

## Epidemiological Study of Pediatric Burns Admitted to A Tertiary Burn Care Center

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### Abstract

**Background:** Pediatric burns are reported to be amongst the most prevalent traumatic injuries around the world, most of which occurring in accidental domestic environment, that are preventable. Currently little literature exists regarding pediatric burns in Indian scenario, with this study, we aim to suggest measures that may be taken to prevent burns in children.

**Methods:** It is a retrospective study of pediatric burns patient under 18 years of age during the period of January 2014 to May 2018 presenting to JIPMER tertiary burn centre. Data was collected from hospital online record system and discharge summaries. Epidemiological data were analysed with children divided into three group's viz. 0–6 years, 7–12 years, and 13–18 years respectively.

**Results:** A total of 418 pediatric burn cases were studied. Male and female children were nearly equally affected. 96.4% burns were accidental in aetiology. Scald burn was the most common mode of injury overall (61.48%), whereas thermal & electrical burns were more common in older children. In our study, overall mortality was 15.31%.

**Conclusions:** Pediatric burns are preventable burns with chronic complication sequel. Aggressive management helps to reduce the mortality and morbidity. This study highlights the aetiology and risk factors for burns in children of different age groups, which help in establishing safety measures. Through a multidisciplinary approach, 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:** Burns; Paediatric; Risk factors; Preventive measures.

## INTRODUCTION

India, the second most populous country in the world with over 125 crore people, has an estimated annual burn incidence of 6–7 million. Based on data from the major hospitals in India, extrapolated

to the whole country, burns remain the second largest group of injuries after road accidents in the pediatric age group.<sup>1</sup> The global incidence of burn injuries (all ages) is 1.1 per 100,000, and it varies with geographic location, socio-economic status, ethnic group, age and sex. Most burn injuries are minor and do not necessitate hospital admission.<sup>2</sup> In developing countries, pediatric burns is reported to be the third most common cause of death in children aged between 5 and 18 years. However, the global incidence of hospitalized pediatric burn patients is unknown. Even though only a small proportion of burn injuries is serious and meets the criteria for transfer to a burn centre, the care of these critically ill children requires a coordinated effort and expertise (in the management of the burned patient) to successfully save and rehabilitate them.<sup>3</sup>

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Epidemiological studies of burn injuries have highlighted risk factors that have led to the establishment of effective preventive programs. 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 18 years or less with burns, admitted between January 2014 to May 2018 in the JIPMER Tertiary Burn Care (JTBC) center, Pondicherry, India was done. American Burn Association criteria were followed for admission of patients. Percentage of burns was assessed on admission with Lund and Browder chart.

The children were grouped based on age into three group viz. Group 1 (0-6 years), Group 2 (7-12 years) and Group 3 (13-18 years). The following data was collected by reviewing patient hospital records, photographic records and discharge summaries-age, gender, etiology, mechanism of injury, percentage of burns and mortality.

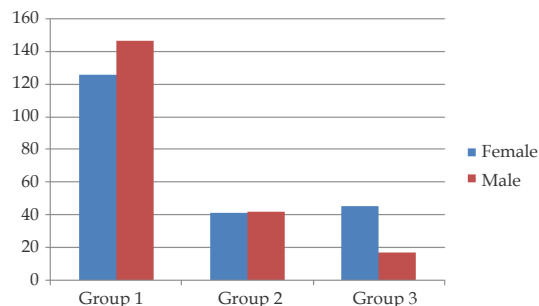
Statistical analysis of the collected data was done using Microsoft Excel (2016, Microsoft corporation, Redmond, USA)

**RESULTS**

A total of 1173 patients were admitted to the JTBC during the period of January 2014 to May 2018. Of these, 418 patients were admitted aged between 30 days to 18 years giving an incidence of 35.63% for pediatric burns. Female children comprised of 50.7% (n = 212) and males 49.28% (n = 206) nearly equal in distribution. 65.31% of children belonged to Group 1, of which 46.15 % (n = 126) were girls and 53.84% (n = 147) were boys, followed by 19.85% in Group 2 (female 49.37%, male 50.6%) and 14.83% in Group3 (female 72.5%, male 27.4%) (Table 1, Chart 1).

**Table 1:** Gender Distribution in Different Age Groups

Age groups	Female	Male	Total
Group 1	126	147	273
Group 2	41	42	83
Group 3	45	17	62
<b>Total</b>	<b>212</b>	<b>206</b>	<b>418</b>

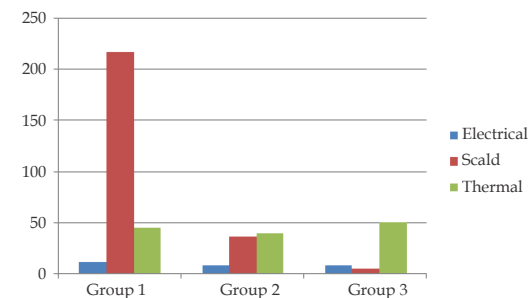


**Chart 1:** Gender distribution in different age groups.

Overall, the most common mode of injury was scalds, occurring in 61.48% (n=257) patients. Thermal burns accounted for 32.05% (n=83) patients and electrical burn injuries accounted for 6.45% (n=27) patients. Thermal burn injury was more common in Group 2 47% (n= 39) and Group 3, 80.64% (n=50). Most of Female children in Group 1 (81%), sustained scald burns, 46.32% thermal burns in Group 2, 93.3% thermal burns in Group 3. Majority of male children in Group 1 had Scald burns (78%), thermal burns in Group 2, 46.71% and Group 3 thermal burns accounted for 47.05%.

**Table 2:** Mode of Injury in Different Age Groups with Gender Distribution

Age groups	Gender	Electrical	Scald	Thermal	Total
<b>Group 1</b>		11	217	45	273
	Female	4	102	20	126
	Male	7	115	25	147
<b>Group 2</b>		8	36	39	83
	Female	1	21	19	41
	Male	7	15	20	42
<b>Group 3</b>		8	4	50	62
	Female	2	1	42	45
	Male	6	3	8	17
<b>Total</b>		<b>27</b>	<b>257</b>	<b>134</b>	<b>418</b>

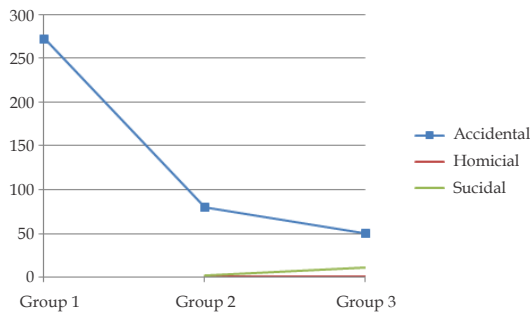


**Chart 2:** Mode of injury in different age groups with gender distribution.

In our study 96.4% of burns were accidental, 3.1% suicidal in nature with 2 case of homicidal injury. 22.23 % of female children in Group 3 were of suicidal in nature. (n=10 of 45) (Table 3, Chart 3).

**Table 3:** Mechanism of Injury in Different Age Groups

Age groups	Accidental	Homicidal	Suicidal	Total
Group 1	273			273
Group 2	80	1	2	83
Group 3	50	1	11	62
<b>Total</b>	<b>403</b>	<b>2</b>	<b>13</b>	<b>418</b>

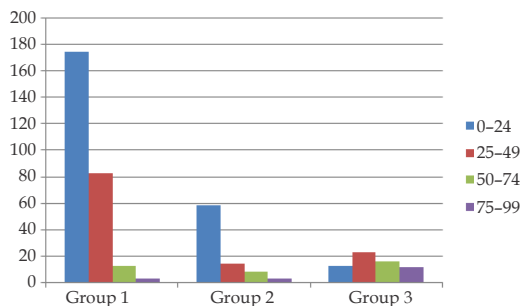


**Chart 3:** Mechanism of injury in different age groups

Percentage of total body surface area involved ranged from 2% to 95% of total body surface area. 58.61% of burns were in the range of 0-24 % of TBSA. 28.87 %, 8% and 4% involving 25-49, 50-74 and 75-99 of TBSA respectively. (Table 4, Chart 4).

**Table 4:** Age Group with Total Body Surface Area of Burns (TBSA)

Age group	0-24	25-49	50-74	75-99	Total
Group 1	175	83	12	3	273
Group 2	58	14	8	3	83
Group 3	12	23	16	11	62
<b>Total</b>	<b>245</b>	<b>120</b>	<b>36</b>	<b>17</b>	<b>418</b>



**Chart 4:** Age group with total body surface area of burns (TBSA).

Mortality was noted to be 94.12% percent in burns over 75% of TBSA, 61% with burns of 50-74% TBSA, 18.33% and 1.63 in 25-49, 0-24 TBSA respectively. Overall mortality rate was 15.

**Table 4:** Age Group with Total Body Surface Area of Burns (TBSA)

Age groups		0-24	25-49	50-74	75-99	Total
Group 1	Result	175	83	12	3	273
	Discharged	171	67	3		241
	Died	4	16	9	3	32
Group 2	Result	58	14	8	3	83
	Discharged	58	12	1		71
	Died		2	7	3	12
Group 3	Result	12	23	16	11	62
	Discharged	12	19	10	1	42
	Died		4	6	10	20
<b>Total</b>		<b>245</b>	<b>120</b>	<b>36</b>	<b>17</b>	<b>418</b>

## DISCUSSION

This study represents one of the largest report on pediatric burns in Indian scenario, managed in single hospital which caters to an area of almost 200 km radius. In India, paediatric burns account for 17-25% of total burn admissions.<sup>1</sup>

Management of pediatric burn is a multidisciplinary approach involving Plastic Surgeons, Paediatricians, Nutritionist, Physiotherapist, dedicated nursing staff. TBSA of children is three time of that of adult, resulting in increased fluid loss and hypothermia requiring relatively greater fluid resuscitation compared to adult. Child's thin skin may make initial burn depth assessment difficult.<sup>4</sup>

In our study, Scald burn was commonest burn injury overall accounting for 61.48% of cases, secondary to pulling of container containing hot liquid in itself, accidental immersion in hot water tub/container, accidental spillage of hot beverages. Thermal burns are common in other age group as younger children are assigned household work involving cooking, boiling water using fossil fuels, etc. Reports of loose clothing catching fire while lighting lamp were noted. Injuries in boys involved playful activities involving fire, crackers or fall in fireplace, adventurous activities with fire. Electrical injuries were noted due to accidental contact with live wires, contact with electrical sockets, putting loose wires into mouth by toddlers, contact with electrical appliances. Majority of these scald and thermal burn injuries were second degree superficial to deep dermal, requiring conservative management with collagen sheets and other wound management regimen. Mortality increased with the increase in percentage of burns. Electrical burn patient required surgical

intervention in form of fasciotomy, debridement and amputation ( $n = 6$  of 27 patients). Suicidal thermal burns were noted in Group 3 patients especially among female patients.

Pediatric burns are avoidable burns with long term post burn injury sequel like hypertrophic scar, keloid, contracture involving extremities, affecting the quality of life before it starts. These burn injuries most commonly occur in household setup and can be prevented. Following steps can be taken to prevent such accidents include.<sup>5-9</sup>

- All activities involving fire, including cooking should be carried out with utmost care & presence of mind.
- Cooking with fossil fuel should be limited.
- Platform for cooking should be at higher level.
- Cooking and heating object should be out of reach of children.
- Overcrowding should be avoided; toddlers should be kept away from cooking area.
- Faulty cooking gadgets & illegal cylinders should not be used.
- Hot water should never be stored in buckets, should be used only when required.
- In the event of gathering or function, tents should be well planned so that cooking area is away from the crowd specially children.
- Chemicals used for cleaning should be labeled well, kept in closed cupboards and taken out only under supervision.
- Children should not have access to firecrackers unsupervised by an adult.
- Electric circuits at home should be carefully insulated and kept out of reach of small children.
- Chargers for electronic devices and other electrical items should not be kept plugged in when not in use to prevent toddlers and infants from putting them in their mouths.
- Used batteries should always be kept out of reach of children and disposed off properly.
- Adults to be attentive towards behavioural changes in age group of 13 to 18years.

## CONCLUSION

Scald burn injuries are overall commonest pediatric burn injury and accidental in nature which can be avoided with preventive measures. Electrical burn injuries had significant morbidity due to amputation. Suicidal burn injury in adolescents is a cause of concern. Complication sequel is prolonged affecting quality of life. Education, awareness, precaution can help in reducing the incidence.

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