

## Original Research Article

# Pediatric scald injury and its comparison in urban and rural population: a clinico-epidemiological study in a high volume burn centre of Northern India

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## ABSTRACT

**Background:** Scalds are the leading cause of pediatric burn admissions and related morbidity, as well as a major cause of pediatric death worldwide. This study was conducted with the objective to study the epidemiological characteristics of pediatric scald injuries and its presentation in urban and rural parts of Indian population.

**Methods:** A retrospective study was conducted by reviewing the medical records of all burn admissions in our institute from January 2017 to December 2019. Data of pediatric patients with scald injury was analyzed.

**Results:** Total 1257 pediatric burn patients were admitted during the study period of which 711 (56.56%) were scald injuries. 57.94% of the children belonged to rural background. The mean Total Burn Surface Area was 38.55% in rural population as compared to 24.16% in the urban population. Immersion burn was most common mode of scald injury in children from rural background (60.19%). Spillage was commonest mode of scald in children from urban background (69.2%) and also the commonest mode of scalds in the pediatric population.

**Conclusions:** The population of rural area had greater total burn surface area, belonged to lower socio-economic status, and had delayed presentation to the hospital and greater mortality rates. Illiteracy and beliefs in quackery further worsened the prognosis of such children.

**Keywords:** India, Pediatric burns, Scalds

## INTRODUCTION

Burns is one of the most devastating conditions encountered in medicine and affects all the countries. Although the developed countries have seen a decrease in the incidence of burns, it is still a concern in the developing countries. As per the World Health Organization (WHO), the incidence of burns is the highest in Africa and South East Asia, as compared to the rest of the world.<sup>1</sup> The children are highly susceptible to burn injuries owing to their curious and experimental nature. Scald injuries constitute for more than 50% of all burns in children.<sup>2</sup> Scald injuries can result in long term

sequelae in the form of physical and psychological impairment to the patient and their family members.<sup>3</sup> The higher frequency of hospital admissions is also associated with increased economic burden to the families of burn patients.<sup>4,5</sup>

Scalds injuries are mostly accidental in nature. Most of these are domestic and preventable as well. Therefore, educating the parents about its prevention can significantly decrease the incidence of burns and the sequelae of burn to the patient and to the family.

Epidemiological studies of burn injuries are very crucial in highlighting the risk factors involved and help in the formulation of preventive strategies. In India, such studies about pediatric burns are few in number surprisingly. We could not find any study for pediatric scald burns, even though scalds account for the majority cases of burns in children. The objective of this study was to study the epidemiological characteristics of the pediatric scald burns and to compare its presentation and outcomes in urban and rural population, as the majority of Indian population resides in rural area.

## METHODS

A retrospective analysis of data of children admitted with scald injury, in the Department of Burns and Plastic surgery, SMS Hospital, Jaipur, India from January 2017 to December 2019 was conducted. Our hospital is a tertiary referral centre, being the largest government hospital in the state of Rajasthan and it caters to patients from the neighboring states as well. It has a dedicated Burn Ward and ICU which caters to a large number of burn patients, making it one of the largest hospitals of Northern India.

Data of all burn admissions during the study period were collected by previous hospital records and the discharge summaries. Data of scald injuries were segregated and analyzed. Patients of pediatric age group (less than 18 years) were included in the study. Patients treated on outdoor basis were excluded from the study. Total Burn Surface Area (TBSA) was rounded off in multiples of 5 for ease of analysis.

## RESULTS

Total 711 patients of pediatric scald injury, out of the 1257 pediatric burn admissions, were admitted in the Burns unit during the period from January 2017 to December 2019. This was from a total of 4555 patients admitted in Burns unit during the above mentioned period. The pediatric scald patients constituted to 15.6% of the total admissions during the aforementioned period. Chi Square test and t tests were used to find out the p value.

### Demographic profile of patients

The mean age of patients in our study was 38.3 months or 3.2 years. The patients ranged from ages of 1 month to 17 years. Male (62.02%) children were more affected as compared to females (37.98%) (Table 1).

### Place of burn

Most of the burn injuries were sustained in home i.e. in kitchen 92.45%, in bathroom 3%, in verandah or hall 2.45%, and in the living room in 1.35%. Almost all the scald injuries occurred at home.

### Seasonal variation

The majority of cases of scald injuries were in winter months 286 cases [40%] (November to February), followed by 227 cases [32%] in monsoon months (July to October) and the least in summer months 198 cases [28%] (March to June) (Table 1).

### Residence

Total 57.94% patients (412) hailed from the rural areas and 42.06% patients (299) were from urban area (Table 1). The presentation of patients and the clinical outcomes of patients from the rural and urban population were compared.

**Table 1: Variables.**

Variables	No of patients	Percentage	P value
<b>Gender</b>			
Males	441	62.02	0.00
Females	270	37.98	
<b>Residence</b>			
Rural	412	57.94	0.00
Urban	299	42.06	
<b>Season of exposure</b>			
Summers	198	27.85	0.00
Winters	286	40.23	
Monsoons	227	31.92	
<b>Timing of report in hours</b>			
<8	425	59.77	0.00
>8	286	40.23	
<b>Status</b>			
Discharged	433	60.90	0.00
Expired	278	39.09	

### Mode of scald

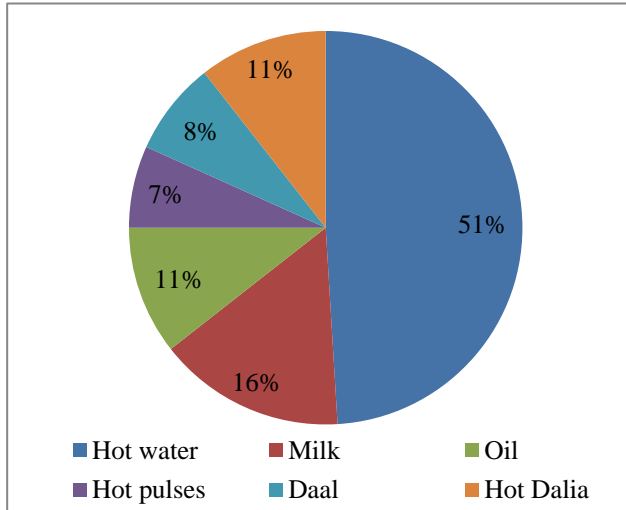
In our study, we found that accidental spillage of hot liquid over the child accounted for 51.6% of the cases and accidental immersion of the child in the container of hot liquid accounted to 47.26% cases. In 1.13% the scald was caused by hot steam from the pressure cooker and steam and they were termed as miscellaneous cause of scald. The mode of burns were further divided on the basis of rural and urban population (Table 2).

**Table 2: Mode of scald.**

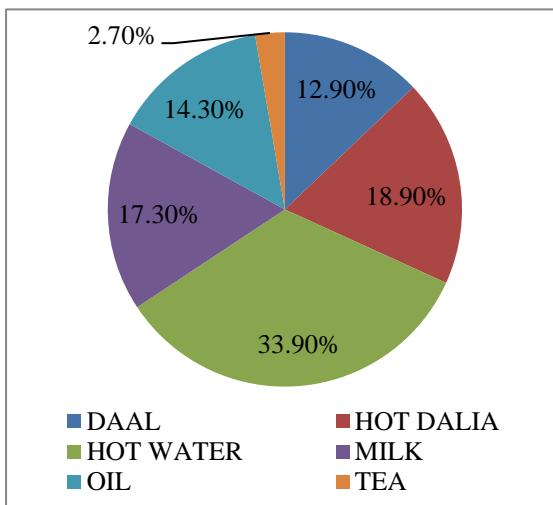
Type of burn	Rural N (%)	Urban N (%)	P value
<b>Immersion</b>	248 (60.19)	88 (29.4)	0.00
<b>Spillage</b>	160 (38.83)	207 (69.2)	0.00
<b>Misc</b>	4 (0.98)	4 (1.4%)	0.61

**Cause of scald**

Hot water (51%) was the leading cause of scalds in our study 51% i.e. 365 cases, followed by hot milk (16%) 116 cases, hot oil and hot porridge (Dalia) 11% each, hot pulses (7%) and hot tea and coffee (3%). The porridge (dalia) was prepared by rural people to feed their cattle and was a significant contributor of scalds in that population (Figure 1-3).



**Figure 1: Cause of Scald.**



**Figure 2: Cause of Scald (rural).**

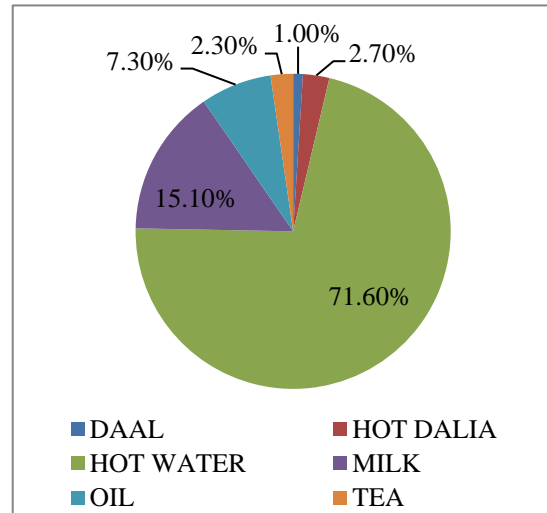
**Timing of presentation**

Total 59.77% of the cases were direct referrals (within 8 hours of the burn) and the remaining 40.23% were indirect referrals (after 8 hours of injury) (Table 1).

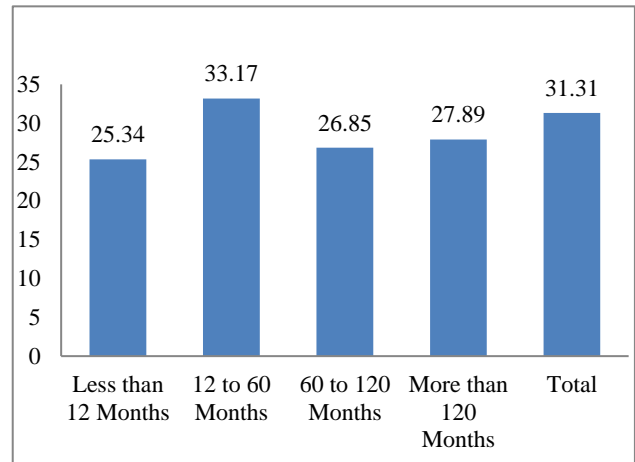
**Distribution of burn patients based on TBSA**

Mean total burn surface area in our study came out to be 31.31% (Figure 4). It was also seen that the mean TBSA

was 38.55% in rural population and 24.16% in the urban population (Table 3).



**Figure 3: Cause of Scald (Urban).**



**Figure 4: Mean TBSA involved with age groups.**

**Table 3: Mean TBSA involved with age groups.**

Variables	Rural (412)	Urban (299)	P value
<b>TBSA</b>	<b>N (%)</b>	<b>N (%)</b>	
≤10	70 (16.99)	146 (48.82)	0.0
11–20	54 (13.11)	43 (14.38)	0.61
21-30	55 (13.34)	32 (10.7)	0.30
31-40	54 (13.11)	21 (7.02)	0.01
41-50	63 (15.29)	25 (8.36)	0.01
51-60	44 (10.69)	20 (6.68)	0.07
61-70	38 (9.22)	7 (2.34)	0.00
71-80	31 (7.52)	5 (1.7)	0.00
81-90	3 (0.73)	0 (0)	0.14

**Outcomes**

We found that 60.90% of our patients were discharged successfully after treatment but 39.09% of the patients

who presented to us succumbed to the injury (Table 1). These variables were further divided in urban and rural population (Table 4).

**Table 4: Outcome.**

Variables	Rural (n=412)	Urban (n=299)	P value
<b>Discharged</b>	194 (47.08%)	239 (79.9%)	0.00
<b>Expired</b>	218 (52.9%)	60 (20.06%)	0.00

**Mortality with TBSA**

We noticed that the mortality rate in our study increased with increasing TBSA (Table 5).

**Table 5: Comparison of mortality with TBSA.**

TBSA	No of Patients (n=711)	Mortality	P value
	N (%)	N (%)	
≤10	216 (30.38)	0 (0.00)	0.00
11–20	97 (13.64)	1 (1.03)	
21-30	87 (12.24)	7 (8.05)	
31-40	75 (10.55)	40 (53.33)	
41-50	88 (12.38)	82 (93.18)	
51-60	64 (9.00)	63 (98.44)	
61-70	45 (6.33)	44 (97.78)	
70-80	36 (5.06)	36 (100)	
80-90	3 (0.42)	3 (100)	

**DISCUSSION**

Scald injuries are the leading cause of burn admissions in the pediatric age group. The incidence of burn injuries is the highest among children below 4 years of age, with responsible factors ranging from children’s impulsiveness, lack of awareness, higher activity levels due to natural curiosity, and often the tendency of children to crawl into danger areas. As the child grows, he is more aware of the surroundings as well as the dangers around, and hence the incidence of burns decreases in the older children.

Children less than 1 year often get scalds due to the carelessness of the caregiver, and have hot liquids spilled over them. The children up to 5 yrs of age are naturally curious about their surroundings and this can put them in potentially dangerous situations. Older children (5-17) begin helping the adults and may injure themselves while they carry a cup of hot tea or pan of hot water or hot dish.

In our study we found that the male children are more affected as compared to females approximately 2:1. Drago and Delgado et al have also found male preponderance in pediatric scald burns in their respective studies.<sup>2,6</sup> It seems that the active and notorious male child are more likely to be injured.

There seems to be a seasonal variation for the scald injuries, incidence being more in winter and monsoon seasons as compared to summers. It could be due to the increased use of hot liquids and beverages in the colder months. It was seen in other studies also.<sup>7,8</sup>

The population in our study was divided on the basis of their residence into two groups i.e. urban and rural. Any area with a municipal corporation, municipal area committee, town committee or cantonment board were collectively called as urban area and the remaining population were classified as rural area.<sup>9</sup>

In our study, we classified scald injury based on its mode and divided it broadly in immersion, spillage and miscellaneous. We found spillage as the most common cause of the scald injuries. Also, we found more cases of spillage burns in urban area while immersion was more commonly seen in rural population.

Most of the houses in rural area are single room accommodation with a dedicated corner of house for cooking, with no separate kitchen. In addition to this, most of the houses have floor kitchens. These single room houses are overcrowded and the residents often have more than 2 children, and hence tend to make more food as the family size is relatively larger. Small children playing around the house especially are at an increased risk. Food is generally cooked over floor stove called as chula. Smaller children have an exploring nature and most of the times play near food containers as a result they can either tumble into the utensil (immersion) or if it has a narrower base, make the utensil and its contents to spill over (spillage), and cause scald injury.

Hot Daliya (Porridge) is a significant cause of scalds in the rural population, which is prepared as a feed for the cattles. Every rural household has surplus livestock owing to the dairy industry and farming practices. Hence these cattle feeds prepared in large quantities in big utensils on the floor stove, are an important cause of scald injuries in the concerned population.

In our study, the mean total burn surface area came out to be 31.31%. The mean TBSA in rural and urban population was 38.55% and 24.16% respectively. This was in accordance with study conducted by Mehta et al.<sup>7</sup>

The average time of presentation to our centre was earlier in the urban population as compared to the rural population, which could be due to the increased awareness among the urban population towards better health facilities. Another reason can also be the issue of road connectivity, which is still a challenge in the remote areas of India.

Furthermore, the people belonging to the rural areas are superstitious and consult quacks who would apply ash over the burns or the parent themselves would apply toothpaste or ink or even oil over the burns, due to

performed notions in their mind. These products harm the child in two ways. Firstly, they irritate the burnt area. Secondly, they prevent proper assessment of burnt area and also the depth of the burn.

They try to manage the patients at home, and only seek medical attention when the child shows signs of irreversible damage. This is the cause of delayed presentation of these patients to hospitals resulting in graver prognosis, as the damage of dehydration is already caused, and hence is hard to curtail even with aggressive resuscitation.

The overall outcome of the patients was also seen to be graver in the rural population. All the above reasons contribute to the increased mortality in the rural population. We also noticed that few attendants from our study group, took their patients on Leave Against Medical Advice (LAMA). We contacted such patients from the details we had from their admission time, and enquired about the final outcome of such patients and included the results in our data of outcome of patients.

The overall mortality in our centre was 39%. This was considerably high as our centre is the tertiary referral centre for the entire state and also from the adjoining states hence it has serious referred patients who could not be managed at other centres. Majority of the patients that present to us are in sepsis or in pre-septic state. We also see that most of our patients have higher TBSA as patients with lower TBSA are managed in other nursing homes and hospitals. The patients with greater TBSA had increased rate of mortality, as mortality rate was almost 100% in patients with more than 50% burns. Hence, this was the limitation of our study, as the population of patients we catered is not fully depictive of the population. The need for a universal Burn register can't be emphasised more.

## CONCLUSION

In conclusion, scald injury accounts for a major chunk of pediatric burns. Scald injuries are mostly domestic and preventable as well. Children especially from rural background had a more grave prognosis owing to delayed presentation to health care, poorer socio-economic conditions, and rural housing conditions like single room houses with floor kitchens and overcrowding. Emphasis should be on education of parents especially mothers about safer kitchen and cooking habits, so as to avoid the accidents which lead to scalds. Children should not be allowed to play near kitchen area. The practice of keeping unsupervised hot liquids in containers should be condemned. We need to highlight the role of local agencies in educating people through various media platforms like radio, television and newspapers about the

hazards of burns and its dire consequences. Burns is a preventable disease and as the saying goes "Prevention is better than cure."

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