

Burns in Israel: Demographic, Etiologic and Clinical Trends, 1997–2003

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Abstract

Background: Burns are a major public health problem, with long hospitalization stay in both intensive care units and general wards. In Israel about 5% of all hospitalized injuries are burn injuries. There are no long-term epidemiological studies on burn injuries in adults in Israel.

Objectives: To identify risk factors for burn injuries and provide a starting point for the establishment of an effective prevention plan.

Methods: We analyzed the demographic, etiologic and clinical data of 5000 burn patients admitted to the five major hospitals with burn units in Israel during a 7 year period (1997–2003). Data were obtained from the records of the Israeli National Trauma Registry. The differences between various groups were evaluated using the chi-square test.

Results: Male gender was twice as frequent as female gender in burn patients (68.0% vs. 31.9%), and non-Jewish ethnicity was more common when considering their proportion in the total population (62.3% vs. 36.8%). Second and third-degree burns with body surface areas less than 10% constituted the largest group (around 50%). The largest age group was 0–1 years, constituting 22.2% of the cases. Inhalation injury was uncommon (1.9%). The most common etiologies were hot liquids (45.8%) and open fire (27.5%). Children less than 10 years old were burnt mainly by hot liquids while the main cause of burns for adults > 20 years old was an open flame. The majority of burns occurred at home (58%); around 15% were work related. The mean duration of hospitalization was 13.7 days (SD 17.7); 15.5% were in an intensive care unit with a mean duration of 12.1 days (SD 17.1). Surgical procedures became more common during the period of the study (from 13.4% in 1998 to 26.59% in 2002, average 19.8%). The mortality rate was 4.4%. We found a strong correlation between burn degree and total body surface area and mortality (0.25% mortality for 2nd to 3rd-degree burns with less than 10% TBSA, 5.4% for 2nd to 3rd-degree burns with 20–39% TBSA, and 96.6% for burns > 90% TBSA). The worst prognosis was for those over the age of 70 (mortality rate 35.3%) and the best prognosis was for the 0–1 year group (survival rate 99.6%).

Conclusions: The groups at highest risk were children 0–1 years old, males and non-Jews (the incidence rate among non-Jews was 1.5 times higher than their share in the general population). Those with the highest mortality rate were victims of burns > 90% TBSA and patients older than 70. Most burns occurred at home.

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Israel they constitute about 5% of all hospitalized trauma cases (Israeli National Trauma Registry).

Israel has five specialized burn units located in tertiary referral centers. However, due to geographic proximity, most burn patients arrive directly at one of these centers and are not referred from other small hospitals, thus representing the variety of burn patients in Israel.

A large percentage of burns occur accidentally [1], which could be minimized by effective prevention plans. These plans are based on the identification of major risk groups (ethnic, social, etc.) and on safety pitfalls. In Israel, these data have been systematically collected and analyzed, but plans and follow-up did not reach the proposed goals. Therefore, data regarding the period 1997–2003 were re-extracted in an effort to identify risk groups and devise a new prevention plan. We present pertinent demographic, etiologic and clinical data essential for establishing such a prevention plan.

Patients and Methods

We analyzed data of 5000 consecutive burn patients admitted for at least one day to one of the five major hospitals with burn units in Israel: Sheba (Tel Hashomer), Hadassah (Jerusalem), Soroka (Beer Sheva), Rabin (Beilinson Campus, Petah Tikva), and Rambam (Haifa) during a 7 year period (1997–2003). Data were obtained from the records of the Israeli National Trauma Registry, which is run by the National Center for Trauma and Emergency Medicine Research at the Gertner Institute for Epidemiology and Health Policy Research, Sheba Medical Center, Tel Hashomer.

In the Trauma Registry, demographic and clinical data are collected on specific pre-defined forms for all participants by dedicated study personnel. These include the nature and mechanism of trauma, various degree indices, prehospital and in-hospital evaluation and initial treatment, medical and surgical management, and procedures performed. We analyzed demographic factors (age, race, gender), etiologic and clinical characteristics (severity of burn, inhalation injury, treatment, ICU admission), and outcome. The total body surface area percentage index was used to define burn severity.

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TBSA = total body surface area

Burn injuries represent a significant public health concern in developed and developing countries, due to the increased length of stay in both intensive care units and general wards [1-3]. In

Results

During the period surveyed (1997–2003), 5000 burn patients were hospitalized for at least one day in one of the five major burn centers in Israel (with or without accompanying injuries).

Demographic characteristics

Gender: Between 1997 and 2003 the distribution of burns according to gender remained almost constant with a clear male predominance. The mean incidence of male gender among burn patients was 68.0% (64.7–70.8%).

Ethnicity: A clear majority of Jewish patients was observed throughout the years. The mean incidence of Jewish descent was 62.3% (58.6–65.8%). However, 80% of the general population in Israel is of Jewish descent, therefore non-Jews comprise a larger group than expected (20% of the general population, 36.8% of burn patients; $P < 0.0001$)

Age: Throughout the entire period infants up to 1 year old comprised the largest age group, with a mean incidence of 22.2% of cases, and infants 2–4 years old comprised 14.8% of the burn patients. We noted a rough negative correlation between age and the percentage of cases: 0–1 years old 22.2%, 2–4 years 14.8%, 5–9 year olds 7.7%, 10–19 years 12.2%, 20–29 years old 14.4%, 30–39 years 9.9%, 40–49 years 8.0%, 50–59 years 6%, 60–69 years old 6%, and ≥ 70 years 3.0% [Figure 1]. That correlation remained constant throughout the entire period.

Etiology and circumstances

Etiology: Hot liquids accounted for 45.8% of burns (39.9–51.2%), an open flame was the second most common cause with a mean incidence of 27.5% (23.9–32.8%); the rates of other causes were much lower [Figure 2]. Figure 3 shows the percentage of the two most common etiologies (hot liquids and open flame) in different age groups. Children under 10 years old (both Jewish and non-Jewish) were injured mainly by hot liquids, while adults over the age of 20 were burnt mainly by an open flame. Jewish teens present a pattern that is between that of children and that of adults (liquids/flame), while non-Jewish teens follow the adult pattern (injured mainly by open flame).

Circumstances: The majority of burns occurred at home (58%); 14.9% were work related (10.2–22.0%).

Clinical characteristics

Total body surface area percentage and degree: Small ($< 10\%$ TBSA) second and third-degree burns accounted

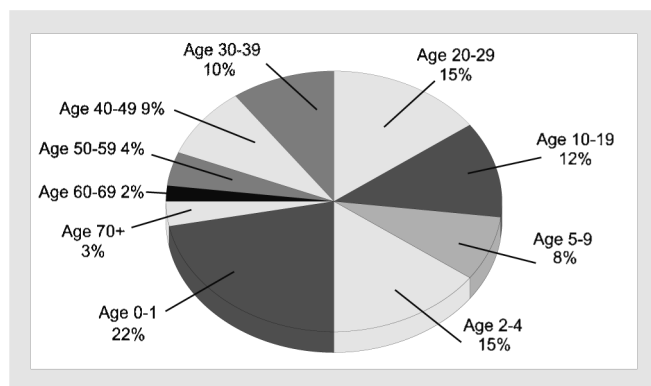


Figure 1. Age: the distribution of burns in various age groups did not change throughout the duration of the study. The two major age groups are 0–1 years and 2–4 years.

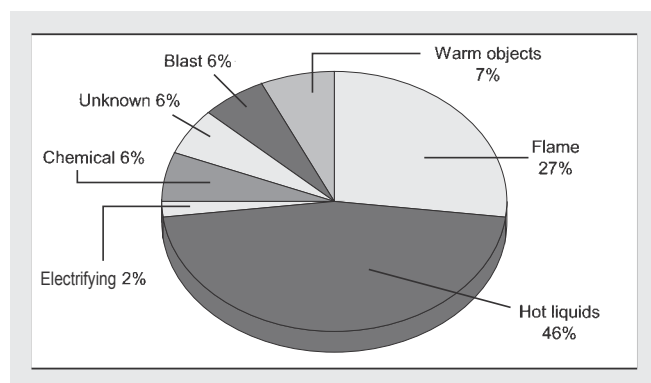


Figure 2. Cause: hot liquid was the major cause of burns, followed by direct contact with open fire.

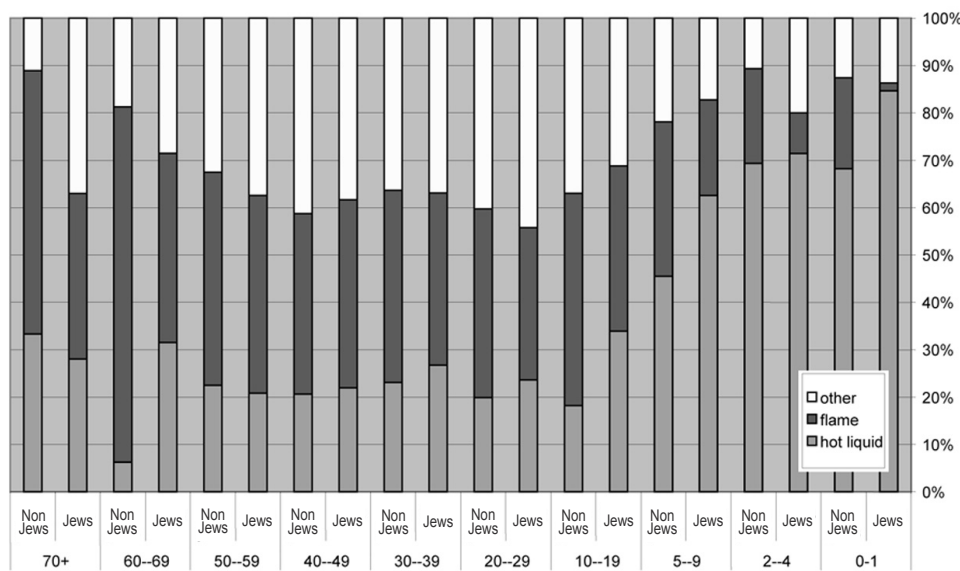


Figure 3. Correlation between etiology and age: the age group 10–19 years reflects differences between ethnic groups.

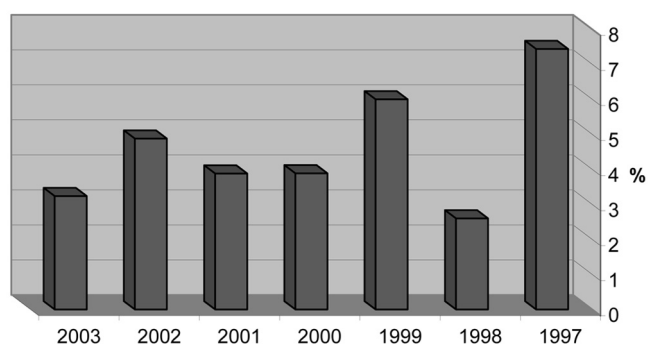


Figure 4. In-hospital mortality: throughout the studied period the trend changed and a more interventional approach has been adopted and mortality rates have decreased. However, it is not clear whether this change is a direct consequence of this interventional approach.

for about half of the hospitalizations in the survey period (mean 56.0%); 18.4% were 10–19% TBSA 2nd and 3rd-degree burns, with no significant change in these groups throughout the years. We noticed a statistically significant decrease in the percentage of 2nd and 3rd-degree burns larger than 30% TBSA – from 14.7% in 1997 to 9% in 2003 ($P < 0.0001$).

Inhalation injury: inhalation injury was uncommon. The mean percentage of burn patients with inhalation injury was 1.9% (1.0–2.9%; inhalation injury cases without accompanying burn or other trauma are not included in the Trauma Registry).

Hospitalization, procedures, and mortality: The mean duration of hospitalization was 13.7 (SD 17.7) days and has not changed significantly. An overwhelming majority of patients (mean 84.5%) were not admitted to ICUs or similar units (a finding that coincides with the low TBSA% shared by most patients). The mean duration of stay in intensive care units for burn patients was 12.1 days (SD 17.1).

Surgical procedures became more common over the reviewed years: the lowest percentage was in 1998 (13.4%) and the highest in 2002 (26.6%). This surge in operations was statistically significant ($P < 0.0001$). The mortality rate changed in the opposite direction [Figure 4] during the corresponding years, with a significant trend toward lower rates ($P = 0.04$). These two trends had no statistically significant correlation between them.

There was a correlation between the degree of burn and the state of the patient on discharge. Among patients with 2nd to 3rd-degree burns, 99.75% of those with less than 10% TBSA were alive on discharge, compared to 62.3% with 40–89% TBSA and only 3.5% of patients with > 90% of body surface ($P < 0.0001$). The worst outcome according to age was for those over 70, with 35.3% mortality, and the best outcome was in infants aged 0–1 years with survival rates of 99.6% ($P < 0.0001$).

Discussion

The main findings of our study are that young age, male gender and non-Jewish ethnicity are risk factors for burns in Israel. These results correlate with those of Goldman et al. [4] whose data related to childhood burns in Israel during a 7 year period. Home

is the primary venue for burns and hot water is the main cause. The majority of burns are small (< 10% TBSA) and inhalation injury (as an accompanying insult) is rare. The demographic and clinical data have not changed drastically over the reviewed years. Surgical interventions have become more common and mortality rates have decreased, without any evident correlation between these two trends.

Risk factors

Young age was the most striking for burns in Israel. The largest age groups among burn patients in Israel were 0–1 years (22.2%) and 2–4 years (14.8%). This finding matches data from developed countries and differs from data on developing countries, where the largest age group is 2–5 years [1,5-7].

Males accounted for 68.0% of patients. This finding correlates with most reported studies [2,8-10], although opposite findings have been published [2,11,12].

The non-Jewish population, which constitutes 20% of the general population, accounted for about 35% of burn patients. We therefore concluded that non-Jewish ethnicity is a risk factor for burns in Israel. The non-Jewish population (mainly the Bedouin), like ultra-Orthodox Jews, come from a low socioeconomic background. Both communities are more likely to suffer burns due to the fact that they have large families and as a result the younger children lack adult supervision. Among the Bedouin, the physical surroundings are potentially hazardous, with an open fireplace used for either cooking or heat. Among the ultra-Orthodox, the electric hot plate and large water urn kept just below boiling point during the entire 24 hours of the Sabbath is an important risk factor for burns, as also reported in other studies [13]. Despite recommendations proposed in that study for a safety device attached to the Sabbath hot plate, no changes have been instituted. However, we assume that public awareness must have increased in this community, since there was a statistically significant decrease in burns caused by direct contact with a hot object (8% in 1997 to 4.36% in 2003, $P < 0.0001$).

As we have shown in this study there is a correlation between ethnicity and the etiology of burns in teens. Jewish teens follow a pattern that is compatible with a change from children to adults, while non-Jewish teens follow an adult pattern. The social role of the teen in the different ethnic groups might offer an explanation for this interesting finding. In Jewish society, as in other western societies, the social role of the teen is between that of a child and that of an adult (in all aspects of everyday life), hence the unique distribution of causes of burns. In contrast, the non-Jewish teen takes on adult roles in all aspects of everyday living at very early stages, hence the “adult” distribution of burn etiologies. The authors suggest that this pattern can be found in other traditional societies as well.

Settings

Most burn injuries occur at home (mean 58%). Recent studies have reported a tendency towards increased frequencies of self-inflicted burns among men and women [3], with mortality rates of 18–84% [3,7,14,15]. We did not encounter such a trend. The most

common etiology was hot liquid (scalds), with a mean incidence of 45.8, followed by fire (27.5%). This finding does not correlate with other studies, which identified fire as the main cause [1,5-9]. This discrepancy could be partly explained by cultural differences (for example, due to the Jewish religious restriction against lighting fire on the Sabbath, it is customary to use a large urn that is kept almost boiling throughout the Sabbath), or by the lack of water temperature-restricting devices in Israel. However, further research is needed to deliver a comprehensive solution to this problem.

Procedures and outcome

Since the demographic and clinical data remained mostly unchanged throughout the reviewed period (second and third-degree burns have decreased, however they constitute a minority of burns), we hypothesized that the decrease in mortality that we observed was also due to an improvement in management. The non-surgical management could not be assessed in this study, but we did note a tendency in recent years towards a more aggressive approach. This finding led us to believe that the increase in surgical procedures accounted for the improved survival rates. This assumption was not supported by our data and we could not demonstrate a clear correlation between surgery and outcome. However, this disappointing finding could be due to the short duration of our study.

Prognostic factors

The overall mortality rate was 4.4%. Our results concur with others in demonstrating two main negative prognostic factors: high percentage of involved body surface area [5-8,16,17], and old age [1]. These two factors were associated with high mortality rates, especially in the extremities (age over 70 years and TBSA > 90%)

Limitations

This study is a retrospective study; to strengthen our findings a prospective study is needed. Our inability to show a connection between surgical intervention and outcome is probably due to the short period reviewed; a longer review would indeed show that an increase in surgical procedures improves outcome. In order to fully assess the contribution of surgical management to outcome, more specific data are needed (including timing of surgery, graft take rates, etc.). Furthermore, the data collected in this paper were obtained only from the five major burn centers in Israel; there are no data regarding non-hospitalized burn patients and the remaining burn victims who arrived at other hospitals.

Conclusions

We sought to identify risk factors and risk groups in order to establish a prevention plan to minimize both burns and their resulting morbidity. We found that the groups at highest risk were children aged 0-4 years, males and non-Jews (low socioeconomic class). These populations will have to be approached and the safe handling of hot water and other domestic hazards addressed.

We believe these findings emphasize the immediate need to raise the awareness of the populations at risk by implementing

educational programs in schools, kindergartens, day care centers, community clinics, traditional community centers (mosques and synagogues), obstetrics departments, and among social workers. As a result of our findings, a bill limiting tap water temperature to 50°C and mandating the installation of safety devices for water heaters was passed in the Knesset (Israeli parliament).

We believe that updated burn data conveying a realistic picture and objective analysis of burn injuries in Israel should be published every year. This kind of database can provide the authorities with an up-to-date status of burns and could be the base for future prevention programs that can be modified periodically. Furthermore, such a database can enable a comparison of the quality of treatment in the different medical centers, which will enable improvements to be made.

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