

Profile of the Pediatric Burn Patient at the Schneider Children's Medical Center of Israel

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Abstract

Background: Burn trauma occurs mostly in young children. Burn injury in the pediatric age group has multiple-aspect sequelae.

Objectives: To characterize the profile of the injured pediatric burn patient, thus targeting the most vulnerable pediatric group.

Methods: Between 1 January and 31 December 1996, a total of 9,235 pediatric patients were admitted for various traumatic injuries (burns, lacerations, fractures, etc.) to the Emergency Medicine Department of Schneider Children's Medical Center. We conducted a retrospective study of the patients' charts, including demographic data, which were stored in a computerized database, for statistical evaluation. The characteristics of pediatric burn patients were examined and compared with other pediatric trauma patients.

Results: Of the total patient population, 282 (3.1%) suffered from burns (37% females, 63% males). The most frequent burn injury was scald burn (58%). The pediatric group that was most exposed to burns was 13–18 month old males.

Conclusions: Having identified the high risk group among the pediatric burn patients, we suggest that prevention programs be directed towards this group in order to reduce further risk of burn injury.

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Although improved survival rates for pediatric burn victims have been reported in recent years, burns continue to pose a major threat to the health of children [1,2]. For the past 20 years in the United States, burns have ranked second among the causes of accidental death in children under age 4 and third for older children [3]. In Israel the annual incidence of burn injury, in both pediatric and adult patients, is 120 per 100,000 population [4].

Apart from causing death, burns leave survivors with disfiguring and disabling scars, psychological trauma, and a loss of productive years for the patient. The care of the burn patient imposes immense stress on the economic, social and emotional well being of the family. All these effects are especially true with regard to the pediatric patient.

Epidemiological studies have been used historically to identify clusters of personal and environmental factors that place certain populations at risk for burn trauma [5]. One such cluster includes young children from highly stressed, single-parent or low income families [6,7]. Based on this information one might expect the population of burn victims to be geographically varied, which might allow an evaluation of the efficacy of a burn prevention program in a target population group. With a similar concept in mind, we used the pediatric trauma registry and the medical data from our emergency room to identify the pediatric group at highest risk for hospital admission due to burn injury. We assessed several parameters of the pediatric burn patient and compared them to other pediatric trauma patients presenting to our ER.

Patients and Methods

We conducted a retrospective study of all pediatric burn victims admitted to our hospital's emergency room between 1 January and 31 December 1996. Every pediatric patient was examined on arrival to the ER by a plastic surgeon. All burn patients were included in the study. The upper age limit for entry into the study was 16 years.

Patient charts were stored in a computerized database for statistical evaluation. The data extracted from the chart included demographic data; admission time to ER by month, day and hour; place the burn occurred (if indoors, the location in the house); type of burn; cause of burn (agent); area and degree of burn; distribution of burn by its anatomical localization; presence of inhalation injury; admission or discharge of patients; and mortality rate.

We used identical data collected from patients admitted to our ER due to causes other than burns as a reference group.

Results

Demographic data

During this one year period, of 9,235 patients admitted to our ER due to various traumatic causes (burns, lacerations, fractures, etc.) 282 (3.1%) suffered from burns. The distribution by gender among burn patients, 105 (37.2%) females and 177 (62.8%) males, did not differ from other trauma patients. Age distribution of burn patients showed that most burns occur during the first 2 years of life. The

age group between 13 and 18 months old represented the major risk group among burn patients, occurring in 49 (17.3%) patients [Figure 1].

Time of admission to the ER

Arrival at the ER was characterized by four major peaks; the first peak was around noon, the second at 3:00 in the afternoon, the third at 7:00 in the evening, while the major peak appeared at 9:30 at night [Figure 2].

Time of ER admission during the year

The highest number of admissions was reported during the summer, in July, and during winter in February; the lowest rate of admissions was reported in November. Most of the burns occurred over weekends [Figure 3].

Place of burn

Of the 282 pediatric burns, 245 (86.8%) occurred indoors. Most of the indoor burns, 163 (57.8%), took place in the kitchen or its immediate vicinity — 63 (22.3%) in the dining room or living room. Thirty-seven patients (13.2%) were injured in an outdoors environment, with the majority of injuries due to bonfires and occurring in summertime.

Type of burn

Scald burn injuries were the most common and constituted 58.3% of all burns sustained. Contact burns represented the second major group with 18.7%, and chemical burns the third, at 10.5% of all burns. Open-fire burns, electrical and ultraviolet burn appeared in minor frequencies — 5.1%, 4.3% and 3.1% respectively [Figure 4].

Cause of burn

Boiling water was the most common agent, causing 33.7% of total burns admitted to the ER. Hot coffee or tea were the second common agent and appeared in 17.4% of total burns sustained. These findings were found to be particularly true for the 0–2 year old patients. Other causes of burn were hot instruments or tools (15.2%) and cigarettes (9.3%), while various other miscellaneous agents caused the rest. Among the most frequent causes of contact burns the kitchen oven represented the major cause of burns throughout the year. The stove appeared to be the major cause in the winter, while bonfires were the principal cause in summer.

Area and degree of burn

Most of the patients (77.6%, 219/282) sustained burns on 5% of the total body surface area or less; 13.1% (37/282) sustained burns between 6% and 10% TBSA and the remaining 9.2% (26/282) had more extensive burns. The most common degree of burn was second degree (50%), the next frequent was first-second degree (33%), while first degree (10%), second-third degree (5%) and third degree burn appeared in minor frequencies.

TBSA = total body surface area

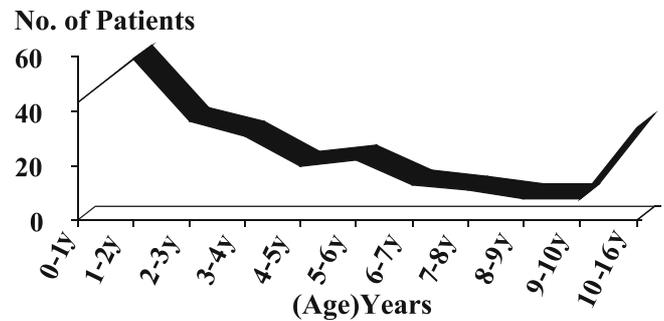


Figure 1. Age distribution of pediatric burn patients

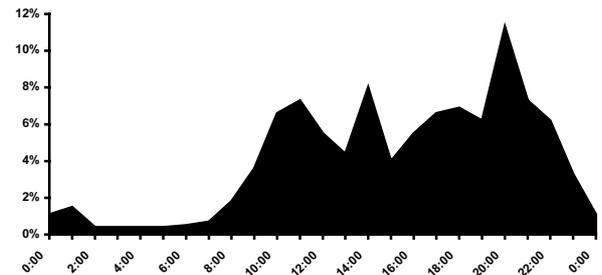


Figure 2. Time of arrival at the emergency room.

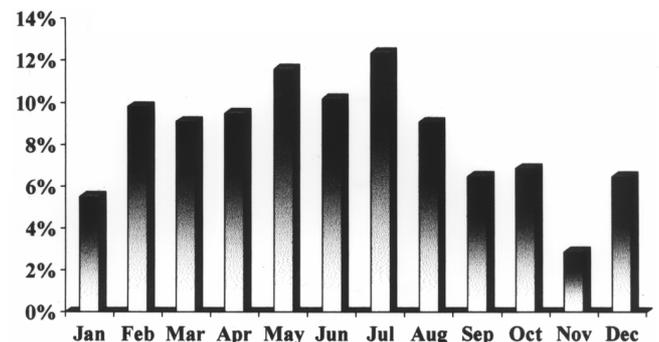


Figure 3. Arrival to the emergency room by time of year.

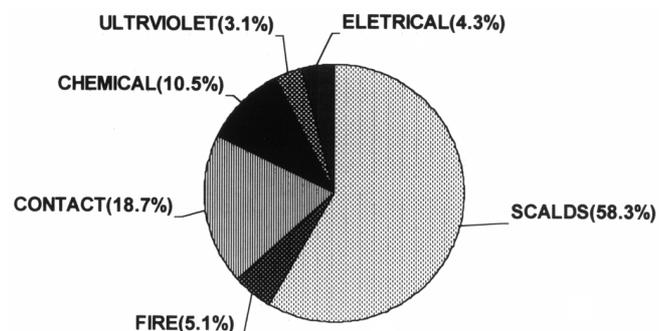


Figure 4. Etiology of burns.

Distribution of burns

The ER charts subdivided the body into four major units: head and neck, trunk, upper limbs, and lower limbs. Each anatomical unit was considered as 100% and distribution of burns was calculated accordingly (in a few cases accurate localization was not specified in the chart, thus not reaching the entire 100%).

- **Head and neck.** The most frequent facial area involved was the periorbital area (36% of total burn injuries to the face). The neck was involved in 23% of patients. Cheek and ears were less involved (11% and 10% respectively), and the least involved were other head and neck areas (20% in total).
- **Trunk.** The distribution of burns in this area was as follows: chest (46%), abdomen (27%), back (13%), buttock (5%), groin (3%), and flank (2%). Genitalia and the perineum area were involved in 4% of total burns sustained.
- **Upper Limbs.** Distribution in the upper limbs was as follows: shoulder (24%), elbow (9%), arm (22%), forearm (16%), wrist (6%), hand (7%), finger 1 (6%), finger 2 (5%), finger 3 (1%), finger 4 (1%), and finger 5 (3%).
- **Lower Limbs.** Distribution in the lower limbs was as follows: thigh (41%), knee (11%), calf (13%), ankle (10%), and foot (23%); toes were not specified on the chart.

Inhalation injury

For a diagnosis of smoke inhalation we used the following criteria: history of an enclosed space injury, perioral and/or oropharyngeal burns, an altered level of consciousness, signs of respiratory distress, carboxyhemoglobin above 5%, and pathological findings on bronchoscopy examination [4]. Nine (3%) of the 282 burn patients had symptoms of inhalation injury. There was one case of mortality among these patients.

Admission versus discharge data

The admission to hospital ratio of pediatric patients between burn and general trauma was 3:1 respectively, 22.9% burn versus 6.4% general trauma.

Mortality

During the one year study period three deaths occurred (all males). The cause of these deaths was open-fire wounds. Smoke inhalation injury involved one patient.

Discussion

Pediatric burn injuries represent a specific niche in the epidemiology of all burns. Pediatric patients are at a higher risk of mortality, especially if an inhalation injury is involved. Treatment is complex and requires a multidisciplinary team approach to cope with the unique problems in this group of patients. Thus, a national program for burn and house-related accident prevention was instituted in Israel 15 years ago. Based on previous epidemiological studies and reported in the literature [8], this program has

contributed both to children's awareness of risks and to injury control in Israel.

The present study has outlined the profile of the burn patient admitted to the emergency room at Schneider's Children Medical Center. It compares burn injury to different general trauma injuries arriving to the pediatric ER, and outlines the pattern of burns in this region. Our demographic data results were found similar to those of other developed countries [9–14].

Distribution by gender among the patients showed a ratio of 2:1 males vs. females (data that appeared also for general pediatric trauma admitted to our ER). We found that the high risk burn patient group (17.8%) was 13–18 months age. We attributed these specific findings to the physical change occurring in the infant, resulting in major risks for different types of trauma. It appears that at this period of the infant's life, as he or she becomes more mobile and capable of newly acquired abilities, the child is more exposed to trauma, the most common of which are burns. The presumed reason for this is the fact that the infant and his environment are not sufficiently cognizant of these newly acquired capabilities.

Scald burns from boiling water were the most frequent type of burn. Most burn injuries occurred indoors, particularly in the kitchen or its adjacent environment. Since this area of the house is the most dangerous for pediatric patients, certain prescribed steps should be taken to prevent the possibility of burn injury.

We noted four peaks of arrival to the ER during the day and night. We suggest that these peaks correlate to "rush hours" at home. Arrival time at the ER was mostly around 10:00 at night, which we interpreted in relation to dinner-time when the kitchen is the center of high activity. Clearly, vigilance and extra care are demanded.

We found that wintertime exposes Israeli pediatric patients to burns from heaters and hot bath water, while in the summer they are exposed to bonfire burns. Similar findings have been described elsewhere [4,15].

The body distribution of burns in the pediatric patient showed a typical pattern in which the most exposed body areas were the head and neck, chest, abdomen and upper limbs. Since most of the burns were scalds (boiling liquids), we compared that pattern of distribution to a "cascade" in which liquid was poured from above (head) towards distal areas. Diminished involvement of articulations is interesting and we interpreted this to mean the minor surface areas affected; in other words, a flexion reflex hides the mobile parts and thus diminishes the probability of burns.

Regarding admission for other types of trauma, our admission rate for burn patients was conspicuously higher. We understand this to reflect a more permissive attitude towards the pediatric burn patient on the part of the examining physician in the ER.

In conclusion, we have delineated the most vulnerable pediatric group presenting to our ER. This group, pediat-

ric burn patients, was found to comprise mostly males aged 13 to 18 months old. We also describe the causes and location where most burns occur. We believe that our data may contribute to targeting prevention efforts towards this vulnerable group.

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