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Epidemiology and outcome analysis of burn patients admitted to an Intensive Care Unit in a University Hospital

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ABSTRACT

Objectives: To describe the epidemiologic aspects of burn victims who were hospitalized in the Intensive Care Unit (ICU) at the Burn Center in the University Hospital of the State University of Londrina (UEL).

Methods: A longitudinal retrospective study was conducted, involving patients admitted to the Intensive Care Unit of the Burn Center from January 2010 to December 2012. Demographic and diagnostic data including the diagnosis of the extent and causes of the burns, complications resulting from the burns and the need for specific surgical interventions were collected, together with data for the calculation of the Acute Physiology and Chronic Health Evaluation (APACHE II), Sequential Organ Failure Assessment (SOFA), Therapeutic Intervention Scoring System (TISS-28) and Abbreviated Burn Severity Index (ABSI). Data were collected at admission and daily until discharge from the burn Intensive Care Unit. Risk factors for death and the prognostic performance of scores to predict mortality were analyzed. The level of significance was set at 5%.

Results: Two hundred ninety-three patients were analyzed in the study; 68.30% were men, with a median age of 38 years (interquartile range: 28–52). The mean total body surface area burned was $26.60 \pm 18.05\%$. Home incidents were the most frequent cause, occurring in 53.90% of the cases. Fire was the most common cause, found in 77.10% of patients. Liquid alcohol was the most common agent and was associated with 51.50% of the cases. The ABSI presented a median of 7, and the area under the ROC curve was 0.890. In multivariate analysis, age ($p < 0.001$), female gender ($p = 0.02$), total body surface area burned ($p < 0.001$), mechanical ventilation ($p < 0.001$) and acute renal failure ($p < 0.001$) were all associated with mortality. ICU mortality was 32.80%, and hospital mortality was 34.10%.

Conclusion: Burns most often occurred in young adult men in our study. The most common cause was a direct flame. Liquid alcohol was the most frequent accelerating agent. Patients

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were considered to be severely burned. Most of the samples had a high mean total body surface area burned. The ABSI score showed the best performance in discriminating non-survivors. Hospital mortality rate was high.

1. Introduction

Loss of skin integrity by injury or disease can result in important physiological imbalance, serious dysfunction or death. The most common causes of skin loss are burns, trauma and chronic wounds. A severely burned patient poses a challenge for a multidisciplinary therapeutic approach and has a great social impact because it affects a wide age range, including young adult patients of working age, and often leaves permanent sequelae [1]. The severity of a burn is mainly related to the total body surface area (TBSA), lesion depth and extreme ages. Inhalation injury is also described as one of the main factors that are associated with increased mortality [2].

According to the World Health Organization (WHO), approximately 11 million victims of burn per year need specialized care worldwide, becoming the fourth leading cause of direct trauma. It is estimated that a direct flame is responsible for 300,000 deaths each year. Although mortality from burns has been reduced in recent decades, 90% of the deaths occur in low and middle income countries. Risk factors for the occurrence of burns include socioeconomic status, race, ethnicity, age, gender, environment, comorbidities, regional factors and intent of injury, e.g., in homicide or suicide cases [3].

In Brazil, according to the Brazilian Society of Burns, about one million incidents involving burns occur each year, resulting in approximately 100,000 hospitalizations. The mortality rate from burns by flames in Brazil is 0.8/100,000 population/year, resulting in 1600 deaths per year [4]. Specialized units for burn treatment are scarce and unevenly distributed in Brazil. Of the 46 existing units in the country, 25 are concentrated in the southeast region [5].

Epidemiological studies with Latin American and especially Brazilian data are scarce, justifying an epidemiologic study with regional data. The present study was designed to answer questions about the most frequent causes of burns, clinical characteristics of patients and risk factors for death.

2. Methods

A longitudinal and retrospective study involving patients admitted to the Intensive Care Unit of the Burn Center of a University Hospital was conducted from January 2010 to December 2012. The Burn Center is composed of sixteen beds distributed in six Intensive Care Unit (ICU) beds and 10 ward beds, one emergency room and one operating room. All patients who were consecutively admitted in the six-bed ICU were included in the study period. Exclusion criteria were length of ICU stay less than 24 h, patients aged less than 18 years, patients admitted for surgical interventions of late sequelae of burns, Stevens–Johnson syndrome and other skin diseases.

2.1. Description of burn care in the ICU

ICU support includes individualized rooms, fluid resuscitation guided by the modified Brooke formula, individualized sedation and analgesia and nutritional support.

At ICU admission, patients are evaluated by plastic surgery staff and are submitted to the first debridement procedure. Daily dressing changes are performed by applying 1% silver sulfadiazine and using essential fatty acids or silver-containing dressings. If the patient can be transported to the operating room, dressing changes are performed under general anesthesia; otherwise, dressing changes are performed in the ICU bed under endovenous analgesia. Tangential excision and skin grafting are performed when clinical and hemodynamic status is established and infection is not present. Ten to 15% of the burned area is usually operated upon in one sitting.

Inhalation injury is suspected in patients with a history of a close-space fire and facial burns with singed nasal hair, carbonaceous sputum, hoarseness, stridor or labored breathing. Bronchoscopy is performed in patients suspected to have inhalation injury. If bronchoscopy is not available, patients are submitted to a direct examination of the oropharynx followed by laryngoscopy. If edema or blistering is seen during the laryngoscopic exam, patients are submitted to intubation. Intubation and mechanical ventilation are indicated if inhalation injury with respiratory distress is present or anticipated.

2.2. Data collection

Data were collected and analyzed from patient's charts and the electronic hospital database. Demographic and clinical data were collected at study entry. These data included age, gender, date of hospital admission, date of ICU admission, date of burn, total body surface area burned, causal agent and chronic diseases. Vital status, date of hospital discharge, length of stay in the hospital and ICU were noted.

Prognostic scores were calculated during the ICU stay. At ICU admission, we collected data to calculate the Abbreviated Burn Severity Index (ABSI) [6] and the Acute Physiology and Chronic Health Evaluation (APACHE II) score [7]. Additionally, during the ICU stay we collected the Sequential Organ Failure Assessment (SOFA) [8] and the Therapeutic Intervention Scoring System (TISS 28) [9] daily.

The extent of the burn was calculated using the Lund and Browder chart at admission [10]. Burns were classified as small, medium and large according to the criteria proposed by the Brazilian Society of Plastic Surgery guidelines [11]. Inhalation injury was suspected in patients with the following