

Epidemiology and clinical pattern of childhood burn at a tertiary children's Hospital

Chaudhary RP¹, Karki G²

¹ Senior Consultant Pediatric Surgeon, Kanti Children's Hospital, Kathmandu, Nepal

² In-Charge, Burn ward, Kanti Children's Hospital, Kathmandu, Nepal.

Corresponding author: Dr. R.P. Chaudhary

Email: chaudharyrpd@gmail.com

Abstract:

Introduction: Burn injuries are major health problems in developing countries leading to increased morbidity and mortality. Majority of pediatric burns are preventable and differ largely from adult burns anatomically, physiologically and psychosocially. Major causes are scald, flame and electrical injuries. Childhood burn is least explored in Nepal and devastating because of ongoing pain, cosmetic and physical disfigurement, multiple surgical procedures.

Methods: This prospective study was conducted from July 2014 to June 2015 in Pediatric burn unit of Kanti Children's Hospital, Kathmandu, Nepal. A detailed history and examination was done. Patient characteristics including age, gender, causes and percentage of total body surface area (%TBSA) burnt, type of treatment, time period of hospital stay and mortality was recorded. Percentage of burn was determined using 'Lund and Browder chart'. Treatment was started based on these parameters. Statistical analysis was done and results expressed in numbers and percentages.

Results: 314 children were included. Boys were 58.60% and girls were 41.40%. Children with burns, younger than 5 years of age were 82.8%, which was high in number. More number of children presented with old burn 164(52.23%) in relation to fresh burn 150(47.77%). Maximum number of children, 235(74.84%) presented with scald burn which is due to hot liquids in comparison to other burn injuries like flame burn which was 64(20.38%). 148 (47.13%) of children had burn injuries with 10- 30% of %TBSA, followed by 144(45.86%) children with < 10% TBSA. Total mortality was 4.78%, with 3.5% mortality in patients with TBSA more than 50%.

Conclusion: Maximum number of burn injuries occurred in male children under five years of age. Scald injuries predominated and patients mainly presented with old burns. Significant numbers of children with burn injuries were treated conservatively. TBSA is one of the important indicators for deciding management and prognosis. Thus, childhood burn is a major cause of morbidity in Nepal.

Key Words: Burn injuries, pediatric, total body surface area, scald injury, Lund and Browder chart.

Introduction

Burns are a leading cause of unintentional injury in children, second only to motor vehicle crashes.⁽¹⁾ 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.⁽²⁾⁽³⁾ 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.

⁽⁴⁾ According to the Ministry of Health, Government of Nepal, 55,902 people sustain burn injuries every year in Nepal.⁽⁵⁾ WHO data shows that 2100 people die of burn injuries in Nepal every year.⁽⁶⁾ In India, over 1,000,000 people are moderately or severely burnt every year.

Burns are the second most common injury in rural Nepal, accounting for 5% of disabilities⁽⁷⁾

Burn injury in children continues to be a major epidemiologic problem around the globe. Nearly a fourth of all burn injuries occur in children under the age of 16, of whom the majority are under the age of five.⁽⁸⁾ The pattern of burn injuries has been reported to vary from one community to another and is influenced by age, sex, economic status, local customs, social and environmental circumstances.⁽⁹⁾

Scald injuries tend to be the most common type of thermal injury under the age of 5 years, accounting for over 65% of the cases, while fire injury tends to occur in older children, accounting for over 56% of the cases.

⁽¹⁰⁾Majority of burn injuries sustained by children occur at home as an accident. Thus, most of these injuries are preventable. Lack of facilities in most public sector hospital and insufficient personnel to take care of this group of patients increases the morbidity and mortality.

⁽¹¹⁾Most burn injuries are minor and do not necessitate hospital admission.⁽¹²⁾ A minority of burn injuries is serious and meets criteria for transfer to a burn center; the care of these critically ill children requires a coordinated effort and expertise in the management of the burned patient. The mortality rate following major burns at these highly specialized centers is less than 3%.⁽¹³⁾ In addition to physical damage caused by burns, patients also may suffer emotional and psychological problem. Burns in children differ in multiple aspects from those in adults; the extent and depth of the burn injury are often more severe, the child's body proportions differ, resulting in greater evaporative water and heat loss, and fluid requirements are therefore generally greater. Children have a relatively thinner dermis, so for any given thermal insult the infant will sustain a deeper burn than the adult.⁽¹⁴⁾ Burn injuries are especially devastating because of the resulting scarring and physical limitations. Although several studies have outlined descriptors of scald burn injuries, such as patient demographic characteristics or substances, containers, or appliances involved, few studies have described or analyzed the actual mechanisms of injury.⁽¹⁵⁾⁽¹⁶⁾⁽¹⁷⁾

In Africa and many of the South-Asian countries, including India, Pakistan, Nepal, Sri Lanka and Afghanistan, childhood burns have emerged as a major public health issue.⁽¹⁸⁾⁽¹⁹⁾ Enough data is not available on pediatric burns in Nepal, which is a major cause of physical disability, morbidity and is a social and economic burden on the society. Considering this, we conducted the study to establish the epidemiology and clinical pattern of childhood burns of patients admitted at Kanti Children's hospital.

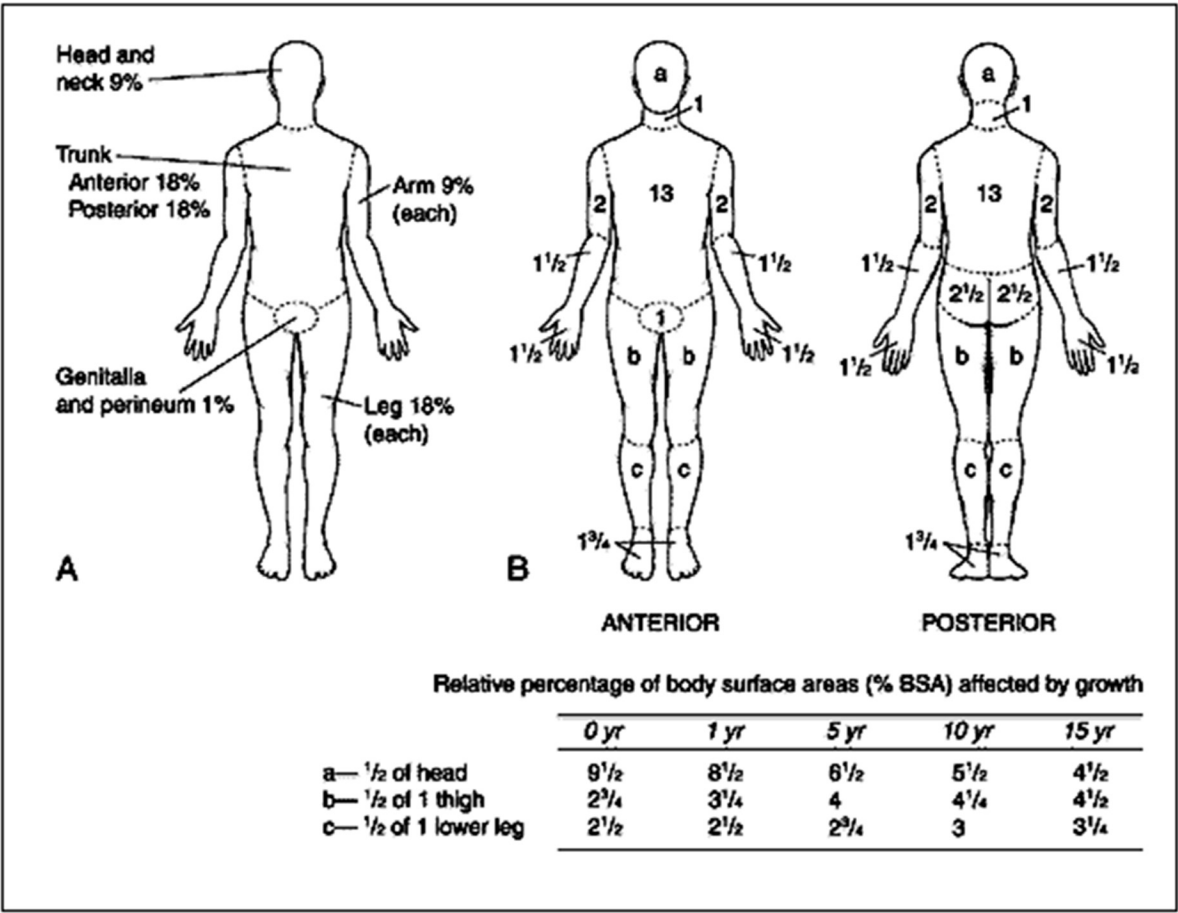
Methods

This prospective study was designed to describe the epidemiology and clinical pattern of pediatric burn injuries which was conducted from July 2014 to June 2015 in Pediatric burn unit of Kanti Children's Hospital, Kathmandu, Nepal. This Hospital is 325 bedded and the only referral governmental children hospital of the country with 22 bedded pediatric burn unit, the only one of its kind in Nepal. We have 6 bedded high dependency burn units for sick and major burns and there is facility of 4 bedded Surgical Intensive Care Unit for burn cases if needed. The pediatric surgeons take care of burn as there is no plastic / burn surgeons available here. We admit the burns patients up to 14 years of the age.

Patients were admitted in the pediatric burn ward from the Accident and Emergency and surgical outpatient department after primary and secondary surveys done by the admitting surgical team. All the admitted patients were enrolled in the study after an informed written consent sought from the parents or guardians. Admission protocol included patients with burnt area 10% or more of Total Body Surface Area (TBSA), but the cases having <10% TBSA involving important areas like face, hands, feet, perineum, electrical, referred and infected burns from remote areas were also admitted. Moderate burns were admitted in the pediatric burn ward and sick and severe burn patients were admitted in the high dependency room of burns ward or in Surgical Intensive Care Unit if required. The %TBSA was assessed using a "Lund-Browder Chart".⁽²⁰⁾

Figure 1: Lund and Browder chart (with age appropriate measurements of %TBSA).⁽²⁰⁾

A: Rule of “nine”
B: Lund –Browder diagram for estimating extent of burns



Data was collected by using a Performa which included patients characteristics i.e age, gender, causes, percentage of total body surface area (% TBSA) burnt, fresh or old burn, type of treatment, time period of hospital stay and mortality. A detailed history and examination was done before treatment was started. Patients were followed up until discharge or death. For Statistical analysis, patients were divided into different groups and results expressed as numbers and percentages. The study was carried out after the approval by the department of pediatric surgery and Institutional Review Committee of Kanti Children’s hospital.

Result

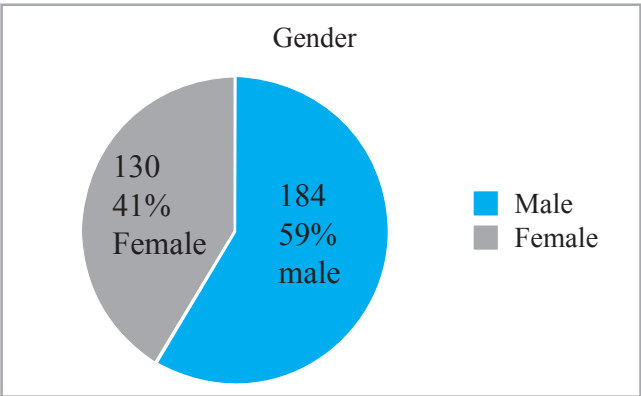
A total of 314 children in one year were admitted with burn injuries at Kanti children’s hospital. During this period of study, 184 (58.60 %) were male and 130 (41.40%) were female. The male: female ratio was 1.4: 1.

Table 1: Age of presentation of Children with burn injuries

Age (Year) at presentation	Number (N)	Percentage (%)
< 1	67	21.34%
1 - 5	193	61.46%
5- 10	35	11.15%
10 - 14	19	06.05%
Total	314	100 %

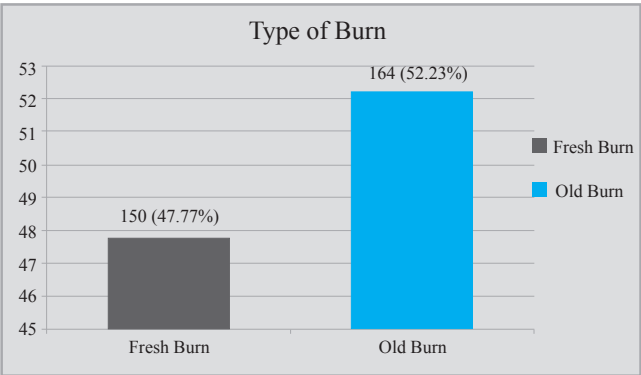
Maximum numbers (61.46%) of children were of the age group of 1 to 5 years as seen in table 1.

Chart 1: Distribution of gender in burn children



Male child (59%) was affected more in comparison to the female child (chart 1).

Chart 2: Distribution of Fresh and old burn



52.23% of children presented with old burn (after 24 hrs of injury) in relation to fresh burn (within 24 hrs of injury), which showed that more children presented late (chart 2).

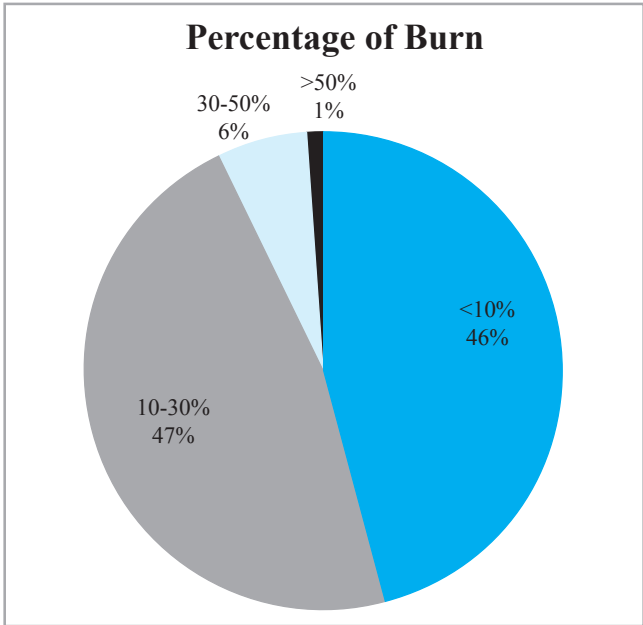
Table 2: Type and Nature of burn Injuries in children

S.N	Type Of Burn	Number (N)	Percentage (%)
1	Scald burn	235	74.84
2	Flame burn	64	20.38
3	Electric burn	7	2.23
4	Chemical burn	6	1.91
5	Acid ingestion	1	0.31
6	Lightening burn	1	0.31
	Total	314	100 %

Maximum number of children presented with Scald burn (N=235, 74.84%) which is due to hot liquids

in comparison to other burn injuries like flame burn (N=64, 20.38%), electric burn (N=7, 2.23%), chemical burn (N=6, 1.91%), acid ingestion (N=1, 0.31%) as shown in table 2.

Chart 3: % TBSA in children with burns

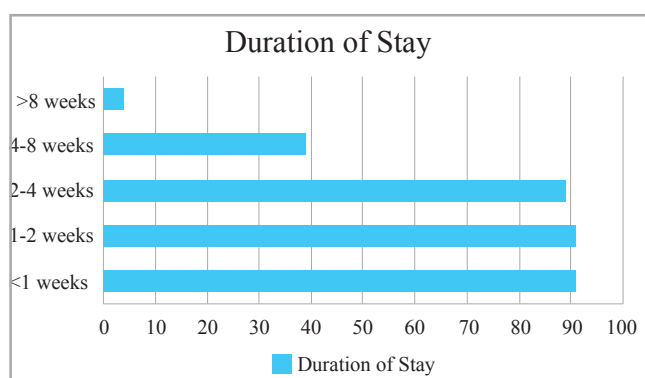


(148, 47.13%) of children attending the hospital for burn injuries had TSBA 10- 30% , followed by(144, 45.86%) with < 10% TSBA , (18 , 5.73%) with TSBA of 30-50% and only (4, 1.27%) children presented with TSBA of > 50% as shown in chart 3 .

Table 3: Type of treatment received by children with burn injury

S.N	Type Of Treatment	Number	Percentage (%)
1	Conservative	209	66.56
2	Debridement	32	10.19
3	Skin Graft	21	6.68
4	Both(debridement+ graft)	52	16.56
	Total	314	100%

Majority of patients were treated conservatively while 23 .24% of patients needed skin grafting.

Chart 4: Duration of stay of burn patients.

The duration of hospital stay was found to be < 1 week and between 1-2 weeks in 182 patients i.e. 57.96% as burn patients had injuries of TBSA ranging from < 10 % to 10- 30% . Thus the bed occupancy and duration of stay was less and only 4 children (1.27%) stayed for more than 8 weeks.

Mortality was seen in 15 children (4.78 %). The number of male and female children who expired was nearly same in number (N= 8, male: N= 7, female). Children who presented with burn injuries of 30- 50% and > 50% had higher mortality (N= 11, 3.5 %).

Discussion

Our study included 314 children with burn injuries which was quite similar to a study done by Al-Shehri et al in South –western Saudi Arabia with 380 children with burn injuries. The number of boys was 191 and 189 were girls (M:F = 1.01:1)⁽⁹⁾, whereas our study had 184 boys and 130 girls with male : female ratio being 1.4 : 1 .Another study in Turkey had 119 male and 81 female hospitalized patients with ratio M: F: 1: 0.67 with male predominance.⁽²¹⁾Chalise et al study done in Nepal showed male: female ratio of 1.3:1.⁽²²⁾Mukerji et al study in India also showed that males were more commonly affected.⁽²³⁾

Age group in our study showed higher number (82.8%) of children younger than 5 years to be affected which is similar to a study done by Balseven- Odabasi et al with sixty-nine percent (n=138) of the burn-injured children who were under three years.⁽²¹⁾ According to Biscegli et al also , there are higher number of cases of children younger than 6 years (52.9%).⁽²⁴⁾ In Chalya et al study, children aged 2 years were the majority accounting for 45.9% of cases.⁽²⁵⁾Antoon et al study had approximately 50% of these patients to be younger than age 5 yr, with an average age of 32 months.⁽¹⁾

In our study, maximum number of children presented with Scald burn (N=235, 74.84%) which is

due to hot liquids in comparison to other burn injuries like flame burn (N=64, 20.38%) ; DeSousa et al study in Africa had similar findings showing majority (41/64) of burns under the age of 5 years, with the vast majority of injury (82.8%) resulting from burns with hot liquids.⁽²⁶⁾ Kemp et al study had similar findings that included 1215 children, 58% (709) had scalds, 32% (390) contact burns and 116 burns from other causes.⁽²⁷⁾ In Koc et al study, it was found that 62.7% of pediatric burns occurred in the kitchen, with 70.7% involving boiling water.⁽²⁸⁾ Unlike these findings Systems et al study showed that children are most often burned by fire or flame.⁽²⁹⁾

In our study, 148(47.13%) children admitted for burn injuries had TSBA 10- 30%, followed by 144(45.86%) with < 10% TSBA. Only 1.27% was admitted with TSBA of > 50%, as most probably other such burn children could not attend the hospital as they expired before they could attain treatment. In Biscegli et al study on average, TBSA was 18% ± 12%, and 305 patients (79.8%) had at most 29% of the body affected ⁽²⁴⁾which was similar to our finding .But, Chalya et al had majority of patients, 194 (56.7%) with moderate burns and severe burns occurred in 148 (43.3%) patients which was unlike our study.⁽²⁵⁾ Similarly in Alavi et al study, Mean Total Burn Surface Area (TBSA) was 15.24 ± 18.4. Lowest TBSA was 0.5% and highest TBSA was 100% which was different from our study .⁽³⁰⁾

In our study, more number of children presented with old burn; 164 (52.23%) in relation to fresh burn; 150(47.77%). Similarly a study done by Chalya et al reported more patients (89.8%) presenting to the hospital later than 24 h.⁽²⁵⁾De Sousa et al study also showed only 37 (11%) of the patients to present within 1 h of their injury; the majority of patients (220/335 or 66%) presented more than 3 hour after their injury, with 77/335 (23%) presenting more than 24 hour after injury.⁽²⁶⁾

Burn patients in our study were treated with conservatively in 209 cases; 66.56% and 52; 16.56% cases were treated with both debridement and skin grafting. Tomkins et al study had fourteen children with their burns managed non-operatively, but eight required various surgical procedures ranging from local debridement and primary closure to full-thickness skin grafting.⁽³¹⁾In Chalya et al study, conservative treatment was performed in 87.1% of cases and surgical treatment mainly skin grafting (65.9%) was performed in 44 (12.9%) of patients.⁽²⁵⁾

In our study, the duration of hospital stay was found to be up to 2 weeks in 182 (57.96%) patients with

maximum burn patients having injuries of % TSBA ranging from < 10 % to 10- 30% . In Biscegli et al study, the majority of patients (235; 61.5%) remained hospitalized for 1-9 days, and the minority (10; 2.6%) for 30-45 days. Hospitalization periods of 10-19 and 20-29 days were observed in 114 (29.9%) and 23 (6%) cases, respectively.⁽²⁴⁾In Tomkins KL et al study the average length of hospital stay was 6 days (range 1-58 days).⁽³¹⁾In Chalya PL et al study the overall average of the length of hospital stay (LOS) was 22.12 ± 16.62 days.⁽²⁵⁾Systems et al study also showed the yearly average length of stay in the hospital to range from 15 to 44 days.⁽²⁹⁾

Figure 1: Old burn of lower limbs



In our study, total mortality was 15 (4.78%) and among them, there were 3 patients who had more than 50% of burn injuries. This is similar to Balseven-Odabaşı et al study which had overall mortality rate of 4% (8 deaths).⁽²¹⁾Antoon et al mentioned fires are a major cause of mortality in children, accounting for up to 34% of fatal injuries in those younger than 16 yrs of age. Scald burns accounted for 85% of total injuries and were most prevalent in children younger than 4 years.⁽¹⁾ In Chalya et al study mortality rate was 11.7%.⁽²⁵⁾In Mukerji et al study, the overall mortality rate was 21.8%⁽²³⁾which is higher than our study.

Figure 2: Skin grafting in burn child



Conclusion

Pediatric burns are challenging and differ from adult ones anatomically, physiologically and psychosocially. Most of childhood burns are preventable. The majority of burn injuries occurred in male children under five years. Scald injuries predominated which was due to hot liquids .More patients presented with old burns in our hospital. Majority of patients presented with 10-30 % TBSA. % TBSA is one of the important indicators for deciding management and prognosis. Mortality was more common in old, major burns.Hence, this study enforces the need for awareness and strategic programmes to alert the parents and society members about prevention of burn injuries.

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Conflict of interest: None declared

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