Original Article

Epidemiological Study of Burn in Children under 7 Years of Age Admitted to Amir Al-Momenin Burn and Trauma Hospital, Shiraz, Iran

Aliakbar Mohammadi [1], Maryam Bahrani [2*], Mehrsa Chabi [2], Mitra Shakiba Moghadam [1], Marzieh Mansouri [1]

1. Burn and Wound Healing Research Center, Amir-Al-Momenin Hospital, Shiraz University of Medical Sciences, Shiraz, Iran
2. Department of Plastic and Reconstructive Surgery, Shiraz University of Medical Sciences, Shiraz, Iran

***Corresponding Author:**

Maryam Bahrani

Department of Plastic and Reconstructive Surgery, Shiraz University of Medical Sciences, Shiraz, Iran.

Email: maryambahranim@gmail.com

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ABSTRACT

Background: We aimed to evaluate the epidemiology, risk factors, clinical features, and outcomes of burn injuries in children less than 7 yr of age in Shiraz, Iran.

Methods: A retrospective review was conducted on all children younger than seven years admitted with acute burn injuries to Amir-al-Momenin Hospital, Shiraz, Iran between Mar 2021 and Oct 2025. Overall, 617 eligible cases were included. Demographic, clinical, and outcome variables were extracted from electronic and paper medical records. Burn etiology, place, season, total body surface area (TBSA), anatomical distribution, and mortality were analyzed.

Results: Of 4305 hospitalized burn patients, 617 (14.3%) were children under seven years; 63.9% were boys. Over half (53%) were younger than two years. Scald injuries from hot liquids constituted the leading cause of burns (60.6%) across all age groups. Most incidents occurred at home and peaked during the spring months. The mean TBSA was approximately 18.795. There were 61 deaths (9.9%), with explosion burns being the primary cause of mortality. Increased TBSA was significantly associated with higher mortality. The LA50 for the cohort was 47.8%.

Conclusion: Most of the pediatric burn admissions in our center involve preschool boys, and the most common cause is scald injury. Most burns occur at home. Explosion, flame, and larger TBSA are more likely to result in mortality. The improvement in LA50 over the last 10 years is likely due to improved regional burn care. These findings reiterate the need for more focused preventative measures, such as parent education, improved safety in the home, community awareness, and more specialized pediatric burn care.

KEYWORDS
Burn; Preschool children; Prevention

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INTRODUCTION

Burn injuries are a major global public health concern and a leading cause of morbidity and mortality. Children, particularly those under five years of age, are among the most affected victims of these injuries. According to literature, burns are the fourth most common injury after road traffic

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accidents, falls, and violence[1]. Burn management presents a significant clinical challenge requiring a multidisciplinary approach. Burn injuries often result in extended hospital stays, permanent scars and disfigurements, long-term disability, and emotional suffering. The WHO estimates that burns affect approximately 11 million people annually worldwide, with 250,000 deaths. More than 90% of these deaths occur in low- and middle-income countries. Burn injuries also account for nearly 18 million disability-adjusted life years (DALYs) annually[2, 3]. Females, older age, and greater total body surface area (TBSA) are strongly associated with increased mortality[4]. Worldwide, pediatric patients account for 40%–60% of all burn admissions.

Preschool-aged children are the most vulnerable group[5]. This increased susceptibility might be related to their curiosity, limited recognition of dangerous situations, and inability to comply with safety precautions. In addition, physiological immaturity, particularly of the skin, immune, and respiratory systems, makes them more prone to complications and poorer outcomes compared with older children. Due to their higher surface area and thinner skin, children are more vulnerable to deeper injuries. They are also prone to complications such as hypothermia, hypovolemic shock, infections, and anemia, which significantly increase morbidity and mortality [2,6]. Furthermore, a narrower airway lumen increases the risk of life-threatening obstruction following inhalation injury.

Over 90% of children's burns occur at home, mostly in the kitchen, with hot water being the most common cause. Children under the age of five—especially boys—are the most affected. Risk factors include poverty, overpopulation, low parental education, and insufficient household safety practices [7]. Effective prevention requires increasing public awareness, parental education, and government-supervised household safety interventions. There is a large body of knowledge about burn characteristics in adults. However, fewer studies have focused specifically on the burn patterns, outcomes, and prognostic factors in preschool-aged patients.

We aimed to characterize the epidemiology, risk factors, clinical features, and outcomes of burns in preschool children. Understanding the epidemiological patterns, causes, and outcomes of pediatric burns is essential for guiding prevention strategies, improving resource distribution, and enhancing burn care services in such a high-risk population.

METHODS

Patients were selected from the individuals who were admitted in Amir- Al-Momenin burn Hospital between Mar 2021 to Oct 2025. Children younger than seven years of age with acute burn injuries, admitted either directly or referred from other centers within 48 h of the event, were eligible for inclusion. Exclusion criteria were age above 7 yr, outpatients, readmissions for non-acute reasons, and cases with insufficient medical documentation. After applying the criteria, a total of 617 Pediatric burn cases were included. Demographic variables included age, sex, place of residence, and place of occurrence. Clinical data included the mechanism of burn (scald, flame, electrical, chemical, contact), burn extent (percentage of total body surface area TBSA), and outcomes (discharge or death). Data were extracted from the hospital research center registry sheets. Variables were entered into Microsoft Excel (2010) and analyzed using SPSS ver. 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were reported as means with standard deviations for continuous variables and frequencies with percentages for categorical variables. Group comparisons were performed using chi-square tests for categorical data and t-tests for continuous data. Statistical significance was set at $P<0.05$. All information were anonymized before analysis to protect privacy.

The study was approved by the Institutional Review Board and Medical Ethics Committee of Shiraz University of Medical Sciences (ethical approval code: IR.SUMS.REC.1404.315). All procedures adhered to the ethical principles of the Declaration of Helsinki.

RESULTS

Between Mar 2021 and Oct 2025, 4,305 burn patients were treated at Amir-al-Momenin Hospital in Shiraz. Of these, 617 (14.3%) were children under seven years of age, comprising our pediatric study cohort. The cohort was predominantly male (63.9%, n=394) and included a slightly higher proportion of infants under two years (53.0%, n=327) compared to children aged 2–7 yr (47.0%, n=290) (Table 1).

Regarding injury characteristics, hot liquid scalds

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were the most common etiology across both sexes and age groups, accounting for 60.6% of injuries (Table 2). The majority of burns occurred within the domestic environment (89.9%), with the highest frequency of incidents observed in spring (27.7%). The mean total body surface area (TBSA) burned was 18.79%, with no significant difference observed between age groups (<2 yr: 18.09% vs. 2–7 yr: 19.57%; *P*=0.31) or sexes (girls: 19.47% vs. boys: 18.40%; *P*=0.48), indicating comparable burn severity across these demographic strata.

Overall, 61 patients (9.9%) died from their injuries. Etiology-specific mortality was highest for explosion-related burns (29.3%), followed by fire-related burns (22.0%) and chemical burns (14.3%), while no deaths were recorded among the small subset of patients with electrical injuries (Table 2). In terms of prognostic indicators, a 10% increase in TBSA was associated with a 4.7-fold higher mortality risk, and the calculated LA_{50} index—the TBSA at which 50% of patients are predicted to die—was 47.8%.

Univariate analysis of additional risk factors revealed that while sex (*P*=0.789) and age (*P*=0.242) were not significantly associated with mortality (Figure 1),

Table 1. Demographic Characteristics and Burn Severity (TBSA)

Characteristic	N (%)	Mean TBSA (%)	*P*-value
Age			
<2 yr	327 (53.0)	18.09	0.31
2-7 yr	290 (47.0)	19.57	
Sex			
Girl	223 (36.1)	19.47	0.48
Boy	394 (63.9)	18.40	
Total	617 (100)	18.79	

Table 2. Etiology of Burns and Associated Mortality

Cause of Burn	Girls, N (%)	Boys, N (%)	Total, N (%)	Mortality (%)
Hot liquid	150 (40.1)	224 (59.9)	374 (60.5)	4.8
Hot object	14 (31.1)	31 (68.9)	45 (7.3)	2.2
Fire	29 (29.0)	71 (71.0)	100 (16.2)	22.0
Explosion	21 (36.2)	37 (63.8)	58 (9.4)	29.3
Electrical	2 (10.5)	17 (89.5)	19 (3.1)	0.0
Chemical	7 (33.3)	14 (66.7)	21 (3.4)	14.3
Total	223	394	617	9.9

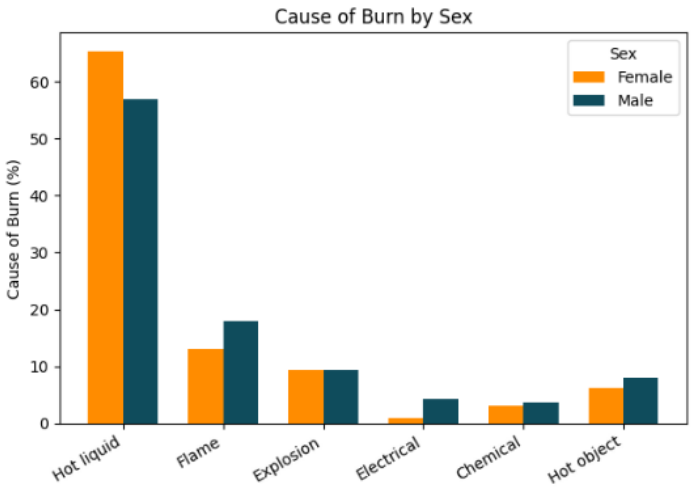


Figure 1. Sex specification by All-cause Mortality

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Table 3. Univariate Analysis of Factors Associated with Mortality

Variable	Number, N (%)	Mortality, N (%)	*P*-value
Sex			
Girl	223 (36.1)	38 (10.3)	0.789
Boy	394 (63.9)	23 (9.6)	
Age			
<2 yr	327 (53.0)	28 (8.6)	0.242
2-7 yr	290 (47.0)	33 (11.4)	
Residence			
Urban	346 (56.1)	28 (8.1)	0.071
Suburban	14 (2.3)	0 (0.0)	
Rural	257 (41.7)	33 (12.8)	
Season			
Spring	171 (27.7)	14 (8.2)	
Summer	159 (25.8)	23 (14.5)	0.153
Autumn	146 (23.7)	11 (7.5)	
Winter	141 (22.9)	13 (9.2)	

rural residence showed a trend toward higher mortality (12.8%) compared to urban areas (8.1%), though this difference did not reach statistical significance (*P*=0.071) (Table 3). Similarly, seasonal variation in mortality was not statistically significant (*P*=0.153), despite the highest observed mortality rate occurring in summer (14.5%) and the lowest in autumn (7.5%) (Table 3).

DISCUSSION

Burn injuries represent a major source of physical, psychological, social, and economic burden for both victims and their families. These patients often require prolonged hospitalization, multiple surgical interventions, and some will require readmissions for secondary or reconstructive procedures. The physical and emotional sequelae of burns often persist for prolonged periods and affect quality of life markedly. According to the WHO the highest burden of burn-related injuries is concentrated within three regions: the Eastern Mediterranean, South-East Asia, and Africa[2].

Children constitute a considerable proportion of burn victims. Patients under 18 yr of age were considered children across many of the studies conducted in different regions[3]. The majority of children suffering from burn injuries were under five years of age [6,8,9]. On a large-scale descriptive analysis of pediatric burn patients that was performed by the WHO, children aged 0–18 yr constituted 42% of cases, and Children aged 1–5 yr represented 62% of the pediatric group. In a previous study in Iran, 26% of all acute burn patients were pre-school children [7]. Preschool children accounted for 78.8% of total admitted burn children in Vietnam [5]. In the present study, 4305 patients were admitted to Amir-al-Momenin Hospital due to acute burn injuries between 2020 and 2025, of whom 14.3% were children under the age of seven. About, 53% of those children were under two years of age. Previous studies identified scald injuries as the predominant cause of burns in both adults and children. The most common scald injuries were caused by boiling water, tea, coffee, soup, or milk [3,4,10,11]. In many cases, especially among individuals of lower socioeconomic status, kettles were identified as the primary household item responsible for such injuries[7].

In the present study, hot liquids were identified as the most common cause of burns in children under seven years of age. This pattern may be explained by children's natural curiosity toward their environment, their limited capacity to recognize and avoid potentially hazardous situations, and the availability of hot liquids in the household. Among children younger than two years, the incidence of scald burns was markedly higher, whereas flame-related burns were far less frequent compared to older children. This discrepancy may be attributed

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to the greater mobility of the children over the age of two and reduced parental supervision compared to younger infants.

In many countries, burns frequently occur when children are left unsupervised at home [12]. This observation emphasizes the critical need for preventive strategies to enhance parental awareness and to reduce household risks. In the United Kingdom," population density, poverty, and low educational attainment were identified as major risk factors for pediatric burns" [7]. Most studies note a male predominance among burnt patients [3, 13-15], which is consistent with the current study. This imbalance could be due to more adventurous and risk-taking behaviors in boys, which expose them to more hazardous environments. Biological factors may also play a role, as boys typically demonstrate greater impulsivity and reduced risk awareness compared with girls.

In this study, isolated superficial burns were observed in only 5% of cases. The second- and third-degree burns were found to be more common, which is consistent with the results of the previous studies[16]. The TBSA was 18.79%, with no statistically significant difference observed between the two sexes or between children younger than two years and those older than two years. In other studies, the TBSA of those admitted to hospital was often 20% or less [2,14]. A study from Vietnam documented a mean TBSA of 8.8%, with deep burns present in 43.5% of patients. Mortality increased by 0.99% for each 1% rise in TBSA according to a study performed in Tabriz. Flame burns were associated with larger TBSA and worse outcomes [15]. According to this study, each 10% increase in TBSA increased mortality by 4.7-fold. Mortality was not uniformly documented across the reviewed studies; however, flame and electrical burns were consistently associated with greater TBSA involvement, poorer clinical outcomes, and higher complication rates [8,15]. In the present study, explosion was the leading cause of death (29.3%), followed by fire (22%).

Gender-related differences in outcomes also warrant attention. In a previous study conducted at our center, female patients exhibited higher mortality rates than males (11.4% vs. 7.2%). This could raise questions about potential gender-based disparities in access to timely and adequate treatment[15]. However, in the present study, mortality did not differ significantly across age groups or between sexes, which may indicate progress in the equity and effectiveness of burn care delivery. Mortality and LA50 values vary significantly between regions and countries. This can be due to differences in burn care infrastructure, access to specialized centers, and prevention programs. In Spain, mortality was exceedingly low (0.7%) despite a relatively high mean TBSA (18.7%) [11]. Adolescents presented with more extensive burns and worse outcomes compared with younger children. Similarly, Vietnam demonstrated excellent outcomes, with a mortality rate of only 0.5% and an LA50 as high as 81.7% [5]. In contrast, outcomes in several Iranian series were less optimal. In Tabriz-Iran, mortality was 3.92% among patients under 16 yr and rose proportionally with TBSA. For every 1% increase in TBSA, there was 0.99% increase in the mortality rate. The LA50 was 41.93%, considerably lower than that reported from developed countries [4].

The overall mortality rate in the current study was 9.9%, which exceeds the rates reported in some other investigations from other regions. This difference can be due to the fact that our hospital is a tertiary referral center from adjacent provinces and usually accepts only burn patients who have high percentages of burns and cannot be treated in their local hospitals. Moreover, many patients who may meet the criteria for hospital admission are treated in the outpatient department in our hospital to keep a place for those with more critical burns. LA50 improved from 40.1% in 2012 to 47.8% in this study [15]. This progressive improvement may be attributed to the institution of a new specialized burn care hospital in the city. The new hospital has more advanced facilities and equipment, and specialized burn intensive care units. Other strength points of the hospital include well-trained nurses and physicians who can deliver enhanced burn care services.

89.9% of burn injuries occurred within the home, a finding that may explain their high prevalence among women and children. These findings are consistent with the results of multiple previous studies [4,5,17]. These findings underscore the necessity of enhancing public awareness and improving the safety of domestic environments.

In the current study, the majority (56.1%) of child victims lived in urban areas, and incidents peaked in spring. This was inconsistent with the results of previous studies, which showed most victims

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lived in rural areas and were injured in winter [5]. The reason might be that people in rural areas are more likely to treat their burn injuries at home or in local facilities. This should prompt the decision to enhance rural people's knowledge and awareness of burns to persuade them to seek specialized care. Moreover, special attention must be paid to perform a comprehensive evaluation of emergency response systems, urban–rural differences in healthcare access, and inter-regional variations in the quality and availability of medical and hospital services.

CONCLUSION

There have been advances in burn care in recent decades, including aggressive fluid resuscitation, prompt airway management, optimized nutritional support, and advances in surgery. Given that most burn injuries occur within the home, the need for preventive measures is of paramount importance. Public education delivered through mass media, schools, and universities can play an effective role. In some countries, effective programs have successfully reduced both the incidence and mortality of pediatric burns. Furthermore, households should be standardized both in terms of structural safety and the regulation of heating appliances and flammable materials. Children, in particular, require continuous supervision to minimize their risk of burn injuries. Preventive measures should therefore include parental education, improvement of household safety, and closer supervision of children. Mass media can play a critical role in disseminating educational messages and raising public awareness. In Shiraz, Iran, the establishment of a specialized burn hospital, along with the provision of adequately equipped wards, trained personnel, and intensive care units, has markedly improved the hospitalization and management of burn patients. These advancements have contributed to a notable increase in the LA50 in recent years.

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CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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