

## A GHASTLY RISING RATE OF PREVENTABLE PEDIATRIC BURNS: WE NEED TO ACT

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### ABSTRACT

**Objective:** To ascertain the increase in paediatric burn admissions. Find various causes of this trend and assess the morbidity and mortality in paediatric population, and suggest remedies.

**Study Design:** Cross sectional study.

**Place and Duration of Study:** This study was conducted at department of Burns & Plastic Surgery, Army Burn Centre, Combined Military Hospital, Kharian, from Sep 2017 to Aug 2019.

**Methodology:** Total number of acute burn admissions under 12 years were recorded. Sub divided this group into 0-2 years and 2 to 12 years. We assessed epidemiology, sex, cause of burn, mode of admission, location of incident, type of first aid given, mortality, and compared results during two equal halves of this period. We used SPSS 20 for data analysis.

**Results:** A total of 504 (49.85%) were pediatric acute burn admissions. Age range 25 days to 12 years (mean  $5 \pm 1.2$  years). One hundred and fifty two infants/toddlers aged 0-2 years. Two hundred and seventy male and 234 females. Three hundred and sixteen direct admissions. There were 72.43% more pediatric burn admissions. Three hundred and eighty one scalds, 91 flame burns, 21 electric burns and 11 chemical burns. There was 11.94% improved survival among burn patients. Two temporal peaks, largest in summer from May to Jul and second in winters. The first peak in summers is unique in subcontinent. This is the time of summer vacations in schools when children are less well supervised.

**Conclusion:** There is a rising trend of preventable pediatric burns. A mass public awareness program is the need of the hour.

**Keywords:** First aid, Mortality, Pediatric burns, Prevention, Severity of burns, Survival.

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## INTRODUCTION

Burns are the fifth most common cause of non-fatal childhood injuries<sup>1</sup>. Incidence of burn injuries is highest among children below 4 years of age<sup>2</sup>. Pediatric burns constitute almost half of overall burn admission load in our setup. There are various reasons for this staggering rate of pediatric burns<sup>3,4</sup>. Studies worldwide have demonstrated that the factors responsible range from children's impulsiveness, lack of awareness, higher activity levels due to natural curiosity, and total dependency on caregivers<sup>5</sup>. Several other factors, including poverty, overcrowding, lack of proper safety measures, lack of proper supervision, use of common areas for both cooking and sleeping, traditional habits of cooking over low stoves or in large pots (boiling milk), consuming

food while sitting on the floor, transferring hot liquids in open containers from one place to another, and sterilization of milk by boiling rather than pasteurization<sup>6,7</sup> are to blame. In our rural and even in urban setting placement of young girls in household roles such as cooking and care of small children, easy access to chemicals, use of kerosene (paraffin) as a fuel source for non-electric domestic appliances and inadequate safety measures for liquefied petroleum gas and electricity are also cause of grave concern<sup>8</sup>.

Thermal injury in children is associated with a very high incidence of mortality and significant physical/psychological morbidity. All these injuries have the potential to result in devastating long-term effects in the form of severe scarring, permanent disfigurement and functional disability due to contractures and restricted range of motion of limbs. Pediatric burns may not only cause life-long disability, but also affect the

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mental health and quality of life of patients and their families, imposing a grave socioeconomic burden<sup>9,10</sup>.

There is a widely prevalent taboo or notion among majority general population in the Indo-Pak subcontinent that pouring water on burns will cause blisters and is prohibited, which as a matter of fact leads to much increased depth and severity of burns. This directly translates to severe post burn contractures, disabilities or fatalities<sup>7</sup>. A huge number of loss of productive future work force results because of this misconception.

One of the reasons for this fallacy is lack of education and more reliance on quacks and faith healers. It is our impression that the root cause of this misconception lies in the era when population did not have access to clean water, and the main source was wells and ponds. Correction of this ill learned concept by our general population needs overall improvement in living standards and education of the masses.

Majority of these accidental serious thermal burns are preventable. The rising indulgence of adults in cell phones/tabs over social media is partly to be blamed. There is not a single dedicated burn care facility for pediatric population in Pakistan. Management of Pediatric burns is a very daunting task. It was our impression that the pediatric burns admission rate was significantly more than the last year.

It is also a point of concern that there is no laid down national action plan for burn prevention/ first aid. Public awareness/education is not getting its due share in print or electronic media. Lack of governmental resolve and ineffective imposition of existing legislation regarding building, fire/ gas/ electricity safety are also responsible for this rising trend of pediatric burns<sup>5</sup>.

## **METHODOLOGY**

This is a "Cross sectional study" conducted at department of Burns & Plastic Surgery, Army Burn Centre, Combined Military Hospital Kharian, from September 2017 to August 2019. Our department is a 20 bed burn care facility with 12

ICU beds, 8 stepdown beds and 20 convalescence beds outside the main building as part of a tertiary care facility. It has its own four operating theatres with three resuscitation bays having general anesthesia facility. It has its own CSSD. It receives patients from all over the country. We have split the time period of study into two equal halves i.e. Sep 17 to Aug 18 and Sep 18 to Aug 19 to ascertain the differences among various study parameters between these two years. Record of all acute burn admissions during study period was sifted through, all acute burns were collated and then record of pediatric burn patients was separated. Data sheet record was tabulated according to the study parameters and analyzed. We included all acutely burnt children aged 1 day to 12 years admitted to our tertiary care facility. Our sample size comprises of all acute pediatric burn admissions during this period. There was no gender bias. All readmissions for secondary procedures or old treated burns were excluded from the study.

Written permission was obtained from institutional research ethics committee.

In this study multivariate analyses were carried out to determine the pediatric burn incidence, etiology, TBSA%, mode of admission, incidence among infant/toddlers vs children of 2-12 years, first-aid treatment methods, location of incident, parent/guardian knowledge of burns and the mortality rate in children.

A record of all acute burn admissions during the study period was created, out of these children were separated. Data was entered and analyzed using the Statistical Package for Social Sciences (SPSS), v 20.0 (IBM SPSS Statistics, Armonk, NY). Descriptive statistics were applied to find frequencies, percentages, means, and standard deviations. Quantitative variables, such as age and TBSA%, were expressed as means and standard deviations.

## **RESULTS**

Total 1011 (441, 2017-18/570, 2018-19) patients with acute burn were admitted to our facility during the period of September 2017 to

August 2019. Out of these 504 (185, 2017-18/319, 2018-19) 49.85% were children. Their age ranged from 25 days to 12 years (mean  $5 \pm 1.2$  years). Out of these 504 children, 152 (59, 2017-18/93, 2018-19) 30.16% were infants/toddlers aged 0-2 years. There were 270 (53.57%) male and 234 (46.43%) females, male to female ratio was 1.15:1. 316

There were 29.25% more over all admissions between 2017-18 and 2018-19. Whereas the total increase in pediatric patient admission was 72.43%. There was 2.74% reduced number of infants and toddlers between 0-2 years. There were 59.61% more males and 88.88% more females admitted in this total period. Standard Lund

**Table-I: DATA of Cohat (Sep 2017 - Aug 2018).**

Months	Total Burns	0-12 years	0-2 years	Male	Female	Deaths	Individual % Total Body Surface Area of Deaths
Sep 17	18	6	2	3	3	1 (16.67%)	24%
Oct 17	28	14	5	5	9	3 (21.43%)	40%, 35%, 60%
Nov 17	16	6	5	5	1	-	-
Dec 17	37	19	9	11	8	7 (36.84%)	50,10,26,26,50,18,56%
Jan 18	39	16	3	11	5	7 (43.75%)	40,40,40,75,35,55,15%
Feb 18	31	15	5	10	5	1 (6.66%)	36%
Mar 18	34	17	5	7	10	4 (23.53%)	40,80,35,50%
Apr 18	41	20	11	15	5	4 (20%)	30,80,40,25
May 18	63	27	1	14	13	10 (37.04%)	65,35,85,70,70,50,20,70,50, 50%
Jun 18	47	18	3	8	10	12 (66.66%)	25,70,20,50,60,80,55,75,50,95,15,25%
Jul 18	36	15	8	8	7	6 (40%)	35,60,40,62,65,40
Aug 18	33	12	2	7	5	-	-
total	441	185	59	104	81	55 (29.73%)	

**Table-II: DATA of Cohat (Sep 2018 - Aug 2019).**

Months	Total Burns	0-12 years	0-2 years	Male	Female	Deaths	Individual % Total Body Surface Area of Deaths
Sep 18	36	16	5	11	5	3 (20%)	50,50,60%
Oct 18	42	19	7	8	11	1 (5.26%)	40%
Nov 18	45	27	9	13	14	4 (14.81%)	35,35,35,25%
Dec 18	45	29	16	11	18	3 (10.34%)	25,40,28%
Jan 19	79	41	14	22	19	2 (4.88%)	45,60%
Feb 19	47	26	13	14	12	5 (19.23%)	45,95,35,35,25%
Mar 19	47	22	2	12	10	1 (4.55%)	40%
Apr 19	45	17	2	10	7	5 (29.41%)	30,80,35,40,17%
May 19	40	26	4	6	20	5 (19.23%)	55,20,35,35,25%
Jun 19	53	30	6	19	11	3 (10%)	18,80,45%
Jul 19	53	43	8	28	15	8 (18.60%)	55,35,50,36,25,30%
Aug 19	39	23	7	12	11	3 (13.04%)	10,45,30%
total	570	319	93	166	153	43 (13.48%)	

(62.70%) patients were direct admissions whereas 188 (37.30%) were indirect admissions which were initially treated at home, by quacks or other hospitals and most of the time brought due to complications/sepsis. All this data plus the mortality and their % TBSA (total burnt surface area) are tabulated in table-I & table-II.

and Browder chart as appropriate for patient age were used for rapid assessment of total body surface area (TBSA) involved. The majority of mortality cases had serious burns with average TBSA% of 40% as is evident in (table-I & II). Few cases with TBSA% ranging from 10% to 15% were all indirect admissions, admitted in critical state with severe sepsis in all and ARDS in 2 cases. The

mortality rate among 441 children during first half of study was 26.05% vs 14.11% among 570 admissions in second half of the study period. There was a significant improvement of 11.94% in

ring 2018-19 there is tangible reduction in the mortality rate.

The most common etiology was scalding (381/504, 75.60%), followed by flame (91/504,

**Table-III: Occurrence of Pediatric burns / analysis of mortality between 2017-18 and 2018-19.**

	Total	0-12 years	0 -2 years	Male	Female	Mortality
Sep 2017 – Aug 2018	441	185 43.24% of total burns	59 31.89% of total children	104	81	26.05%
Sep 2018 – Aug 2019	570	319 55.96% of total burns	93 29.15% of total children	166	153	14.11%
Inference	29.25% more admissions	72.43% more admissions	2.74% less admissions	59.61% more boys	88.88% more girls	11.94% improved survival

overall survival rate among these children in the second half (table-III).

The data was plotted on a chart (fig-1). It

**Table-IV: Cause vs frequency of burn percentage.**

Type	Frequency	Cause
Scalds	381/75.60%	Water Milk Curry Tea oil
Flame / contact burns	91/18.05%	Gas explosion Candles/ Lamps/ fire Inflammable liquids Contact with hot surfaces (Heaters, stove, cooking plates, Utensils)
Chemical Burns	11/2.18%	1. Common house hold Acids (toilet cleaners, sweep) 2. Common house hold Alkalis (Bleach) 3. White phosphorous/Sulphur
Electric Burns	21/4.17%	1. Household electricity 2. High voltage electricity from exposed transmission line and transformers placed on ground

graphically shows the significant increase in the overall and children admissions during two halves of the study period. It also highlights that in spite of many more pediatric admissions du-

ring 2018-19 there is tangible reduction in the mortality rate. The most common etiology was scalding (381/504, 75.60%), followed by flame (91/504, 18.05%), electricity (21/504, 4.17%), chemicals (11/504, 2.18%), (table-IV). As for temporal distribution, burn events occurred most frequently in July (n=58, 11.51%), followed by May (n=53, 10.54%) and Jun & Dec (n=48, 9.54%), (table-I, II).

Regarding the first response of the care giver/attendant at the time of incident, 78% panicked, had no clue what to do and either removed clothes/applied household remedies or rushed to nearest doctor/hospital. Only 22% of the time the parent or attendants first response was to pour water or cold liquid on the burns, before any other measure.

In infants and very young, the commonest cause was immersion in boiled milk or water by slipping from hands of elder into the pot or immersion of a playing or standing toddler in the pot lying on the floor. It was also noted that among scalds the depth and severity of burns was worst with cooking Oil and milk (due to high fat contents of unskimmed milk). Other causes were boiling Curry, tea, gas explosions and fires.

Almost 90% of burns happened in the home and 10% occurred around homes, schools or other areas. Out of domestic accidents, 80% happened in kitchen, 15% in bathroom, bedrooms or hall ways and 5% in the vicinity of home<sup>11-13</sup>.

**DISCUSSION**

The occurrence of pediatric burn in our study was almost 50%, which is a staggering incidence. Dhopte *et al*<sup>8</sup> from Delhi India in their prospective

epidemiological study have also shown 475 pediatric admissions in one year which is a large number for any centre. They have also inferred that scalds were the commonest cause closely followed by thermal flame/electric burns. They also showed two temporal peaks in 1st and 3rd

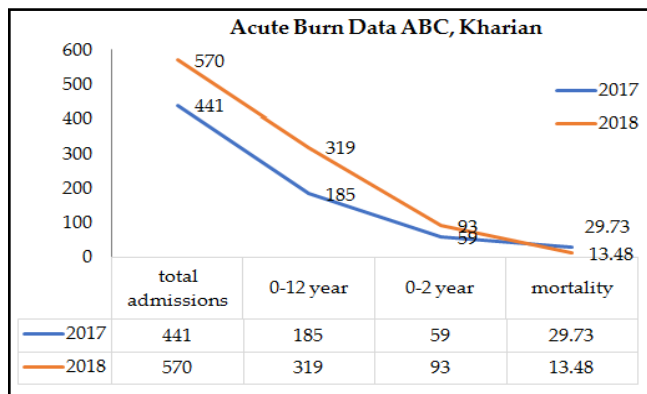
season was spring. This was in contrast to our study where scalds were 76%. About 90% burns occurred in the home and we had two peak injury seasons that is June/July (summer) and Dec/Jan (winter).

**Table-V: Type of first aid given vs site of accident.**

Direct Vs Indirect Admission	First Aid / Pouring Water	Type of First Aid if Any Used	Location of Accident	
63%: 37%	Only 22% confirmed that they poured water as first response 78% said either they panicked and did not know what to do or were afraid water will cause blisters and cause more harm	Water Sugar Water Potato Water Ink Milk Cooking Oil Mobil Oil Tooth Paste Burned Ash Homeopathic Cream Homemade Paste	Domestic 90%	Kitchen 80%
				Bedroom/bathroom /hall 15%
			School/ others 10%	Vicinity of home 5%

quarters of the year. Since our demography and social setup is closely identical with that of India because of being neighbor countries<sup>11,14</sup>. We also observed that Scalds was the commonest cause followed by thermal flame/electric burns. We

There was 11.94% improved survival among these burn victims during the second half of the study. when we see it combined with a 72.43% increase in admissions in this period. This improvement translates into a large number of children healing and leaving the hospital<sup>3</sup>. This improvement in the final outcome is because we are following strict contact isolation protocols. All staff is regularly monitored and trained in hand hygiene and barrier nursing techniques. Enhanced environmental cleaning is being ensured by strictly following the protocols of our department. Judicious use of appropriate antibiotics along with early excision and graft for deep burns are some of the steps which have improved our clinical practice and the final outcome for our patients<sup>15-17</sup>.



**Figure-1: Acute burn data.**

have also seen two peaks in pediatric burn admissions in Dec to Jan and Jun to Jul. It is peculiar with pediatric burns that there are more instances of pediatric burns in hot summer months<sup>14</sup>.

Zvzdic *et al*<sup>3</sup> in 2017 during a large study revealed that 84.9% burns were scalds, 97.3% burns occurred in the homes and the peak injury

Our study has clearly shown 72.43% more acute pediatric burn admissions. There were 29.25% overall more admissions during second half of the study. This significant rise in pediatric burn incidents between first and second half of study period may have a number of explanations. First and the foremost is that, there is no dedicated pediatric burn care facility in the whole of

the country. We get a large number of referred/transferred pediatric burn cases from other hospitals. Secondly probably there were more burn accidents in recent past in our catchment area. This study has proven beyond doubt that we have seen a significant increase in childhood burns but has failed to identify the exact cause of increased pediatric burns during second half of the study. This needs further evaluation and community research to identify the exact cause.

Bakker *et al* in clinical psychology review in 2013<sup>9</sup> showed that child anxiety, traumatic stress reactions, and behavioral problems were considerably prevalent in the first months after the burn event. Among parents, high rates of posttraumatic stress, depressive symptoms, and guilt feelings were found<sup>10</sup>. It was our observation that the feeling of guilt and profound stress and agitation was commonly seen in the mothers of the burnt children<sup>18</sup>.

Prevention strategies should address the hazards for specific burn injuries, education for vulnerable populations and training of communities in first aid<sup>19,20</sup>. An effective burn prevention plan should be multisectoral and include broad efforts to improve awareness, develop and enforce effective policy, describe burden and identify risk factors, set research priorities with promotion of promising interventions, provide burn prevention programs, strengthen burn care, strengthen capacities to carry out all of the above<sup>20-22</sup>.

In 2009, Cuttle *et al*<sup>1</sup> reported that more than 20 min of cold-water treatment following burn injury could significantly decrease hospitalization duration. In our study only 22% of the patients received this treatment. Therefore, improvement of first-aid education for parents/guardians may significantly improve burn prognosis in this population. We also need to make the use of flame-retardant clothing and the use of smoke detectors mandatory<sup>23</sup>.

Burn treatment is very costly. It has a huge negative impact on healthcare system of any nation where government provides free treatment. In majority of developing countries like

ours, no proper health insurance system exists. The public sector hospitals are inadequate and overcrowded, unable to cope up with the needs. Private treatment is very expensive and it has crushing impact on the financial standing of the victim's family. This huge negative financial impact on the economy of the country is enough justification to invest more aggressively in the country wide burn prevention campaign<sup>24,25</sup>.

## CONCLUSION

We need to start a very aggressive campaign on print and electronic media for these preventable injuries and deaths. We probably need nationwide drive to educate our rural population to raise their stoves from ground, ban or restrict toddlers and children's entry into kitchens. We need to sensitize the population about this ghastly rising trend.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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