estimated to be 15 cases/10,000/year among individuals 20 years and younger. The majority of burn injuries were reported to be in children younger than 6 years and predominantly, the burn injuries were sustained at home.^[5]

The incidence of mortality from burn injuries was estimated in one study to be between 5% and 37%.^[6] Approximately, 35-80% of burns were scald burns, and 2-5% were flame burns. Most burn injuries occur in the kitchen, followed by the bathroom, where children are at risk of hot water exposure in tubs.^[7]

In Makkah, Saudi Arabia, a cross-sectional study was conducted of 459 pediatric burn patients admitted to Al-Noor Specialist Hospital between January 2008 and December 2010. The most common cause of burn was scald burn (81.7%). Approximately, 92.8% of patients had burn injuries involving 25% or less of the total body surface area (TBSA).^[8]

Reports from Saudi Arabia also reported that children subjected to burn during desert camp. Hand is the most affected body parts in children between the age of 6 month to 1-year.^[9] Hand burn was also reported to be prevalent in older children as a result of a blast from fireworks.^[10]

In Riyadh, the central region of Saudi Arabia, there have been no published reports in the literature estimating the prevalence of burns or examining the pattern of burns among children. According to published reports in other regions, the burn prevalence will be similarly high. However, this issue needs clear documentation regarding prevalence to establish preventive strategies that can reduce the risk of thermal injury. Adopting preventive strategies in other countries has been shown to lower the risk of burns and have a great impact on improving public health. This study aims to report the burn injury incidence

and the pattern of pediatric burns seen in a level I trauma center in Saudi Arabia.

MATERIALS AND METHODS

The study design is a cross-sectional retrospective chart review. The study was approved by the Ethics Board of King Abdul-Aziz Medical City-Riyadh (KAMC) (RR013/62). KAMC is considered one of the biggest Tertiary Hospitals and Level I Trauma Centers in Saudi Arabia and the Middle East. The hospital serves the population of the national guard and their dependents in addition to patient referrals from all over the Kingdom and the Gulf region. The KAMC emergency department has a 24-bed capacity in addition to the resuscitation area. Data was collected from pediatric patients who presented with burns to the emergency department at KAMC between January 1, 2013, and December 30, 2013. Information gathered from the patient's emergency sheet and the patient's electronically scanned emergency sheet charts using the hospital information system (QuadraMed system). All patients' ages 1 month to 14 years with burns in the previous 24 h were included, and patients with incomplete charts were excluded. Cases were identified using the medical file numbers of patients listed in the emergency burn tracking Excel spreadsheet. Burn patients were divided into two groups based on the percent of TBSA: Either 10% less or 10% more. Variables were compared between the groups to identify the risk factors associated with more than 10% TBSA involvement. All collected data were entered into an Excel spreadsheet. The data were imported to Statistical Package for the Social Sciences (SPSS) (version 20) statistical software for analysis. Tables and percentages were used to describe categorical variables such as age, gender, and the mechanism of injury. Chi-square test and multivariate logistic regression were used to test the association between the primary outcome and the study variables. Odds ratio and 95% confidence interval (CI) was used to report results. A $P = 0.05$ was statistically significant.

RESULTS

The total number of pediatric emergency visits in 2013 was 30,000. During the study period, 148 patients were treated for burn injuries. The burn incidence rate was 4.9 pediatric patients/1000/year (494 burn patients/100,000/year). Children with burns on more than 10% TBSA accounted for 16% incidence (0.8/1000 pediatric emergency room patients). The burn injuries ranged in severity from 1% TBSA to 37% with a mean of 5%.

Males represented 54.1% of burns; females 45.9%. Children between 1 and 3 years of age sustained the majority of

burn injuries (48.6%). Children between 3 and 5-year-old represented 26% of patients with more than 10% TBSA burns. In general, toddler and preschool children accounted for more than 80% of the study population. In children older than 5 years, the majority of burn patients were male [Figure 1]. Face, upper chest, and knees were the most commonly affected body parts, with between 20% and 30% of patients burned in these body areas [Table 1].

Table 1: Demographic characteristics

Variable (%)	Number 148 (%)
Gender	
Male	80 (54.1)
Female	68 (45.9)
Age (years)	
0-1	34 (23)
>1-3	72 (48.6)
>3-5	19 (12.8)
>5-10	18 (12.2)
>10-14	5 (3.4)
Burn injury mechanism	
Scald	113 (76.4)
Flame	23 (15.5)
Contact	8 (5.4)
Chemical	3 (2)
Others (missing)	1 (0.7)
Percentage of TBSA	
<10	122 (82.4)
>10	24 (16.2)
TBSA with age distribution	
0-1 year	
<10 TBSA	30 (90.9)
>10 TBSA	3 (9.1)
>1-3 years	
<10 TBSA	60 (80.3)
>10 TBSA	12 (16.9)
>3-5 years	
<10 TBSA	14 (73.3)
>10 TBSA	5 (26.3)
>5-10 years	
<10 TBSA	15 (83.3)
>10 TBSA	3 (16.7)
>10-14 years	
<10 TBSA	4 (80)
>10 TBSA	1 (20)
Body parts affected	
Face, neck	51 (34.5)
Chest	36 (24.3)
Abdomen	19 (12.8)
Back	28 (18.9)
Right arm	14 (9.5)
Left arm	20 (13.5)
Right forearm	30 (20.3)
Left forearm	14 (9.5)
Right thigh	19 (12.8)
Left thigh	13 (8.8)
Right knee	27 (18.2)
Left knee	30 (20.3)
Perineum	3 (2)
Place where burn occurred	
Home	52 (35.1)
Outside home	4 (2.7)
Missing	92 (62.2)

TBSA: Total body surface area

Scald burns were the most common injury mechanisms followed by flame [Figure 2]. Most of the scald burn injuries were attributed to hot water and beverages. As children advanced on age, scald injury were found less common, and they were mostly subjected to flame burn injuries [Figure 3].

Although most emergency data sheets did not specify where the burn injuries occurred, many injuries happened at home (35%) compared with 2.7% that occurred outside the home. The majority of patients were treated in the emergency department and discharged with follow-up. The hospitalization rate was 12%, and 4% required intensive care support. No deaths due to burn injury were identified during the study period.

A Chi-square test and logistic regression were used to predict the probability of more than 10% TBSA burns based on the study predictor variables. There were no significant associations found between gender and the percentage of body surface area affected ($P = 0.335$). Children aged 1-3-year-old were 3 times more likely to have more than 10% body surface area burns, however, this was not statistically significant ($P = 0.1$; 95% CI 0.746-17). Multiple predictor variables were analyzed using a logistic regression model to predict the severity of burn injury by age, gender, and mechanism of the burn; all variables were not statistically significant [Table 2].

DISCUSSION

This epidemiological study reported the incidence of burns over a 1-year period in one of biggest Tertiary Care Hospitals and Level I Trauma centers in Saudi Arabia. The incidence figure is considered to be high compared to global prevalence figures.^[4] High incidence was reported nationally in many studies in the past.^[8-12] This figure indicates the magnitude of the problem and supports the idea that burn injuries remain a national health burden. Urgent need of effective preventive strategies should be one of the major targets of injury prevention programs.

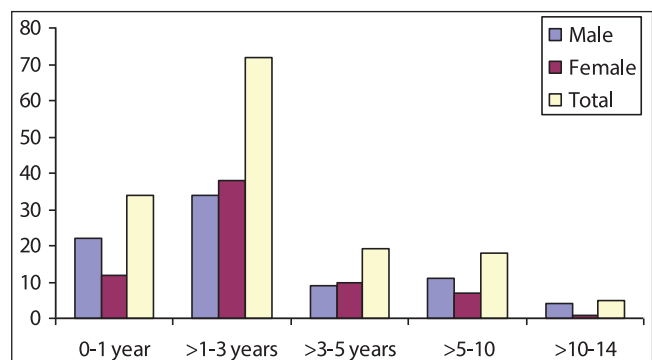


Figure 1: Distribution of age and gender

Table 2: Predictor variables analyzed with logistic regression model

Variables	P	OR	95% CI for EXP(B)	
			Lower	Upper
Age	0.652			
0-1	0.333	0.236	0.013	4.393
1-3	0.599	0.481	0.031	7.359
3-5	0.933	0.893	0.063	12.635
5-10	0.575	0.445	0.026	7.544
Burn injury mechanisms	1.000			
Type (scald)	1.000	478,467,136.496	0.000	
Type (flame)	1.000	430,802,775.040	0.000	
Type (contact)	1.000	1.188	0.000	
Type (chemical)	1.000	0.727	0.000	
Gender				
Male (1)	0.281	0.602	0.239	1.514
Constant	1.000	0.000		

OR: Odds ratio, CI: Confidence interval

Previous studies have suggested that burn injury peaks in children younger than 5-year-old. Furthermore, reports have suggested that children younger than 5 years are at an increased risk for sustaining burn injuries.^[13,14] In this study, 80% of burn patients were younger than 5 years; the highest percentage of patients were between 1 and 3 years of age. However, the majority of patients in this age group had <10% TBSA. Children aged 3-5 years accounted for 26% of burn injuries in which more than 10% TBSA was affected [Figure 4]. Similar to previous studies, our review showed gender difference among patients with a male:female ratio of 1.7:1. Previous studies have reported males were twice the number of females.^[14-16] Gender difference was not explained in the literature however, all reports were consistent with males are affected more the females.

Scald burns were found to be the most common burn injury mechanism in our review, which is consistent with previously published reports.^[14-17] In the middle-east reports, scald burns were reported to be the main cause of burns in children and were responsible for most hospital admissions.^[11,12,15,17,18] We reported the same finding where up to 12% of scald burn patients required hospital admission. Hot water and beverages were the main cause of scald burn injuries. There were 26% of patients with scald burn caused by hot water who had more than 10% TBSA affected. Unfortunately, the hot water source was not identified in our review, but previous studies have reported the source of scald burns is tap water.^[19] With older children, flame burn became the primary cause of burns, especially in children older than 10 years [Figure 3]. Flame burn was caused by open home fire and the misuse of fireworks. In our study, all burns caused by fireworks occurred in boys older than 10 years of age, and 20% of these patients had more than 10% TBSA affected. Previous articles reported similar findings as a result of fireworks; trauma burn injury was the most common injury affecting predominately males.^[20,21] A small proportion of burns occurred from

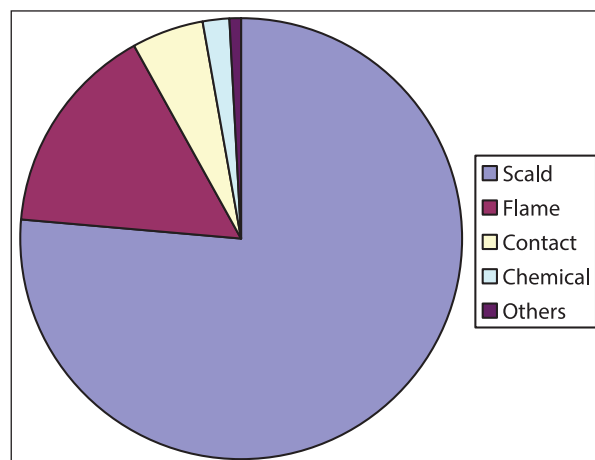


Figure 2: Burn injury mechanism

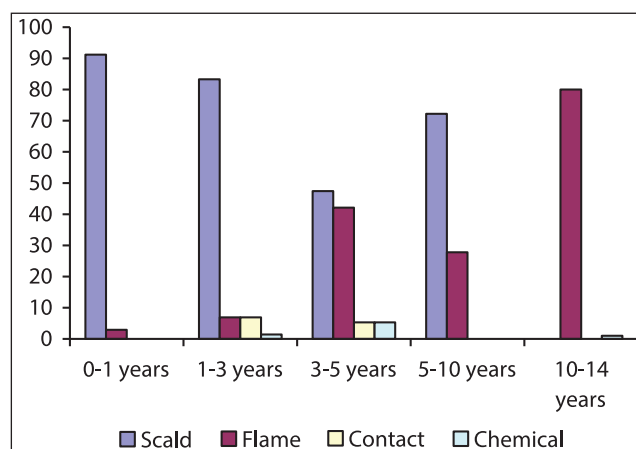


Figure 3: Percentages of burn mechanism injury according to age group

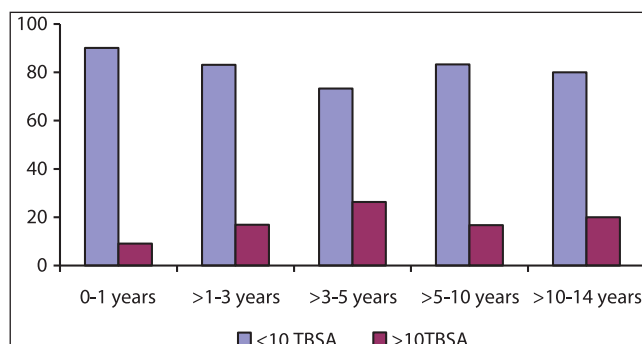


Figure 4: Percentages of total body surface area burns according to age distribution

contact with hot surfaces or chemical exposure. Irons and hot stoves were reported to be the reasons for these burn injuries. Exposure to strong detergents was responsible for chemical burns. Although these burns were not common and all patients had <10% TBSA affected, this finding should raise concerns, particularly with domestic exposure because reports document most chemical burns, especially in children, occur in a domestic area.^[22,23]

Our data showed the majority of burn injuries were sustained at home. Nearly 60% of patients had no information regarding the location of where the burn happened, however, most of the injury mechanism information provided with those with missing data indicates that the injuries were most likely sustained at home. Children older than 5 years were more likely to sustain burn injuries outside their homes. The literature documented similar findings where a majority of pediatric burns occurred at a family residence.^[5,24]

Our finding is similar to local and international reports where a majority of burn injuries sustained in the pediatric population are preventable. Achieving prevention was highly suggested in the literature to focus on parent's knowledge, awareness, supervision skills, and establishing home safety measures.^[25,26] A sustainable burn injury prevention program was reported to be effective in reducing hospital admission caused by burns.^[27] A predictive model was used to suggest focused target population preventive strategies based on our data. Patient age, gender, and mechanism of burn were not associated with a higher percentage of TBSA affected.

We conclude that the incidence and the severity of burn injury consider being high as well as at national level based on previous local reports from other regions.^[8-12] Burn injuries continue to affect the pediatric population, and predominantly young children, which indicates the need for parent educational programs and government regulations focuses on home safety. We reported scald burns as the most common burn injury mechanisms, which are consistent with previous national reports; we recommend that legislation should focus on scald burn prevention. Adopting community-based regulations of lowering hot water temperatures in residential locations was found to be cost-effective and contributed to scald burn injury prevention.^[19,26-30]

Limitations

This study has several limitations. Its retrospective review of the amount of information and available data are limited. The number of burn patients could be underestimated as we had included patients who visited the emergency department, but did not include the primary health care and the outpatient clinic patients. The study was conducted in one center in one region. Thus, our small sample size may affect the ability to generalize these data because this population may not be representative of the population of the whole kingdom.

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Conflict of interest

There are no conflicts of interest.

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