

# A Prospective Analysis of Epidemiology and Outcome in Major Burns Patients at a Tertiary Burn Care Center in North India

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## ABSTRACT

**Background:** The incidence of burn injuries varies from country to country. Burn trauma has been one of the most devastating health problems for all the times. It requires a treatment process including a multidisciplinary approach by experienced burn surgeons and health care professionals in a well-equipped burn unit or center. The aim of this study was to ascertain and analyze the epidemiology and outcome in major burns patients at our center. **Methods:** This prospective study was conducted at Department of Surgery, Hamdard Institute of Medical Sciences and Research, Jamia Hamdard, New Delhi India from April 2017 to July 2019. A total of 627 patients were enrolled in study. The principal investigator obtained the variables of clinical histories from the admission records, case notes, operation details, anesthesia charts, and nursing monitoring charts. Help of a biostatistician was taken for data collection and analysis. The data collected were thoroughly cleaned and entered into MS-Excel spread sheets and analysis was carried out. **Results:** Patient in age group less than 15 yrs were 76 (12%), majority of the patients i.e. 514 (82%) were in age group between 15 and 45 years and only 37 patients (6%) were of age more than 45 years. Most common area of burn was the upper limb in our patients (39.78%), followed by head and neck (24.21%), lower limbs (26.49%) and anterior trunk (9.52%). Of the 627 patients, 167 patients (26.6%) had ARDS (Acute respiratory distress syndrome), 232 patients (37.0%) had septicemia, 465 patients (74.16%) had wound infection (as diagnosed by wound cultures), 123 patients (19.6%) had urinary tract infection, and 12 patients (1.9%) had clostridium difficile colitis. Total of 232 (37%) patients died during their hospital stay. **Discussion:** Age and sex are essential elements of any epidemiological study. The age distribution seen in our study is in concordance with that seen in other studies. In our study 370/627 (59%) patients were males with a male to female ratio of about 1.5:1. Comparing data regarding the gender preponderance, our observations are in agreement with other authors. In our study most common area of burn was the upper limb in our patients (39.78%), followed by head and neck (24.21%), lower limbs (26.49%) and anterior trunk (9.52%). This finding of our study is similar to that of Sadeghi Bazargani et al. **Conclusion:** It is a well known fact that burns are serious but preventable accidents and without recognition of affecting factors we cannot plan any preventive program. Most victims of major burns come from poor, underdeveloped areas. These people have little formal education about burns and are either low skilled temporary workers or unemployed. So the knowledge of affecting factors in relation to demography and epidemiology of patients is a must for proper management of burn victims.

**Keywords:** Burn, Trauma.

## INTRODUCTION

The incidence of burn injuries varies from country to country. According to the most recent statistics compiled by the World Health Organization and the World Fire Statistics Center, fires caused 6.6 million major burn injuries and 400 000 deaths every year. Burn trauma has been one of the most devastating health problems for all the times. It requires a treatment process including a multidisciplinary

approach by experienced burn surgeons and health care professionals in a well-equipped burn unit or center. The victims of burn events face several physical, psychological and social problems that challenge their return to life. The main purpose of rehabilitation in these people is returning them to their previous life situation. In this regard, consequences are considered one of the determinant scales for the pursuit of caring and rehabilitating programs.

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### Aim

The aim of this study was to ascertain and analyze the epidemiology and outcome in major burns patients at our center.

## MATERIALS AND METHODS

This prospective study was conducted at Department of Surgery, Hamdard Institute of Medical Sciences and Research, Jamia Hamdard, New Delhi from August 2013 to July 2015. A total of 627 patients were enrolled in study. The following criteria was used for admission: The criteria for admission of patients who had sustained burns were : any patient who had sustained > 10% TBSA second-degree burns, third-degree burns of any degree, inhalation injuries, electrical burns, and chemical burns. Outpatients with minor burns were excluded from the study group.

The severity of burn injury was assessed by "abbreviated burn severity index (ABSI)" score. Both peripheral and central venous lines were placed for fluid transfer. Initial fluid resuscitation of patients was calculated by the Parkland formula. The purpose of fluid replacement was to maintain adequate tissue perfusion and oxygenation. The Parkland formula was used to calculate the resuscitation volume: the amount of Lactated Ringer solution fluid (ml) required in the first 24 hours after the injury was  $4 \text{cc} \times \text{patient's weight (kg)} \times \text{TBSA percentage of burn}$ . Half the volume was given in the first 8 hours after the injury. It was important to remember that the volume calculated must be given from the time of injury. Urine output of 30cc to 50cc per hour for adults and greater than  $1 \text{cc} \times \text{patient's weight (kg)}$  per hour for children proved an excellent guideline for adequate fluid resuscitation. Intravenous antibiotic in the form of amoxicillin clavulanic acid 1.2 grams 8 hrly, alongwith tramadol for analgesia and proton pump inhibitors were administered after admission. As burn wounds are prone to tetanus, any patients with an unknown immunization status required hyperimmune serum, whereas patients immunized within the previous 5 years did not. Patient history was important when assessing the extent of the injuries and thus epidemiologic data was gathered to identify the patient's age, sex, and origin, as well as the circumstances, time, type, depth, TBSA, and any prior treatment of the burn.

Inhalation injury was suspected in all patients with flame burns; hoarseness, expiratory wheezing, and carbonaceous sputum were all positive signs of an inhalation injury. The initial biological assessment served as a reference and included daily determination of hematocrit levels, albumin, renal function, and electrolytes to assess the effectiveness of hydration. ECG tests were conducted on patients with electrical burns. The burnt surface of skin was subjected to closed dressing by using topical antimicrobial dressings, with silver sulfadiazine applied locally over greasy gauzes, to prevent skin microbial contamination. Dressings were renewed every 3 days in aseptic conditions.

## Data collection procedure

Institutional ethical committee approved the study. The principal investigator obtained the variables of clinical histories from the admission records, case notes, operation details, anesthesia charts, and nursing monitoring charts. Help of a biostatistician was taken for data collection and analysis.

## Statistical analysis

The data collected were thoroughly cleaned and entered into MS-Excel spread sheets and analysis was carried out.

## RESULTS

A total of 627 patients were admitted and analyzed in this 2 year prospective study.

Based upon age and sex, there was wide distribution of age. The age of patients ranged from 6 months to 90 years. Patient in age group less than 15 yrs were 76 (12%), majority of the patients i.e. 514 (82%) were in age group between 15 and 45 years and only 37 patients(6%) were of age more than 45 years [Figure 1]. Out of 627 patients, 370(59%) were males and 257(41%) were females. Rural patients were 468 and urban patients were 160. When the religion of patients was analyzed it was found that 288 (46%) were Hindus, 326 (52%) were Muslims and 13(2%) were Sikhs in this study.

In this study, 125 (20%) patients sustained <15% TBSA (total body surface area), 282 (45%) patients sustained 15-45% of TBSA burns, and 220 (35%) sustained > 45% TBSA burns. The mean and median total body surface area of burns was 56% ( $\pm 10.2$ ) and 54%. We found a significant difference in the TBSA of the burns suffered by victims of different social backgrounds. Burns > 45% TBSA were more common in housewives. Most common area of burn was the upper limb in our patients (39.78%), followed by head and neck (24.21%), lower limbs (26.49%) and anterior trunk (9.52%). It has been shown in [Figure 2]. Timewise distribution of burn cases was ascertained to know the time of burn and type of burn sustained. It was found that accidental burns most commonly occurred during night and early morning. Suicidal burns occurred mostly in evening. Males sustained burn injury mostly during night and females sustained it during day time.

Burns <15% TBSA were common in working class especially electricians. Scald burns were more common in the pediatric population. With regards to the causative agent, 439 patients (70%) sustained flame burns, 112 (18%) sustained scald burns, 57 (9%) sustained electrical burns and 19(3%) sustained chemical burns [Table 1]. Modality of flame burns was also analysed. Out of 439 patients who sustained flame burns, 168 had sustained it due to kerosene lamp, 124 due to LPG leakage and kitchen related burns, 98 patients had burns due to diesel and petrol related fires and 49 patient had matchstick related fire.

When place of sustaining burns was analyzed it was found that 567 out of 627 patients (90.4%) sustained burns in closed space. Out of these 357(57%) sustained burns while working in kitchen and 270(43%) sustained burns in open space. On analyzing the reason of burns, 560 (90%) sustained accidental burns, 38 (6%) sustained suicidal burns, while 24 (4%) sustained homicidal burns. Risk factors for burns in patients enrolled in the study was also noted. Ill-equipped and inadequately insulated lineman/electrician was found in 12 patients, epilepsy in 25 patients, drug addiction in 47 patients, depression in 145 patients. No risk factor was associated in 398 patients [Figure 3].

Surgical procedures 250(40%) had their post burn raw areas covered with split skin graft. Tangential excision and grafting was done in 188 patients (30%). 107 patients underwent fasciotomies. All these patients had electric burns. Of the 57 patients with electric burns, 46 patients (80.7%) underwent amputation of upper or lower limbs. Blood transfusions. Patient with <15% TBSA received an average of 3 blood transfusions, patient with 15–45% TBSA burns received an average of 6 blood transfusions, and patient with > 45% TBSA burns received an average of 9 whole blood transfusions.

Complications. Of the 627 patients, 167 patients (26.6%) had ARDS (Acute respiratory distress syndrome), 232 patients (37.0%) had septicemia, 465 patients (74.16%) had wound infection (as diagnosed by wound cultures), 123 patients (19.6%) had urinary tract infection, and 12 patients (1.9%) had clostridium difficile colitis [Table 2]. Most common organisms causing wound infection were Pseudomonas. Most common organisms causing urinary tract infection was E. coli.

Mortality Total of 232(37%) patients died during their hospital stay. Of these 232 patients, 215(92.6%) patients had > 45% TBSA burns. 130 patients (56%) out of these 232 patients died of ARDS, 67 patients (28.8%) died of septicemia, 9 patients (3.8%) died of burn shock, and 26 patients (11.2%) died of multi organ dysfunction syndrome [Figure 4]. The main contributor to ARDS was inhalational injury.

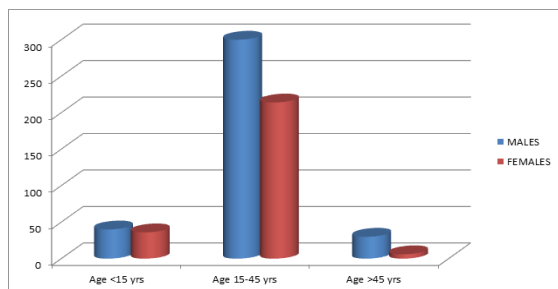


Figure 1: Age and sexwise wise distribution of patients enrolled in study

Duration of hospital stay Mean hospital stay for patient with <15% TBSA burns was 25 days with a

range of 5 to 46 days, 65 for patients with 15–45% TBSA with a range of 21 to 90 days and 72 for patients with > 45% TBSA burns with a range of 30 to 142 days. If we compare hospital stay with the surgical procedure there was a significant difference. The mean and median hospital stay for patients who did not require surgery was 23(±10) days and 21 days. This was significantly less than the length of stay for patients requiring surgery, who had mean and median of 60(±24) days and 70 days.

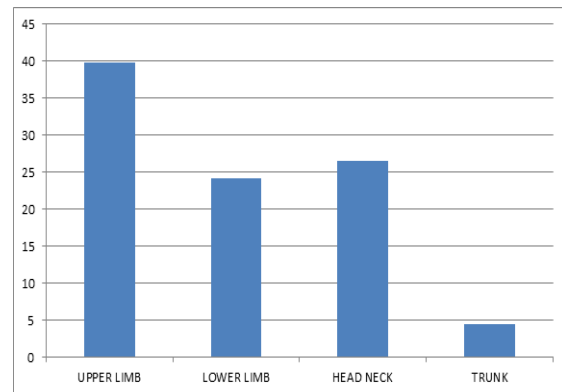


Figure 2: Incidence of burn depending upon area of body

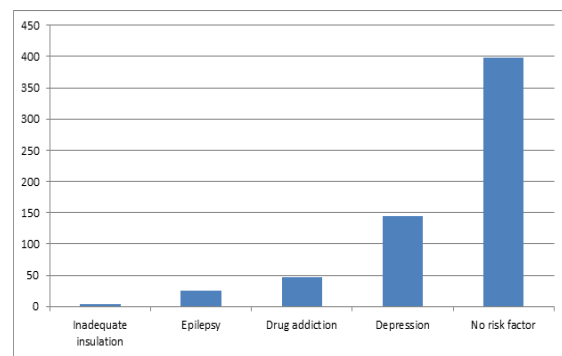


Figure 3: Showing various risk factors associated in the burnt patients.

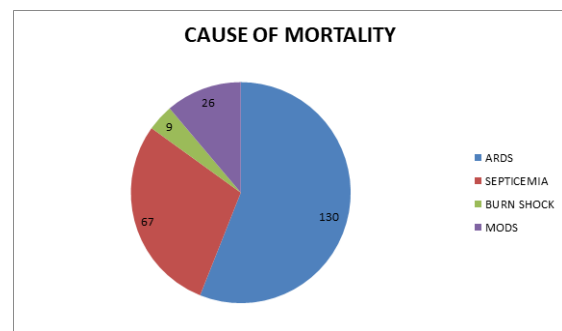


Figure 4: Showing Various Causes Of Mortality

Table 1: Showing number of patients with different causative agents of burns in the study

S. No.	Causative Agent	Number Of Patients	Percentage
1	Flame	439	70
2	Scald	112	18
3	Electricity	57	9
3	Chemicals	19	3

**Table 2: Showing various complications in burn patients**

S. No	Complications	Number Of Patients	Percentage
1	ARDS	167	26.6
2	Septicemia	232	37
3	Wound Infection	456	74.16
4	Urinary Tract Infection	123	19.6
5	C. Difficile Colitis	12	1.9

## DISCUSSION & CONCLUSION

It is a well-known fact that burns are serious but preventable accidents and without recognition of affecting factors we cannot plan any preventive program. Most victims of major burns come from poor, underdeveloped areas. These people have little formal education about burns and are either low skilled temporary workers or unemployed. So the knowledge of affecting factors in relation to demography and epidemiology of patients is a must for proper management of burn victims.

Age and sex are essential elements of any epidemiological study.<sup>[1]</sup> The age distribution seen in our study is in concordance with that seen in other studies.<sup>[2,3]</sup> In our study 370/627 (59%) patients were males with a male to female ratio of about 1.5:1. Comparing data regarding the gender preponderance, our observations are in agreement with other authors.<sup>[4-6]</sup> But this finding of our study varies from findings of other authors where females outnumber males.<sup>[7,8]</sup> This can be due to various social and economical reasons of a particular region. The present study revealed that about half the cases were aged between 15-45 years, confirms other studies.<sup>[9]</sup> High incidence among young adults may be explained by the fact that they are generally active and exposed to hazardous situations both at home and at work. Burns > 45% TBSA were more common in housewives. Indian women wear loose flowing synthetic garments which can catch fire easily and cause extensive burn injury. Cooking appliance was the most common source of injury in females and this finding indicates that women should be very careful all the time. This finding indicates the caution needed when using equipment causing burns. Also there is a need for women at home to be extra careful with their clothes properly tied and the males to know the way to rescue other victims from fire. In our study most common area of burn was the upper limb in our patients (39.78%), followed by head and neck (24.21%), lower limbs (26.49%) and anterior trunk (9.52%). This finding of our study is similar to that of Sadeghi Bazargani et al.<sup>[10]</sup> However certain authors like Mago et al.,<sup>[11]</sup> Forjuoh and Muhammad are of different opinion and describe most common site of burn as legs,<sup>[12]</sup> followed by trunk. In the causes of burn injury, flame was the most common agent affecting more than four-fifth of cases followed by scald and

electrical similar to studies.<sup>[13-15]</sup> The high incidence of flame burn is explained by use of oil for lamps in villages, candle for lighting, substandard kerosene and gas stoves, use of open coal and wood fires chulha for warmth and cooking in villages and use of pressure stoves for cooking in urban areas. This is consistent with the findings of study in developing countries.<sup>[16]</sup> Scalds were observed mostly in children because of the carelessness and restlessness associated with them. Homes were the site of accident, This figure is comparable to other reports from developing countries.<sup>[17]</sup>

Systemic sepsis continues to be a life-threatening condition in burn patients.<sup>[18]</sup> In our study most common, complication was septicemia which is similar to other studies.<sup>[8,11]</sup> In this study 250 (40%) patients had their post burn raw areas covered with split skin graft. Tangential excision and grafting was done in 188 patients (30%). Of the 57 patients with electric burns, 46 patients (80.7%) underwent amputation of upper or lower limbs. Our findings are in accordance with that observed by Ramcharan et al,<sup>[19]</sup> and Mzezewa et al.<sup>[20]</sup>

The high mortality rate 37% may be explained by the high incidence of major flame burns, delay in seeking medical help, higher degree &TBSA of burn, high incidence of septicemia and lack of resources both on part of the patients and the hospital. This compares favourably with the mortality reported in other study.<sup>[21,22]</sup> Mean hospital stay for patient with <15% TBSA burns was 25 days with a range of 5 to 46 days, 65 for patients with 15–45% TBSA with a range of 21 to 90 days and 72 for patients with > 45% TBSA burns with a range of 30 to 142 days. These findings were all nearly similar to a study of Rouzbahani et al.<sup>[23]</sup>

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