

# Retrospective study on early outcome of acute burn injuries treated at Nepal Cleft and Burn Centre of Public Health Concern Trust-Nepal

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## ABSTRACT

**Background:** Nepal Cleft & Burn Center, Kirtipur Hospital, Kathmandu has been providing the acute burn care since 2013 with 10 ICU beds, 32 general beds and two operating rooms. This study analyses the demographics of and early outcome in the acute burn patients.

**Methods:** This is a descriptive retrospective study of the clinical data of acute burn patients admitted from January 1 to December 31, 2014.

**Results:** There were 78 patients from 3 months to 88 years of age with a median age of 29 years. Forty six (58.9%) were females and 32 (41.1%) were males. Most of the injuries (n=57; 73%) occurred inside the house. Flame burn was the commonest mode of injury (n= 48, 61.6%). Only eleven (14.1%) patients arrived on the same day of the injury. The time elapsed was from 1 to 67 days with a median of 5 days. Only two (2.5%) patients had poured water for more than 20 minutes. Range of total body surface area (TBSA) involved was 1% to 70% with a median of 12%. Range of hospital stay was 1 to 105 days with a median of 17 days. Sixty (76.9%) patients underwent 102 surgical operations. Twenty six (33.3%) patients needed blood transfusion. A total of 15 (19.2%) patients died. None survived a burn injury of more than 40% TBSA.

**Conclusions:** Treatment of acute burn is very challenging with high mortality rate. A lot of effort is needed to change the present standard of care. Awareness programs on First Aid treatment of burn injuries together with the preventive programs focused on high risk population such as females and children in a large scale needs to be organized as soon as possible.

**Keywords:** acute burn; burn injury; burn mortality; burn outcome; epidemiology.

## INTRODUCTION

According to World Health Organization, 11 million people sustain burn injuries globally every year and 95% of these injuries occur in the low and middle income countries.<sup>1,2</sup> Fire related burn injury alone causes 320,000 deaths globally every year and more than half of these deaths occur in South East Asia alone.<sup>3</sup> According to the Ministry of Health, Government of Nepal, 55,902 people sustain burn injuries every year in Nepal.<sup>4</sup> WHO data shows that 2100 people die of burn injuries in Nepal every year.<sup>5</sup> The hospital based data from Bir Hospital, Kathmandu showed that females were more

commonly involved in the burn injuries and most were of productive age (16-35 years). Most of the injuries occurred at home during cooking as accidental incidents and overall mortality of 21% in 100 patients treated in a duration of one year (April 2007-March 2008).<sup>6</sup>

This study describes the demography of the burn injuries and early outcome of the treatment so that it can be used for instituting preventive measures, monitoring the standard of care in the future, and for quality improvement (QI).

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## METHODS

A retrospective cross sectional study was conducted analyzing the clinical records of all the acute burn patients admitted to Nepal Cleft and Burn Centre of Kirtipur Hospital, Kathmandu from January 1 to December 31, 2014. The facility has been operational since 2013 with 10 ICU and High Dependency Beds, 32 general beds, two dedicated operating rooms available 5 days a week, a dedicated team of 10 surgeons supported by nurses and other professions trained in Emergency Management of Severe Burns (Australia and New Zealand Burn Association) and Essential Burn Care Course (Interburns). All forms of burn injuries were included in the study. Patients treated on an outpatient basis were excluded. Epidemiological data such as age, sex, mode of injury, causes, place of incident, total body surface area (TBSA) involved, depth, first aid treatment, time elapsed from the time of injury to the time of hospital arrival, existing co morbidities, number of surgeries, blood transfusion, presence of infection at the time of admission and after, mortality were noted. Ethical approval was obtained from the Institutional Review Committee of the Public Health Concern Trust-Nepal which runs the hospital. Microsoft Office Excel 2007 was used for analyzing the data.

## RESULTS

A total of 78 patients were included in the study. Forty six (58.9%) of them were females. Age of the patients ranged from 3 months to 88 years with the median age of 29 years. Twenty (25.6%) of them were less than 15 years of age. More than half of the patients were of age 30 years or less. There were only 8 (10.2%) patients who were older than 60 years of age.

Only 22 (28.2%) patients came from Kathmandu Valley. Out of them, 5 were from Kirtipur town where the Burn Center is located. All the other 56 (71.8%) patients came from out of valley from 39 out of 75 districts of Nepal except two from India.

Majority of the burn injuries (N=48, 61.6%) were due to flame burns followed by scalding (N=15, 19.2%). There were 11 patients with electric burns. Blast, contact, frost bite and acid burns were each seen in one patient. The median age for scalding was 5 years with a range of 0.4 to 81 years where as those for flame and electric burns were 27 (range 2-88 years) and 27.5 years (range 10-60 years) each.

More burn injuries due to flame and scalding occurred inside the house but the difference was not seen in case

of the electrical and other types of burns as shown in Table-1.

**Table 1. Distribution of modes of burn injury inside and outside the house.**

Mode of Burn Injury	Inside the house	Outside the house	Total
Flame	38	10	48 (61.6%)
Scald	12	3	15 (19.2%)
Electrical	5	6	11 (14.1%)
Others	2	2	4 (5.1%)
<b>Total</b>	<b>57</b>	<b>21</b>	<b>78</b>

The average TBSA affected by burn injuries that occurred inside the house and outside the house were 15.25% and 16% respectively. Significantly more females were involved in the burns that occurred inside the house (Female/Male=40/17;  $p=0.05$ ). There were more males ( $n=14$ ) than females ( $n=7$ ) involved in the injuries that occurred outside the house.

Only eleven (14.8%) patients were brought to the burn center on the same day of the injury. The time elapsed between the burn injury and the hospital arrival was from 1 to 67 days with a median of 5 days. All the patients who were not admitted on the same day of burn incident were treated in another hospital.

Twelve patients (15.4%) had received some first aid treatment before the arrival. Two patients (2.5%) who came to the burn center immediately after burn incident had cold water poured for more than 20 minutes at the emergency room of the burn centre by the duty doctor while the rest of the 10 patients (12.8%) had applied water for less than 20 minutes.

Many patients had several body areas involved in the burn injury. The most commonly involved area of the body was upper extremity (N=48, 61.5%) followed by lower extremity (N=40, 51.3%). Other areas involved are shown in Table-2.

**Table 2. Distribution of different body parts involved in the burn injury.**

Body Parts Involved	Number of patients	%
Upper Extremities	48	61.5
Lower Extremities	40	51.3
Chest	26	33.3
Head and Neck	22	28.2
Abdomen	19	24.3
Back	18	23
Perineum	11	14.1

Co morbidity was present in a total of 13 (16.6%) patients. Hypertension was found in 4 (5.1%) patients while diabetes mellitus, chronic obstructive pulmonary disease, seizure disorders were found in two patients each. Hyperthyroidism, paraplegia and psychiatric disorder were present in one patient each.

Inhalation injury was present in one patient (1.3%) only. Circumferential burns were seen in 10 (12.8%) patients. Seven patients (8.9%) presented with gangrene.

Range of total body surface area (TBSA) involved in the burn injury was 1% to 70% with a median of 11%. Forty five (57.7%) patients had burn injuries of less than 10% TBSA and few patients had burns of more than 30% TBSA.

Range of hospital stay was 1 to 105 days with a median of 17 days. Four patients at the time of reporting this study were still at the hospital.

Four patients (5%) had already developed infection of the burn wound on admission with multi drug resistant organisms. One patient was admitted to the burn center on 13<sup>th</sup> and 29<sup>th</sup> post burn days each while two patients were admitted on the 26<sup>th</sup> post burn days. *Citrobacter freundii* was found in two patients. The other two patients had *Proteus vulgaris* and *Pseudomonas* infection.

Only 8 (10%) patients had superficial burns while 70 patients (90%) had mostly deep burn.

In children under 15 years of age, 6 (7.7%) had superficial burn and 14 (17.9%) had deep burns. Among the children with deep burns, 7 (8.9%) had burns less than 10% TBSA (minor) while 7 (8.9%) had more than 10 % TBSA (major) burns.

Similarly in adults (older than 15 years), only 2 (2.5%) patients had superficial burns while 56 (71.8%) patients had deep burns. Among the adult patients with deep burns, 41 (52.5%) had less than 20% TBSA (minor) burns and 6 (7.6%) had more than 20% TBSA (major) burns.

A total of 60 (76.9%) patients underwent 102 surgical operations (excluding dressing changes under anesthesia). Ten (12.8%) more patients had needed surgery but one did not give consent for surgery, and 9 patients were too sick (not fit) for surgery. None of the eight (10.2%) patients with superficial burns needed surgery. One patient with electric burn underwent 5 surgeries.

Table-3 shows the distribution of different types of surgeries performed. Several patients needed multiple

surgeries. Skin grafting was performed on 52 (66.6%) patients. Among the patients who had undergone skin grafting, 14 (18.%) needed grafting for two sitting and 4 (10%) needed grafting for three sittings.

**Table 3. Distribution of different types of surgeries.**

Type of operation	Number of patients	Number of surgeries
Escharotomy	8	8
Fasciotomy	3	3
Amputation and disarticulation	8	8
Burn Wound Excision only	4	4
Burn Excision + Skin Grafting	47	69
Skin Grafting only	5	5
Flaps	4	5 (1 division of flap)
<b>TOTAL</b>		<b>102</b>

Fifty one (65.4%) patients underwent burn wound excision. Maximum TBSA excised at one sitting was 35% in which case live skin donor (from their own family) was available.

Four (5.2%) patients also needed flap for the coverage of their wounds.

All together, 26 (33.3%) patients needed blood transfusion. Twenty patients with an average TBSA of 30% needed 6 to 10 units of blood. One patient with 30% TBSA electric burn needed more than 10 units of blood.

Mechanical ventilation was performed in a total of 5 (6.4%) patients. None of them survived.

A total of 15 (19.2%) patients died at the hospital. The mortality was found to be more with the increasing TBSA burn as shown in Table-4. Nobody survived a burn of more than 40% TBSA. None of the patient with superficial burns died.

**Table 4. Distribution of deaths in different TBSA burn.**

TBSA	Number of Patients	Deaths
<10 %	46	1
10-20%	15	3
20-30%	9	3
30-40%	8	6
40-50%	1	1
50-60%	0	0
>60%	1	1

## DISCUSSION

In the present study, the late presentation of patients was very common. Very small number of burn victims had proper first aid treatment. Public as well as health professional awareness programs on proper first aid treatment needs to be in place in a larger scale at national level together with primary preventive measures focused on the high risk population - women and children.

A mortality rate of 19.2% with an average TBSA of 15% in this study is much higher than the mortality rate reported from countries like the Netherlands (3.2%), Brazil, South Korea, Israel (4.4%).<sup>7, 8, 9, 10</sup> but comparable to the mortality rates reported from Iran, India, and Nigeria.<sup>11, 12, 13</sup> Burns involving more than 50% TBSA was invariably fatal in Sri Lanka.<sup>14</sup> In the present study 40% TBSA burn was invariably fatal.

In the USA, a developed country with ten times more population than that of Nepal, only 3500 people die of burn injuries every year where as 2100 people die in Nepal according to WHO. There are multiple reasons for this disparity in burn mortality rate such as dedicated multi disciplinary team, availability of high level technology eg cadaveric skin or other skin substitutes like artificial skin, Intensive care facility and fund for taking care of burn patients in any developed country. Half of the patients who sustain burn injuries involving as much as 90% TBSA survive in the USA.<sup>15</sup> Present study as well as one past study from Nepal shows that mortality approaches 100% in Nepal once the burn injury involves more than 40% TBSA.<sup>16</sup> Finding of the present study that almost half of the patients who sustain 20 to 30% TBSA burn die is an indicator of poor outcome of burn care. This kind of disparity is the major motivating factor for the burn professionals working in the developing countries to improve the burn care. Challenges include lack of access to adequate burn care by poor people, lack of access by the professionals to proper technology and adequate fund. Inability to attract younger professionals in burn care will have a long term negative impact. Simple things like the first aid knowledge of pouring cold water over the burnt area has not been able to reach the general public and medical community. Training of manpower as well as establishment of burn care facilities in different geographical regions of the country will improve the access. This has to be coupled with availability of the fund by governmental and non-governmental organizations for the burn care since the patients and families are not capable of covering all the cost. Prevention and first aid programs involving common people in national level will have to be started as soon as possible.

Lack of cadaveric skin, or artificial skin has been a great problem for coverage of extensive burn wounds in Nepal. Intensive care for severely burnt patients also needs to be improved significantly. Nanocrystalline silver and collagen dressings are available locally now in Nepal but still are out of the reach of most families.

Recently, the burn unit where the study was conducted has been trying to improve the burn care by working on issues such as establishment of a skin bank, improving ICU care with ventilators, monitors, arterial blood gas analyzer and training of team members on burn critical care. Electric and battery operated dermatomes, meshers including Meek Micrograft meshers, nanocrystalline silver dressings and collagen sheets have recently been acquired by the unit mobilizing resources from several agencies. Continuing education of the team members, microbial monitoring, proper health care waste disposal system are already in place.

The small number of the cases treated in the burn center is the weakness of this study which did not allow in depth statistical analysis. The number of cases is expected to go up as the burn center will be known to more people in the future.

## CONCLUSIONS

The outcome of the burn care in Nepal has not changed over time which is reflected by high overall mortality of 19% and 100% mortality above 40% TBSA. A lot of efforts need to be put in to change the present standard of care such as availability of critical care, cadaveric skin and skin substitutes, and fund for treatment of poor burn patients. Awareness programs on First Aid treatment of burn injuries together with the preventive programs in a large scale needs to be organized as soon as possible.

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