

AN EPIDEMIOLOGICAL STUDY OF PEDIATRIC BURNS AT A TERTIARY CARE CENTRE OF NORTH INDIA

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Abstract

Background: A Burn is defined as a tissue's trauma due to heat, chemicals, electricity, sunlight, or radiation. The epidemiological profile of burn injury has changed with time and societal advancement. Scald burns due to hot liquids, hot gases, and steam are the most common mode of burns in paediatric age groups. Most of them occur in predictable home environments and indoor settings and can be prevented. Besides saving lives, the ultimate goal of such an epidemiological study is the prevention of such devastating Injuries.

Materials and Methods: This is a retrospective study done at the Department of Plastic & Reconstructive Surgery PGIMS Rohtak, Haryana over a period of one year (March 2022- march 2023). A total of 134 (one hundred thirty-four) burn patients were admitted to the department which included all forms of burn injury in the pediatric age group. **Result:** Out of 134 burn patients, 19 patients suffered from Electrical burns (%), 41 suffered flame burns (%), 60 suffered scald burns (%), and the remaining 14 patients suffering from other types of burns. 75 patients were of the age group 1-4 years (%). Of 134, 80 were males (60%) and 54 were females (40%) of all burn admissions. **Conclusion:** Our study concludes that the most common mode of burn injury is Scald and flame burn in the pediatric age group and the most common age group which needs extra care and prevention is the 1-4 yrs, age group. With this study, we want to send the message to the public that burns in pediatric age groups are very devastating, and prevention of these burn injuries could be possible by small efforts by their relatives.

INTRODUCTION

According to statistics, India experiences between 6-7 million burn incidences each year. The high incidence is brought on by the general public's lack of safety awareness, poverty, and illiteracy. Burn injuries are a major cause of death and a critical public health concern.^[1] Burn injuries are among the leading causes of mortality and morbidity and a severe public health obstacle. Paediatrics Burn remains a serious epidemiological issue that is extremely challenging to address. Children under the age of 16 account for over a quarter of all burn injuries, with children under the age of five being the majority.^[2] At these dedicated facilities, the mortality rate following serious burns is less than 3%.^[3] 20–25 percent of all burn patients admitted to a major burn centre is youngsters. After traffic accidents, burns are the second-leading cause of trauma-related fatalities. Previous research conducted globally has shown that children under

the age of four have the highest prevalence of burn injuries.^[4-7]

Low-income and middle-income nations (LMICs) bear a disproportionate amount of the burden of burns.^[8] In south Asia, burns have a tendency to occur more frequently during the Diwali holiday, which is observed annually in October or November. Particularly troubling is the situation in India. India had an estimated 23 000 fire-related deaths in 2019, which accounts for 20% of global mortality.^[9]

The cause of burn injuries varies depending on the child's age. Under the age of 4, scald burns account for over 65 percent of thermal injuries and are often the most prevalent form. Older kids are more likely to have thermal burn from being in close proximity to a fire; over 56% of instances in developed countries.^[5] Thermal burns account for over 80% of the total burn cases in India and other developing countries.^[7] The high incidence of cooking accidents is due to unsafe heating practices, floor-level cooking, and wearing of loose-fitting clothes in

villages. Scalds constitute only 15% of all burn admissions in India.^[6] The incidence of scalds peaks around the age Group of 1 to 8 years. Most of the accidents happen when the child is unattended or parents are distracted or engaged with hot liquid/food with the child in their lap. The sitting child gets perineal, genitals and thigh burns if it falls on his/her lap. Overall, boys get scald and thermal injuries more frequently as compared to a girl child. Thermal burns in pediatric age groups are mostly accidental. The accidents occur, while preparing tea or soups or boiling milk and from spillage from a hot water bottle. Chulha is most commonly used for cooking food which is situated on the ground level and many of our patients have a history of falling in this chulha accidentally while playing.

Electrical burns in children are generally caused by domestic electric current, which is 220–250 V, and 60 Hz in India. Electrical burn account for only 5% of burn cases but are generally extremely devastating. The majority of the cases are males and are in the age group of 5 to 12 years.^[10]

Firecracker injuries are another common cause of burn and hand injuries, especially during Diwali and other festive occasions.^[11,12] The ill-defined legalities regarding the sale and use of firecrackers and the lack of safety among people explain the high incidence of such injuries. Most of the blast Injury patients are males and are in the age group of 4 to 10 years and unsupervised also. About 15% of the victims are bystanders. The most commonly responsible firecrackers are 'bomb', 'anar', and igniting of collected firework powder accounting for more than 60% of cases.^[13]

Finally, child abuse has to be on the differential for any suspicious lesion like a small burn over the hands, thighs, and face. The child burn victim is almost always under the age of 10 yrs, the majority under 2yrs. A typical “stocking” pattern and line of demarcation are possible evidence that the injury was not accidental. A high index of suspicion should be there in all burn injuries. In children under the age of 2, about 20% of burn injuries (according to western data) are reported to state social services for investigation.^[14] No accurate data was available about child abuse in India.

The management of a pediatric burn patient is complex and requires a multidisciplinary approach. The multidisciplinary team approach of pediatricians, surgeons, anesthesiologists, intensivists, nurses, physiotherapists, and other healthcare providers with a unique opportunity to make a collaborative effort. Pediatric burns can have a long-term physical, economic, and social impact on patients and their families with ongoing treatment, rehabilitation, and the need for regular interventions. So prevention of these burns has a good long-term impact on society and the country.

Epidemiological data can provide vital information for the development of prevention strategies, thus reducing the frequency of burns and the budget utilization of the health care system. Such studies

from India are few and significantly fewer data were analyzed and reported by these studies. Such studies can encourage the government to take important measures and make policies to prevent these.^[2,15,16] This study aimed to provide recent epidemiological data on pediatric burns in India, defining important etiologies such as electrical burns and suggesting future high-impact preventive strategies.

MATERIALS AND METHODS

This is an observational study. Subjects were patients up to 14 years, 134 consecutive fresh admissions to the burn unit of PGIMS Rohtak, Haryana, during the period 1 March 2022 to 28 February 2023.

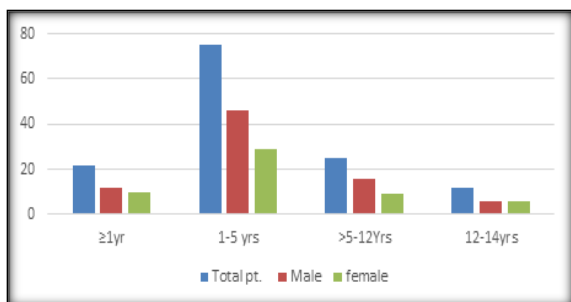
We collected annual case data and relevant epidemiological and clinical information on admission and later analyzed them using a qualitative test of significance. Data about the history of the mechanism of injury and clinical assessment were collected from all patients for this assessment. Data were collected from the clinical notes after confirmation from the index person (doctor) writing the notes if required.

Standard Lund and Browder charts were used as appropriate for children's age to calculate the total body surface area (TBSA) involved in the burn.

Comparison of TBSA between males and females, inhalation injury (yes/no), and type of burn also done.



Figure 1: Various types of burns occur in pediatric age groups



Age group	Total patients	Male	Female
≥1yr	22	12	10
1-5 yrs	75	46	29
>5-12Yrs	25	16	9
12-14yrs	12	6	6

RESULTS

A total of 134 pediatric patients were admitted to our burn unit during the assessment period. The incidence of electrical burns (n =19) seen in all age groups most commonly seen in 4-12 yrs age group. There were no suicidal burn cases in any pediatric age groups. There were 80 males and 54 females, giving a male-to-female (M: F) ratio of 1.48:1. Most burns [n= 80 (59.70%)] were sustained inside the home, either in the kitchen, living room, or

bathroom. Most of the patients belonged to nuclear families [n = 71 (53%)], and 63 (47 %) patients had a family size of fewer than six members.

Aetiology/characteristics of the burns:

In total, 60(48%) patients sustained scalds, while 31 (25%) had thermal burns. The degree, depth, and severity of the burn wound were all strongly correlated with the burn agent. The flame burns usually caused mixed second and third-degree, deep, and severe burns. The sites most commonly affected were the face, upper extremity, and upper trunk followed by the lower extremity. Twenty-five patients also had sustained accidental injuries like head trauma due to falls.

The history given by the patients and their relatives revealed that the majority of scald and flame injuries occurred at home. The etiology of burn wounds did not have any significant influence on mortality 15.

In approx. 60% of the pt. domestic cooking, stove, Chulha, etc were responsible for the flame and scald burns. Scald burn was the most common of burn injuries (60 of 134) which comes out to 48%). In scalds the commonest causative agent was tea or hot milk.

Table 1: Incidence of various modes of burn

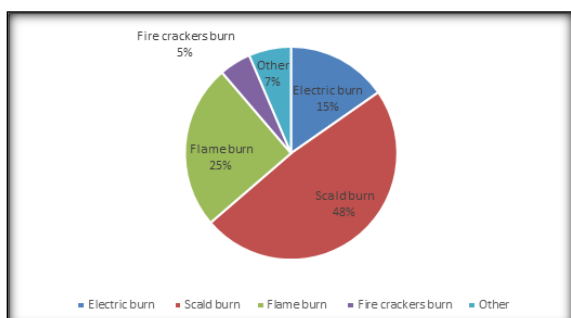
Types	Total no of pt.	Percentage
Electric burn	19	15
Scald burn	60	48
Flame burn	41	25
Firecrackers burn	6	5
Other	8	7
Total patients	134	

Table 2:

Months	Cases of burn
March-may (summer)	37 (27%)
June- August (Monsoon Season)	40(30%)
September- Nov (Autumn Season)	28(21%)
December to Feb (Winter Season)	29(22%)

Table 3:

Percentage of burn	No of patients	Percentage
≤10%	28	21
10-30%	78	58
30-50%	22	16
>50%	6	5



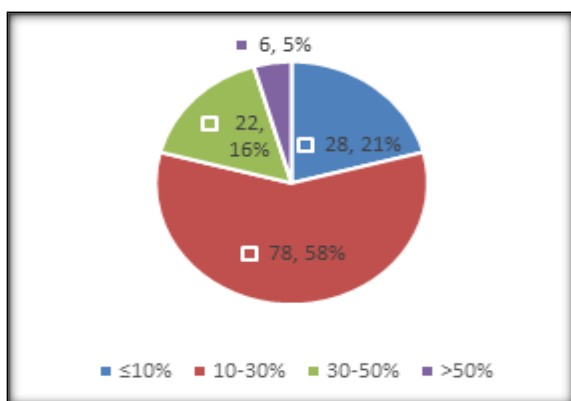
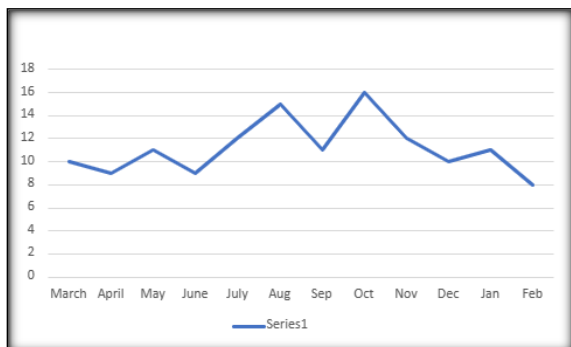
Temporal variation and type of referral

The number of admissions during different quarters of the year varied from 37(27%) patients between March and May to 40 (30%) patients between June and August. There is highest burn incidence occurs between July to September month. No data was calculated about patients who came directly or were referred from other hospitals.

TBSA and Depth of burns and pre-hospital first aid:

Then highest proportion of patients (34%) sustained partial thickness burns, while 59 patients had mixed-thickness burns. Most cases admitted were second-degree superficial or deep burns, using the rule of

nine, of 10-30% of the total body surface area. The deep burn was seen in 40 (30%) pt. Deep burns were mostly seen in unattained children or nuclear families. Regarding pre-hospital first aid, some patients received at least some form of first aid. Among these, cold water was used in most cases. Other techniques ranged from blankets made of toothpaste, ice, ink, and sand to unidentified medical treatments. The precise information is not available for India.



DISCUSSION

Burn care in India is not very well structured and organized. The government sector handles most of the burn care load and the availability of beds can range anywhere from 500 to a few thousand. Burn care beds managed by general surgery and dedicated burn units managed by the plastic surgery team.

Epidemiological studies have played an important role in burn prevention, and their knowledge helps in the appropriate selection of target groups for preventive action. The common reasons listed are lack of education, overcrowding in the house, and unsafe cooking habits.

The most important step is public education and the availability of good burn care facilities in all institutions.^[16]

Consistent with the available literature, children between 1 and 4 years of age in our study were shown to be at the greatest risk, so making they should be the prime targets for prevention. Similar to reports from previous studies our study shows males were affected more than females.

Scalds (48.8%) were the most common type of burn among our patients and followed by thermal burns (43.4%). These data were similar to data from other previous studies. Some studies show a high incidence of thermal burns also.

In our study, 19 (7.5%) patients sustained burns due to electrical injuries. Four patients suffered chemical burns caused by corrosive substances. Similarly, another study from a burn center in India reported 38 pediatric patients with chemical burns during a study period of 10 years.^[17]

Admissions were higher in the summer and monsoon seasons. Studies show variations in burn incidence with weather changes and during festivities with the use of fire (during Holi), light, and firecrackers (during Diwali). However, in our study, there was an increase in burns due to firecrackers during Diwali this trend can be attributed to vigilance by elders and awareness and management of most firecracker burns on an OPD basis with no need of admission.^[2] In our study, we have to admit some hand injuries occur due to firecrackers. Appreciating seasonal patterns and mechanisms can allow burn centers to activate resources for increased needs, and improve injury prevention efforts.

The overwhelming majority of burn accidents occurred indoors and while playing (>80%). This finding can likely be the result of children, living and playing mainly indoors. Studies have also revealed that indoor burns occurred in the absence of parents or caretakers. Previous studies suggest that burn prevention strategies should focus on indoor burns, as that was the location where most burns were sustained in this age group and our study results are the same.

Standard worldwide guidelines consist of providing first aid by running tap water for 20 min. Cooling blankets are also can applied but not available easily. We should avoid hypothermia due to excessive cold-water use or ice, especially in children. According to our study, fewer patients were provided with cold water as a first aid measure. We need to improve society's knowledge about how to prevent burns and what should we do as first aid management after any burn accident.

A Major limitation of this study was the likely inability to accurately quantify the incidence and risk of mortality. Our burn center is a tertiary care center; Patients who did not need admission and were managed on an OPD basis were not included in the study. As our primary aim was to focus only on the epidemiology of burns other outcomes consisting of morbidity and mortality data are not reported.

CONCLUSION

This study was originally conducted to give epidemiological data in a tertiary care burn unit in Rohtak, Haryana. The paediatric age group burns

affected most commonly those aged between 1 and 4 years so that should be the prime target of prevention. The kitchen, bathroom, and living room are common areas of the house where accidental burns happen the most, so proper precautionary measures should be undertaken.

Most burn accidents are happening indoors in the absence of their guardians so there is a need to formulate guidelines and education of parents and guardians to prevent burn-related accidents in children. Proper surveillance of the children should be necessary. We have outlined risk factors for pediatric burns through this study. This outlined framework should aid the formulation of effective burn prevention programs for the country as well as the development of prevention strategies. In our villages, the chulha is most commonly used for cooking and is situated on the ground and children used to play near it. So we must avoid using chulha like this or we should prohibit the children to play near it. The entire country should switch to safer piped cooking gas, as is being done in various major cities.

Older children should be taught and supervised to reduce the incidence of electrical burns. There is usual history of electric burns occurring with the finger putting into the socket or touching exposed wires or putting it inside the mouth. To avoid this mechanism strict guideline regarding having no exposed wires or unguarded sockets in a home should be formulated and implemented.

Prevention programs and measures play a major role in the significant reduction of rates of serious burns. A variety of preventive measures which can be undertaken include limiting water temperature in geyser, smoke alarms, sprinklers, improved construction of buildings, and fire-resistant clothing. Firework injuries can be prevented by strict adherence to government rules regarding their manufacture and sale.

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