#### **Research Article**

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20161392

# Epidemiological study of pediatric burns at a tertiary care centre in South India

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Received: 10 March 2016 Accepted: 6 April 2016

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#### ABSTRACT

**Background:** Burns in children are reported to be amongst the most prevalent traumatic injuries around the world, most of which occurring in accidental domestic environment, that are preventable. With this study, we aim to suggest measures that may be taken to prevent burns in children.

**Methods:** Data of children ( $\leq$ 15 years of age) with burns admitted to Burns Unit at our centre from August 2010 to July 2015 was analysed retrospectively. For the purpose of analysing, these children were divided into three groups based on their age.

**Results:** A total of 122 pediatric burn cases were studied. Male children (57%) were more commonly affected. 93% burns were accidental in aetiology, however a significant number of suicidal burns was noted (6.5%). Average percentage of total body surface area (TBSA) burnt was 34.06%. Scalds was the most common mode of injury in toddler age group (0-5 years), whereas thermal & electrical burns were more common in older children. In our study, 70% of instances needed surgical intervention and the overall mortality was 13.64%.

**Conclusions:** This study highlights the aetiology and risk factors for burns in children of different age groups, which help in establishing safety measures that can be included in preventive programs. Through a combination of prevention strategies and improved burns care, considerable progress can be made not only in lowering the death rates, but also in achieving the goal of physical, social and psychological rehabilitation in paediatric burn patients.

Keywords: Paediatric burns, Safety measures, Suicidal burns

#### **INTRODUCTION**

Burns is a global health problem, accounting for an estimated 310,000 deaths annually. The global incidence (all ages) is 1.1 per 100,000, and it varies with geographic location, socio-economic status, ethnic group, age and sex. Over 95% of burns occur in low & middle income countries, with highest incidence occurring in World Health Organization (WHO) Southeast Asia region. In India, over 1,000,000 people are moderately or severely burnt every year.

Burns in children are reported to be among the most prevalent traumatic injuries around the world. In developing countries, it is reported to be the third most common cause of death in children aged between 5 and 14 years. However, the global incidence of hospitalized pediatric burn patients is unknown.

Epidemiological studies of burn injuries have highlighted risk factors that have led to the establishment of effective preventive programs.<sup>6</sup> However, in pediatric burns, most

of the injuries occur in accidental domestic circumstances which are preventable. Therefore, it is important to educate parents, make them aware of the potential danger in the home environment and how to prevent common burn accidents.

#### **METHODS**

Retrospective analysis of data of children with burns, up to 15 years of age, admitted to the Burns Intensive Care Unit in KLES Dr. Prabhakar Kore Hospital and Research Centre, Belgaum, India during the study period of August 2010 to July 2015 was done.

Data was collected by reviewing patient hospital records, photographic records and discharge summaries. Data regarding age, gender distribution, aetiology, mechanism of injury, percentage of burns and depth of burns, treatment modality, duration of hospital stay and mortality were collected and analysed.

#### **RESULTS**

A total of 122 pediatric cases aged between 5months and 15 years, were admitted in the Burns Unit at the centre, during the study period from August 2010 to July 2015. This was amongst a total number of 736 patients admitted to the burns unit during this period, accounting for an incidence of 16.6% of pediatric burns. Male (57%) children were more commonly affected compared to females (43%). Nearly half of the children were below 5 years of age (48%), followed by 25% in 6 to 10 years age group and 27% in 11-15 year age group.

In our study, 93% (113) of burns were accidental in aetiology, 6.5% (8) were suicidal and 0.5% (1) was homicidal. Overall, thermal injury (flame burns) was the most common mode of injury, occurring in 61 cases, scalds in 43 cases, followed by electrical burns in 17 cases, and chemical burns in 1 patient.

Percentage of total body surface area (TBSA) burnt ranged from 8% to 98% with an average of 34.06%. Figure 1 gives distribution of number of patients with percentage of TBSA burnt.

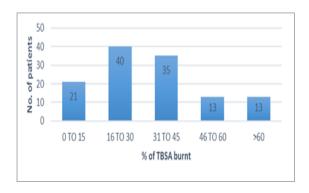


Figure 1: Distribution of patients with percentage of TBSA burnt.

Likewise, majority of pediatric burn patients admitted to our centre had II degree deep burns in 74 cases (60%), followed by II degree superficial burns in 30 cases (25%), III degree in 12 cases (10%) and IV degree burns in 6 cases (5%).

Various treatment modalities that were followed in our centre included collagen sheet dressing for superficial burns, operative procedures like escharotomy, debridement and skin grafting for II degree deep burns and fasciotomy, flap cover and amputations were required in III to IV degree deep electrical burns. In our study, 70% of instances needed surgical intervention of one form or the other.

For the purpose of analysing the data, these children were divided into three groups based on their age. Majority of children affected belonged to age group of 0 to 5 years accounting for 48%. The other two groups of 6 to 10 years and 11 to 15 years accounted for 25% and 27% respectively.

The various factors analysed in each of the age groups are summarized below:

Males were affected more than the females in all age groups (Table 1).

Table 1: Sex distribution in different age groups.

	0 -5	6 -10	11-15
	years	years	years
Male	34	16	19
Female	24	15	14
Total	58	31	33

Most common aetiology was accidental in nature in all the age groups, but there was noted a significant number of suicidal burns in older children (11 to 15 years). The impulse for such extreme step was usually associated with academic failures or parents refusing to fulfil the child's demand or parents scolding the child (Table 2).

Table 2: Aetiology in different age groups.

	0-5 years	6 -10 years	11-15 years
Accidental	58	30	25
Suicidal	-	1	7
Homicidal	-	-	1

Hot liquid (Scald) was the most common mode of injury in infants and toddlers (0-5 years), mainly due to tipping over or accidental fall into containers with boiling liquids or bathing accidents. Whereas, in older children (6 to 15 years), thermal (flame) burns was the most common mode of injury followed by electrical burns (Table 3).

Table 3: Mode of injury in different age groups.

Mode of injury	0 -5 years	6 -10 years	11 -15 years
Scald	35	7	-
Thermal	22	15	24
Electrical	1	8	9

Thermal burns in our study, was mainly seen in younger girls who were assigned to do household work of cooking and boiling water using Choolas (fire place on kitchen floor using firewood as fuel) and kerosene stoves, both of which are predominantly used by the rural population of North Karnataka, India. Also, incidences of loose clothing catching fire while lighting lamps were noted. Cracker burns accounted for thermal burns mainly in boys. Electrical burns were due to contact with live wires while flying kites on the terraces with low lying high tension electric wires and also due to mishaps with household electrical appliances.

Majority of burns in younger children and toddlers was of superficial depth owing to scald injury predominantly, that required conservative treatment in the form of regular dressings or collagen sheet dressing. Whereas, II degree deep to III and IV degree burns were more common in the older children who required multiplesurgical interventions (Table 4 and 5).

Table 4: Depth of burns in different age groups.

Depth of burns	0-5 years	6-10 years	11-15 years
II <sup>0</sup> superficial	19	6	4
II <sup>0</sup> superficial-deep	33	18	22
II-III <sup>0</sup> deep	2	4	4
III-IV <sup>0</sup> deep	-	3	3

**Table 5: Treatment modality in different age groups.** 

Treatment modality	0-5	6-10	11-15
	years	years	years
Conservative	12	3	6
Collagen sheet	35	7	5
Operative	11	36	35

Table 6: Mortality in different age groups and extent of burns.

TBSA burnt (%)	0-5	6-10	11-15
	years	years	years
30-45%	-	-	1/9
			(11.11%)
46-60%	3/8	1/4	2/4
	(62.5%)	(25%)	(50%)
>60%	3/3	1/3	4/5
	(100%)	(33.33%)	(80%)

It was noted that high mortality rates was seen in younger age groups irrespective of the percentage of burns. And also, the mortality rate was directly proportional to the extent of burns in all age groups of children. Death rate in this study was 13.64% with a total of 15 deaths (Table 6).

#### **DISCUSSION**

Burns are an important cause of preventable injury, especially in the pediatric age group. Burn injury historically carried a poor prognosis, but with advancements in fluid resuscitation and advent of surgical intervention, survival has become an expectation even for patients with severe burns. Continued improvements in critical care and progress in skin bioengineering herald a future in which functional and psychological outcomes are equally important as survival alone. <sup>7</sup>

This study was carried out on 122 pediatric burn patients with an objective to study the epidemiological data in different age groups and analyze various factors which influence their management and outcome. In this study, we aim to suggest measures that may be taken to prevent burns in children and those preventive measures that can be implemented through public education.<sup>8</sup>

Analysis of age and sex records in our study showed nearly half of the patients were below 5 years of age, and had male sex predominance, both of which conform to other studies on pediatric burns. <sup>6,9-15</sup>

Most of the injuries occurred in domestic circumstances with accidental aetiology being most common (94%). <sup>6,9,10,13-16</sup> However, we have noticed an alarming increase in suicidal burns (6.5%), in children of 10-15 years of age. This finding was in agreement to Peddi et al and Lari et al, who had 1.8% and 4.1% of suicidal burns respectively. <sup>17,19</sup> No cases of intentional burns due to child abuse was noted in our study.

As the only Burns tertiary care centre in the entire region of North Karnataka and surrounding border districts of Maharashtra and Goa, majority of the cases which get referred to our centre are usually of higher percentage and greater severity. This is very well depicted in our data that about 83% of them had more than 15% of TBSA burnt (Figure 1). The average being 34.6%, which is higher when compared to other studies. <sup>6,9,14,15</sup>

Scald burns (61%) was the most common mode of injury in children less than 5 years of age, especially in infants and toddlers, all occurring in accidental domestic circumstances. However, older children sustain injury more commonly due to flame burns (60%), but there is also a significant increase in electrical burns (25%) in them. 14,15

The overall death rate in our study was 13.64%. Mortality was found to be higher in younger age group and in extensive burns. Deaths up to 77% was noted in TBSA of >60% burns, 29% in 45-60%, and only 6% in 30-45% burns.

With a higher mean percentage of burns, a good survival rate at our centre is mainly attributed to the dedicated Burns Intensive Care Unit (BICU) managed under Department of Plastic and Reconstructive Surgery, with strict protocols followed at all stages of patient care including resuscitation protocols, asepsis and infection control, antibiotic regimen, aggressive management of inhalational injury, mechanical ventilation, aggressive nutritional support, wound care with regular bath and dressings and planned surgical interventions when necessary. This is provided by involving multidisciplinary staffs from various specialities including Plastic surgery, Paediatrics, Pulmonology, Psychiatry, Microbiology, Physiotherapy, Blood bank, dedicated nursing staff, counsellors and dieticians.

Average hospital stay was 17.56 days with 70% patients requiring surgical intervention of one form or the other. This is accomplished with a dedicated operation theatre within the BICU, which facilitates in performing surgical procedures both minor and major, under strict sterile conditions, including the dressings. This is important, especially in pediatric age group, who will require sedation and monitoring during every change of dressing. It also caters to the logistics of operation theatre (OT) availability thus preventing delays in transition of patients from burns ward to the OT complex.

#### **CONCLUSION**

Infants and toddlers are more prone for accidental scald burns, whereas older children are more affected with accidental thermal and electrical burns, all occurring in domestic home environment. Therefore, parental counselling regarding potential dangers of household circumstances, fire safety and first-aid is most important in paediatric burns.

With various modes of injuries noted in our study, we suggest some of the safety guidelines that can be implemented in preventive programs for burns in the form of:

- Housing designs with safer cooking areas and techniques.
- Safer methods of boiling water and bathing.
- Containers with boiling liquids to be kept away from children's reach.
- Educate regarding safety with fire crackers and loose clothing.
- High-tension electric wires placed away from the terraces.
- Electric appliances to be handled under adult supervision.
- Flying kites in open areas.

Rising incidence of suicidal burns in children and younger teens, calls for an initiative to manage the stress and need for psycho-social support, in order to prevent them from taking such extreme steps.

A dedicated multi-disciplinary team with good infrastructure exclusively for burn patients and strict protocols followed at every stage of the treatment is utmost important for better outcome in paediatric burns. Through a combination of prevention strategies and improved burns care, considerable progress can be made not only in lowering the death rates, but also in achieving the goal of physical, social and psychological rehabilitation in paediatric burn patients.

Funding: No funding sources Conflict of interest: None declared Ethical approval: Not required

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Cite this article as: Powar RS, Sudhir BM, Prabhu MD, Rajput DU, Mallapur BN. Epidemiological study of pediatric burns at a tertiary care centre in South India. Int J Community Med Public Health 2016;3:1242-6.