

BURN PATIENTS;

Causes of death and factors affecting mortality a 4 years study at a tertiary care hospital

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ABSTRACT... Aim: To determine major risk factors of mortality and causes of death in patients presented with burn injury. **Study design:** Prospective Descriptive Study. **Setting and duration:** Department of Burns and Plastic Surgery, Khyber Teaching Hospital, Peshawar, Pakistan from April 2008 and June 2012. **Methodology:** A prospective descriptive study was performed among the patients who admitted to the Department of Burns and Plastic Surgery, Khyber Teaching Hospital, Peshawar, Pakistan between April 2008 and June 2012. All relative information was collected through a detailed proforma and patient's treatment files. Patients of any age, any degree of burns and burns exceeding 10% TBSA were included. Patients presenting after more than one week post burn or patients referred from other hospitals were excluded. Within this period, demographic data, treatment, and outcomes of treatment were reviewed and analyzed. Survivors and non-survivors among burn patients were compared to define the predictive factors of mortality. **Results:** Between April 2008 and June 2012, 1850 patients were admitted with burn injuries. There were 1150 male patients (62%) and 700 female patients (38%). Mean age was 36 years with range of 1-70 years. Inhalation injuries were present in 45 patients (2.40%). Causes were flame burns (65.0%), electrical burns (15%), scalds (13%) and chemical burns (7.0%). The total body surface area (TBSA) burn ranged from 10- 100%, with a mean of 38% TBSA burn. Mean length of hospital stay was 12 days (ranging from 24 hours to 170 days). Mortality rate was 11.2%. Higher age, larger burn area, wound infection, longer hospital stay and the presence of multi-system organ failure significantly predicted increased mortality. **Conclusions:** Prevention is a key factor in reducing the morbidity and mortality associated with burn injury. A campaign to educate people that burns can be prevented will be important in our community. The prevention of multi-organ failure and septicemia are likely to be more effective than their treatment.

Key words: Burn, Mortality, Hospital stay, Infection

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INTRODUCTION

Burn injury is very common and affects approximately one per cent of the general population every year¹. Burns account for 5% or more of the total hospital inpatients at any time². In the developing countries, Burns poses significant social, public and medical problem to the families³. Burns are one of the most important causes of disability and mortality both in developed and developing countries⁴. The primary indicators of mortality in burns are advanced age, total body surface area (TBSA) involved and presence of inhalation injury⁵. Factors identified during the course of hospitalization also help to predict accurately the mortality of burns⁶. Burn causes more than 310,000 deaths per year⁷. In developing countries, death rate is estimated to be eleven times higher than in developed countries⁸. The most danger effects of burns are pain, infections, scarring, wound contractures, amputations, psychological trauma and death⁹.

Complex fluid and metabolic changes are the main contributors to adverse outcome in severely burned patients¹⁰. The management of a burn patient needs special intensive care, equipment and well trained educated personnel¹¹. Nowadays, mortality rates following burns have markedly decreased as a result of establishment of specialized burn centres, advances in critical care and anesthetic procedures, early excision and grafting, and use of topical and systemic antibiotics¹². Since most burn injuries are accidental, the best way to reduce the incidence of burn injury is prevention by minimizing the risk factors and public awareness^{13,14}.

We performed a prospective review in order to describe our population, compare results and analyze causes of death following burns at the Burns centre of Khyber Teaching Hospital (KTH) Peshawar catering to a large population from the Khyberpukhtonkhwa, Tribal

areas and Afghanistan.

MATERIALS AND METHODS

A prospective descriptive study was performed among the patients who admitted to the Department of Burns and Plastic Surgery, Khyber Teaching Hospital, Peshawar, Pakistan between April 2008 and June 2012. All relative information was collected through a detailed proforma and patient's treatment files. Patients of any age, any degree of burns and burns exceeding 10% TBSA were included. Patients presenting after more than one week post burn or patients referred from other hospitals were excluded. Survivors and non-survivors among burn patients were compared to define the predictive factors of mortality. Information was collected on age, sex, type of burn (flame, scald, chemical, or electrical), total body surface area affected, length of hospitalization, and presence of inhalation injury and causes of mortality.

The variables chosen to predict mortality during the hospital course included age, presence of inhalation injury, total burn area, development of infection, flame injuries, presence of multi-organ failure and length of hospitalization. Burn area was estimated from age-appropriate diagrams by one of the attending physicians. The total body surface area burned (TBSAB) was calculated from LUND & BOWDER's chart, adding percentages of dermal and subdermal burns.

RESULTS

The burn patients were analyzed prospectively during 4-years period between April 2008 and June 2012. There were 68% male and 32% female. Mean age was 36 years with range of 1-70 years. 88% of patients sustained burn injury accidentally while 12% were suicidal. Causes were flame burns (65.0%), electrical burns (15%), scalds (13%) and chemical burns (7.0%). The total body surface area (TBSA) burnt ranged from 10- 100%, with a mean of 38% TBSA

burn. Mean length of hospital stay was 12 days (ranging from 24 hours to 170 days). Mortality rate was 11.2%. Two hundred and fifteen (11.62%) patients died during their stay in the burn unit. Fifty five patients (25.25%) presented signs of severe infection at the time of death. The main contributing factors to death in patients without infection were Multisystem organ failure in 134 patients (62.32%) and cardio-respiratory failure in 16 patients (7.44%).

Non-surviving patients were significantly older and had larger burns. There were 37% deaths (n=80) in children less than 2 years and 44% deaths (n=95) in patients older than 50 years while only 19% deaths (n=40) in patients between 2 and 50 years. Non-surviving patients also stayed longer in the unit. With regard to the cause of burn, non-survivors suffered significantly more flame injuries and self-damage. Further, non-surviving patients needed more frequently catheters and blood transfusion. Also, non-survivors had significantly more infectious complications. Forty-five patients (2.45%) had suffered severe inhalation injuries and were intubated; and only eleven of them survived while 34 patients (75%) died. Higher age, larger burn area, wound infection, longer hospital stay and the presence of multisystem organ failure significantly predicted increased mortality. The characteristics of the patients are outlined in tables I and II and figures 1-4 below.

TBSA % Burnt	Cured / Discharged	Expired
10-20%	655 (35.40%)	-
20-30%	405 (21.89%)	-
30-40%	290 (15.67%)	-
40-50%	210 (11.35%)	52 (2.81%)
50-70%	75 (4.05%)	63 (3.40%)
70-100%	-	100 (5.40%)

Table-I. Outcome of patients with respect to TBSA% burnt

Patient Characteristics	Survivors	Non-Survivors
Hospital stay (days)	11 Mean	21 Mean
Causes of Burn		
Flame burns	60%	5%
Electrical burns	11%	4%
Scalds	8.5%	4.5%
Chemical burns	4.5%	2.5%
Inhalation injury	-	2.4%
Causes of death		
Multisystem organ failure	-	62.32%
Septicemia	-	25.25%
Cardiac/respiratory failure	-	7.44%

Table-II. Characteristics of survivors and non-survivors



Figure-2. Age 15 male (Electrical burns 24%)



Figure-1. Age 45 male (Acid burns 45%)



Figure-3. Age 24 female (flame burns 67%)

DISCUSSION

Burn injuries are the major health hazards leading to prolonged hospitalization and hence increased expense for the patients, their families and society¹⁵. The mortality is one of the most important outcome parameters following life-threatening trauma and may serve as a measure for quality of care¹². It has been well established in the literature that burns by a direct flame, especially with smoke inhalation, percentage of total burned body surface and percentage of deep

body surface burned and patient age are significant determinants of the prognosis of burn patients^{16,17,18}. Several authors have proposed that different approaches to burn care may be meaningfully compared using patient age and total burn area as the cardinal determinants of burn mortality¹⁸. Initially, Bull and Squire defined their prediction of mortality after burn based on age and burn area¹⁹.

According to the literature, multisystem organ failure is the leading cause of death²⁰. Over time, various reports have shown progressive improvement in mortality with advances in burn care^{21, 22}. Treatment in specialized burn centers has influenced survival after burns. New and innovative techniques such as early excision and grafting, institution of appropriate nutritional support, aggressive therapy for respiratory injury, and prompt recognition and treatment of burn-related infections have played major roles in burn survival²³.



Figure-4. Age 12 female (flame burns 67%)

Total Body Surface Area (TBSA) burnt is a highly significant variable affecting mortality as shown from our results as well.. The increasing severity of injury through more skin loss exposes the largest burns to more surgical operations and more complications, thus increasing mortality rate. With large burn area, the degree of skin loss renders the available donor skin area very small, and multiple operations using the same area as a donor site will be required to cover the entire, large wound area⁶.

We got 100% mortality in those patients having more than 60% TBSA burnt. The death rate in our study was 11.62% which is more than the overall 5% mortality rate. Our mortality rate is less than the death rate of

19.6% reported in the Tohid burn centre in Tehran²⁴. Mortality rate in our hospital was comparable to similar studies^{24, 25, 26}. Flame, being the most common cause of burn in our study (65%) is associated with more severe destruction of tissues and also accompanied by considerable immunosuppression making the patient prone to infection leading to high mortality²⁷. The other major reason for the greater mortality in our patients is the lack of an intensive burns care unit. The lack of specialized intensive care unit leads to a delay in early tangential excision and skin grafting contributing to greater mortality²⁸.

There is strong correlation between burn mortality and age of the patient as shown in the literature²⁹. We got high mortality rate in children less than 2 years and older than 50 years comparable to similar studies^{22, 29}. Likewise, inhalation injury is also a strong predictor of mortality^{22, 30}. In patients with extensive burns, the co-morbid effect of inhalation injury is largely obscured by that of the burn injury. We got 75% mortality in those patients having inhalation injury showing it a strong predictor of mortality. Similarly, the development of infectious complications in burns has been a significant cause of mortality³¹. Burn injury leads to immunosuppression and increased metabolic rate proportional to the extent of injury. The dysfunction of the immune system, a large cutaneous bacterial load, the possibility of gastrointestinal bacterial translocation, prolonged hospitalization and invasive diagnostic and therapeutic procedures, all contribute to sepsis, making the burn wound different from other forms of trauma²³. According to reports, 75% of all deaths following burns are related to infection³². In our study, we came across 55 cases (25.25%) of death due to sepsis. It is therefore necessary to carry out periodic review of patterns of isolation and susceptibility profiles of microorganisms infecting burn wounds in order to modify the preventive and therapeutic strategies for effective management of burn sepsis. This may also help to reduce mortality rate by preventing the colonization of microorganisms

responsible for septicemia in different burn centers.

Multi-organ failure is one of the leading causes of increased mortality in burn patients. There are multiple foci of infections in burn patients leading to uncontrolled systemic inflammation, multi-organ failure and death²⁰. In our study, multi-organ failure by flame burns caused the greatest number of deaths and was the deadliest among all the causes. This lethality is associated with respiratory lesions that increase the probability of death. In flame burns, total body surface area and inhalation injury are the predictors of death.

CONCLUSIONS

Prevention is a key factor in reducing the morbidity and mortality associated with burn injury. A campaign to educate people that burns can be prevented will be important in our community. The prevention of multi-organ failure is likely to be more effective than its treatment. The prevention requires early wound excision and closure to minimize wound sepsis and inflammation, support of the gut through enteral nutrition, and general hemodynamic support to ensure adequate oxygen delivery to the gut and peripheral tissues.

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