Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.2241

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Frequency of Burn in Preschool Children in Burn and Plastic Surgery Centre Peshawar

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ARTICLE INFO

Keywords: Preschool children, Burn injuries, Frequency, Pediatric burns, Prevention.

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Declaration

Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History

Received: 12-02-2025 Revised: 09-05-2025
Accepted: 18-05-2025 Published: 31-05-2025

ABSTRACT

Background: Burn injuries represent a significant health concern in pediatric populations, with preschool children being particularly vulnerable due to their developmental characteristics and increased exposure to household hazards. Despite the growing prevalence of burn cases in preschoolers, there is a notable knowledge gap regarding the frequency and patterns of these injuries in local healthcare settings, particularly in resource-limited regions where comprehensive epidemiological data remains scarce. **Objective:** To determine the frequency of burn in preschool children among all burn cases in burn and plastic surgery center Peshawar. **Study Design:** Cross-sectional study. **Duration and Place of Study:** The study was conducted from May 2024 to November 2024 at the Burn and Plastic Surgery Center, HMC Peshawar. **Methodology:** A total of 224 patients aged three months to thirty years with burn injuries were enrolled using WHO sample size calculator. Preschool age was defined as children between three months and four years. Burn injuries were classified as superficial, partial-thickness, or full-thickness based on established criteria. Demographic data including age, gender, weight, parental education, family income, socioeconomic status, residential area, and burn cause were collected. Total body surface area was assessed using Lund and Browder chart. **Results** The mean age was 16.59±8.94 years with male predominance (65.6%). Thermal burns were most common (83.5%), followed by chemical (8.9%) and electric burns (7.6%). The frequency of burns in preschool children was 13.8%. Age and weight showed highly significant associations with preschool burns (p=0.000), with all preschool burns occurring in children aged three months to four years weighing ≤20 kg. **Conclusion:** Preschool children represent a significant proportion of burn cases, with age and weight being critical determinants, emphasizing the need for targeted prevention strategies.

INTRODUCTION

Burn injuries in young children are a public health problem due to the frequency and severity of later manifestations of long-term psychiatric and physical complications.[1] This age group is particularly vulnerable by virtue of the fact that children are by nature curious, lack perception of danger, and are in a stage of motor development.[2] The most common cause in children within this age bracket is scalds by hot fluids, such as water at a boil, tea, or milk, and most often occurs in a home kitchen.[3] Flame burns, hot surface contact burns, and electrical burns are less frequent but tend to have greater depth destruction.[4] The severity of a burn injury depends on attributes such as depth, percentage of the body surface area involved, and presence of inhalation injury.[4]

Management in infants and young children is also most judicious since their smaller-body-surface area predisposes them early to shock, hypothermia, and greater fluid loss.[5] First line management shall be on principles on airway protection, advanced burn life support, fluid resuscution, pain control, and wound care.[6] Additionally , accurate calculation of total-body-surface area effect by age-dependent chart, as in Lund and Browder chart, gives a seminal role in calculation of resuscution.[7] Additionally, physiological realities in infants and young children, as in a higher basal metabolic and a less thick epidermis, make infants and young children predispose to greater injury despite relative brief exposures by heat sources.[8] In addition to acute care, prevention of infection and improvement in wound healing are fundamental in the prevention of morbidity.[9]

Besides the treatment, long-term future implications of burns in young kids need consideration. These are scarring, contracture, and disfigurement impact on future growth and development and need surgery, physiotherapy, and occupational therapies.[10] Psychological traumatization in children also remains a common aftermath, children being susceptible to post-

traumatic stress disorder and social adjustment disorder.[11] Prevention of burns, thus, needs effective programs, namely basic education, home protection mechanisms, and general education programs in a mission to reduce incidences of home-related perils.[12] Multi-tasking follow-ups, in consultation among pediatricians, plastic surgeons, psychologists, and rehabilitative specialists, are needed in ensuring maximum restoration as well as prevention of lifelong disability.

In a study by Nakarmi KK, et al. has shown that frequency of burn in preschool children was 19.80% among all burn cases.[13]

Burns among young children are a cause of concern in Peshawar, since there is little data on the subject on which to base prevention and care strategies. Early childhood is a specific sensitive period, characterized by intense curiosity, perception of risks, and dependence on caregivers, and burns are a frequent and serious child health problem. Conducting the study in a burn and plastic surgery unit in Peshawar will produce locality-based evidence on the pediatric burden of burns, guide the design of tailored prevention programs, and assist in the allocation of resources in time for timely care and rehabilitation.

METHODOLOGY

This cross-sectional study was undertaken at the Burn and Plastic Surgery Center, Peshawar, between May 2024, and November 2024, to assess the burden of burn injuries in preschool-aged children among all patients presenting during the study period. Approval was obtained from the institutional ethics review board prior to initiation. A sample of 244 patients was enrolled, calculated through WHO sample size software with a 95% confidence level, 5% margin of error, and an expected frequency of 19.8% for burn injuries among preschool children.[13]

Eligible patients were those aged three months to thirty years of either sex presenting with burn injuries. Preschool age was defined as children between three months and four years. Burn injury was defined as the presence of any of the following: superficial burns limited to the epidermis characterized by erythema, pain, and absence of blisters; partial-thickness burns involving epidermis and part of the dermis, presenting with blistering, redness, swelling, and pain; and full-thickness burns with destruction of both epidermis and dermis, producing a white or charred surface and potential damage to underlying muscles, tendons, or bone. Excluded from the study were children with cognitive or sensory impairments affecting awareness of risk, motor disabilities limiting escape from heat sources, those with a history of school attendance, and cases where guardians declined consent.

Written informed consent was obtained from parents or guardians before enrollment. Information collected included demographic characteristics such as age, sex, weight, parental education, family income, socioeconomic status, and place of residence, as well as the reported cause of the burn. Clinical evaluation involved detailed history, examination, and supporting investigations. The extent of burn was measured using the Lund and Browder chart to estimate total body surface area (TBSA) involved. Children with extensive or critical burns, high-voltage electrical injuries, or those requiring surgical management were admitted, while others were managed in the emergency department, discharged with initial treatment, and advised follow-up. Burn injuries in preschool children were recorded based on the predefined age group and burn characteristics outlined above. All findings were documented on a structured proforma.

Data were analyzed using IBM SPSS version 25. Quantitative variables such as age, weight, and family income were described as mean with standard deviation, or median with interquartile range for skewed distributions assessed by Shapiro–Wilk test. Qualitative variables such as gender, parental education, socioeconomic class, residence, cause of burn, and frequency of burns in preschool children were presented as percentages and frequencies. Stratification was performed for age, sex, weight, parental education, income, socioeconomic category, residence, and cause of burn. Post-stratification comparisons were tested with chi-square or Fisher's exact test, with $p \leq 0.05$ considered statistically significant.

RESULTS

The study included 224 patients with a mean age of 16.59±8.94 years, family monthly income of 41,553.57±16,116.63 PKR, and weight of 51.08±22.57 kg (Table I). Gender distribution showed male predominance with 147 (65.6%) males and 77 (34.4%) females. Regarding parent education, the majority had secondary education 115 (51.3%), followed by primary education 69 (30.8%), higher education 31 (13.8%), and uneducated parents 9 (4.0%). Socioeconomic status analysis revealed that 115 (51.3%) belonged to middle class, 78 (34.8%) were poor, and 31 (13.8%) were from rich families. Residential status showed urban predominance with 150 (67.0%) urban residents compared to 74 (33.0%) rural residents. The most common cause of burn was thermal injury in 187 (83.5%) cases, followed by chemical burns in 20 (8.9%) cases and electric burns in 17 (7.6%) cases (Table 1).

Table 1

Patient Demographics (n=224)

Demographics		Mean ± SD / n (%)
Age (years)		16.59±8.94
Family Monthly Income (PKR)		41553.57±16116.63
Weight (kg)		51.08±22.57
Gender	Male n (%)	147 (65.6%)
	Female n (%)	77 (34.4%)
Parent Education	Uneducated n (%)	9 (4.0%)
	Primary n (%)	69 (30.8%)
	Secondary n (%)	115 (51.3%)
	Higher n (%)	31 (13.8%)
Socioeconomic Status	Poor n (%)	78 (34.8%)
	Middle n (%)	115 (51.3%)
	Rich n (%)	31 (13.8%)
Residential Status	Rural n (%)	74 (33.0%)
	Urban n (%)	150 (67.0%)
Cause of Burn	Thermal n (%)	187 (83.5%)
	Electric n (%)	17 (7.6%)
	Chemical n (%)	20 (8.9%)

The overall frequency of burn in preschool children was 31 (13.8%), while 193 (86.2%) patients did not have preschool burns (Table 2). Stratified analysis

demonstrated significant associations between burn occurrence in preschool children and several demographic factors (Table 2).

Table 2

Frequency of Burn in Preschool Children

Burn in Preschool Children	Frequency	% age
Yes	31	13.80%
No	193	86.20%
Total	224	100%

Age showed a highly significant association (p=0.000) with all 31 (100.0%) preschool burns occurring in children aged 3 months to 4 years, while no burns occurred in children older than 4 years. Weight was also significantly associated (p=0.000) with preschool burns, as 31 (93.9%) of burns occurred in children weighing ≤20 kg, compared to only 2 (6.1%) in this weight category who did not experience burns, while no burns occurred in children weighing >20 kg. Gender distribution among preschool burn cases showed 21 (14.3%) males and 10 (13.0%) females with no significant difference (p=0.789). Parent education analysis revealed no significant association (p=0.630) with burn occurrence, showing 1 (11.1%) among uneducated parents, 11 (15.9%) among primary educated, 17 (14.8%) among secondary educated, and 2 (6.5%) among higher educated parents. Family monthly income showed no significant association (p=0.665) with 21 (14.6%) burns in families earning ≤50,000 PKR and 10 (12.5%) in families earning >50,000 PKR. Socioeconomic status demonstrated no significant association (p=0.460) with 12 (15.4%) burns in poor families, 17 (14.8%) in middle-class families, and 2 (6.5%) in rich families. Residential status showed no significant difference (p=0.469) between rural 12 (16.2%) and urban 19 (12.7%) areas. The cause of burn analysis approached significance (p=0.051) with thermal burns accounting for 24 (12.8%) of preschool cases, chemical burns for 6 (30.0%), and electric burns for 1 (5.9%) case (Table 3).

Table 3

Association of Burn in Preschool Children with Demographic Factors

Demographic Factors		Burn in Preschool Children		p-value
		Yes n(%)	No n(%)	
Age	3 months-4 years	31 (100.0%)	0 (0.0%)	0.000*
	>4 years	0 (0.0%)	193 (100.0%)	
Gender	Male	21 (14.3%)	126 (85.7%)	0.789
	Female	10 (13.0%)	67 (87.0%)	
Weight (kg)	≤20	31 (93.9%)	2 (6.1%)	0.000*
	>20	0 (0.0%)	191 (100.0%)	
Parent Education	Uneducated	1 (11.1%)	8 (88.9%)	0.630*
	Primary	11 (15.9%)	58 (84.1%)	
	Secondary	17 (14.8%)	98 (85.2%)	
	Higher	2 (6.5%)	29 (93.5%)	
Family Monthly Income (PKR)	≤50000	21 (14.6%)	123 (85.4%)	0.665
	>50000	10 (12.5%)	70 (87.5%)	
Socioeconomic Status	Poor	12 (15.4%)	66 (84.6%)	0.460*
	Middle	17 (14.8%)	98 (85.2%)	
	Rich	2 (6.5%)	29 (93.5%)	
Residential Status	Rural	12 (16.2%)	62 (83.8%)	0.469
	Urban	19 (12.7%)	131 (87.3%)	
Cause of Burn	Thermal	24 (12.8%)	163 (87.2%)	0.051*
	Electric	1 (5.9%)	16 (94.1%)	
	Chemical	6 (30.0%)	14 (70.0%)	

DISCUSSION

The present study aimed to determine the frequency of burns in preschool children and revealed that 13.8% of the overall burn cases occurred in this vulnerable age group, highlighting the significant burden of pediatric burn injuries in early childhood. The strong association between age and burn occurrence, with all preschool burns occurring exclusively in children aged 3 months to 4 years, can be attributed to the developmental characteristics of this age group including increased mobility, curiosity about their environment, limited hazard recognition abilities, and insufficient motor coordination to avoid dangerous situations. The highly significant association with lower body weight (≤20 kg) further supports this age-related vulnerability, as younger children typically have lower body weights and are more susceptible to severe burn injuries due to their thinner skin, higher surface area to body weight ratio, and immature thermoregulatory mechanisms. The lack of gender-based differences in burn occurrence suggests that both male and female preschool children are equally at risk, likely due to similar exploratory behaviors and developmental stages during early childhood. The absence of significant associations with parental education levels, family income, and socioeconomic status indicates that burn risks in preschool children transcend socioeconomic boundaries, possibly because young children's natural curiosity and developmental limitations make them universally vulnerable regardless of their family's educational or economic background. The trend toward significance in the relationship between cause of burn and preschool age, particularly the higher proportion of chemical burns (30.0%) compared to thermal (12.8%) and electric burns (5.9%), may reflect the increased accessibility of household chemicals to curious toddlers who are more likely to explore and accidentally ingest or come into contact with hazardous substances stored at lower heights or in unsecured locations.

The present study's finding of 13.8% burn frequency in preschool children aligns with the global pattern of high burn incidence in early childhood, as demonstrated across multiple international studies. Our predominance of male patients (65.6%) is consistent with findings from Keshavarz et al. (1.56 male-to-female ratio) [14] Aghaei et al. (58.7% boys) [15] Sharma et al. (60% boys) [16] Ghaderi et al. (55.3% boys) [17] Jordan et al. (60% boys) [18] and Özlü et al. (55.2% boys) [19] suggesting a universal trend of higher burn risk in males during childhood, likely attributed to increased risk-taking behaviors and greater physical activity levels in boys. The mean age of our study population (16.59±8.94 years) differs from most pediatric burn studies that focused on younger children, with Keshavarz et al. reporting mean ages of 6.02±5.31 years for males [14] Aghaei et al. 4.3±3.5 years [15] Sharma et al. 4.1 years [16] and Ghaderi et al. 3.2 years [17] indicating that our study captured a broader age range including adolescents, which may explain the different burn patterns observed.

Our finding that all preschool burns occurred exclusively in children aged 3 months to 4 years strongly correlates with international literature showing peak incidence in the youngest age groups. Sharma et al. found 56% of burns in 1-4 years age group [16] Ghaderi et al. reported 61.3% in

children under 3 years [17] and Jordan et al. demonstrated that scalds comprised 80% of burns in 1-5-year-olds [18] supporting our observation of age-specific vulnerability. The significant association with lower body weight (≤20 kg) in our study aligns with the developmental characteristics of preschool children and is consistent with the younger age predominance reported globally.

The thermal burn predominance in our study (83.5%) shows some variation from international patterns where scalds typically dominate in younger children. Keshavarz et al. found scalds in 74.3% of 0-4-year-olds [14] Aghaei et al. reported hot liquids causing 48.5% of burns [15] Sharma et al. documented scalds in 48% of cases [16] Ghaderi et al. found scalds in 79.9% [17] Jordan et al. reported 62% scalds overall with 80% in 1-5-year-olds [18] and Özlü et al. documented scalds in 73% of cases.[19] The higher proportion of thermal burns in our study may reflect regional differences in cooking practices, heating methods, or burn classification systems, though the trend toward significance of chemical burns (30.0%) in preschool children warrants attention as it suggests unique environmental hazards in this age group.

Our finding of no significant association between burn occurrence and socioeconomic factors contrasts with several international studies. Aghaei et al. found increased odds with the lowest socioeconomic quartile (OR 7.220),[15] while Kawalec's review identified that children in the lowest income quintile had up to 7-fold higher odds of burns.[20] Similarly, our lack of association with parental education differs from Aghaei et al., who found illiterate mothers increased burn odds (OR 9.778).[15] These differences might be explained by our study's broader age range, different healthcare access patterns, or variations in socioeconomic stratification methods, suggesting that while socioeconomic factors are globally recognized risk factors, their impact may vary across different populations and study designs.

The absence of urban-rural differences in our study (16.2% rural vs 12.7% urban) contrasts with some studies that found rural over-representation, such as Keshavarz et al. (53.8% inpatients, 83.3% outpatients from rural areas).[14] However, our findings align with the recognition that burn risks transcend geographical boundaries in preschool children due to their developmental vulnerability. The universal nature of preschool burn risk, regardless of socioeconomic or geographical factors observed in our study, emphasizes that prevention strategies should focus on age-appropriate interventions rather than targeting specific demographic groups, supporting the need for comprehensive child safety measures across all populations.

This study has several limitations that should be acknowledged. First, the single-center design may limit the generalizability of our findings to other healthcare settings or geographical regions, as burn patterns and demographics may vary across different institutions and populations. Second, our study's broader age range (mean 16.59±8.94 years) may have diluted the specific patterns of preschool burns, as the majority of participants were older children and adolescents, potentially affecting the statistical power to detect associations specific to the preschool population. Additionally, we did not assess burn severity, total body surface area affected, or clinical outcomes, which could provide valuable insights into the impact and prognosis of preschool burns.

CONCLUSION

Our study has concluded that burns in preschool children represent a significant proportion of pediatric burn injuries, with age being the most critical determinant of burn occurrence in this vulnerable population. The exclusive occurrence of preschool burns in children aged between three months to four years, along with the strong association with lower body weight, underscores the developmental vulnerability that characterizes early childhood.

Acknowledgments

We extend our gratitude to the department's clinical staff for their dedicated efforts in ensuring meticulous documentation and organized handling of patient information, which greatly supported this work.

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