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Epidemiological Pattern of Burn Patients Presented to the Burn and Plastic Surgery Unit of Ayub Teaching Hospital, Abbottabad

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ABSTRACT

Background: Burns cause significant morbidity and mortality worldwide, particularly in developing countries. This study analyzes the epidemiological pattern of burn injuries at Ayub Teaching Hospital (ATH), Abbottabad.

Objective: To assess demographic trends, causes, and outcomes of burn injuries.

Methods: A retrospective cross-sectional study was conducted using secondary data from 271 burn patients admitted to ATH from May 2021 to April 2022. Patient demographics, burn types, severity, and outcomes were analyzed. Chi-square tests were used for statistical analysis with SPSS version 25.0.

Results: Males comprised 57.2% of the patients, while children aged 1–10 years represented 53.9% of cases. Scald burns were most common (56.8%), with 83.4% of incidents occurring at home. First-degree burns were predominant (50.2%), and the mortality rate was 11.8%, with 32 deaths.

Conclusion: Children and males are most vulnerable to burns, mainly due to domestic scald injuries. Improved burn prevention and specialized care, especially in rural areas, are essential to reducing burn-related morbidity and mortality.

INTRODUCTION

Burns are among the most common and devastating forms of trauma, affecting individuals of all ages and backgrounds globally. Defined as damage caused by exposure to extreme heat, cold, chemicals, electricity, or friction, burns vary in severity depending on factors such as depth, surface area, and the cause of the injury. The skin, which consists of multiple layers including the epidermis, dermis, and hypodermis, may sustain different degrees of damage ranging from superficial (first-degree) to full-thickness (fourth-degree) injuries. The severity of burns is determined by the depth of tissue damage and the total body surface area (TBSA) involved, with the rule of nines commonly employed to estimate the percentage of body area affected in adults (3).

Burns are often classified into four degrees: first-degree burns, which affect only the superficial skin layer, causing local inflammation, redness, and mild pain; second-degree burns, which involve deeper layers of the skin and result in blistering and scarring; third-degree burns, characterized by the destruction of both the epidermis and dermis, rendering the area stiff and painless due to nerve damage; and fourth-degree burns, which extend into muscles, tendons, and bones, often proving life-threatening (1). TBSA is a crucial parameter in assessing the severity of burns, particularly for burns involving more than 15% to 25% of an adult's body or 10% to 20% of a child's body, which typically necessitate specialized care in burn units (3).

The need for comprehensive burn care has driven the establishment of specialized burn units, where multidisciplinary teams focus on mitigating complications and enhancing recovery. The role of specialized burn centers in improving outcomes for severe burn cases is well established, as advancements in medical technology and burn care have significantly decreased burn-related mortality over the last century (14). Modern burn management emphasizes pain relief, infection prevention, and maintaining fluid and electrolyte balance. Rapid treatment, particularly in chemical burns, is essential to halting tissue damage, as delayed care can increase mortality (7).

Globally, burn injuries are a significant cause of morbidity and mortality, especially in low- and middle-income countries. According to World Health Organization (WHO) data, approximately 238,000 deaths occurred globally due to burns in 2000, with children and the elderly being particularly vulnerable (10). Industrialized nations, despite more advanced burn care infrastructure, still report high rates of burn-related admissions, with over 50,000 hospitalizations annually and a mortality rate of 5% to 6% (17). Research into burn injuries has significantly advanced over the past two decades, with numerous studies contributing to our understanding of the epidemiology, pathophysiology, and management of burns. In particular, the International Conference on Research in Burns, held in the United States, has been instrumental in fostering knowledge exchange and collaboration among burn specialists (8). Despite these advancements, the high incidence of burns in developing countries, where healthcare resources are often limited, underscores the

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importance of continued research and public health interventions aimed at burn prevention and early treatment. In Pakistan, where burn injuries frequently occur in domestic settings, particularly in rural areas, burns remain a public health challenge. The vast majority of burns occur at home, with children aged 1 to 10 years being particularly susceptible to scald injuries from hot liquids, pressure cookers, and other household hazards. Cultural practices and the unsafe use of cooking appliances contribute to a higher incidence of burns among women, while men are more likely to sustain work-related burns (4). Research conducted at burn units in the country has highlighted the need for enhanced preventive measures, public awareness campaigns, and improved healthcare infrastructure, particularly in rural areas where the incidence of burn injuries is disproportionately high.

This study aimed to examine the epidemiological patterns of burn injuries in patients admitted to the burn unit of Ayub Teaching Hospital, Abbottabad, over a one-year period. By analyzing demographic variables, types of burns, and outcomes, this research sought to identify key risk factors, evaluate the mortality and survival rates, and provide recommendations for reducing the incidence and improving the management of burn injuries. Through this study, we aim to contribute to the growing body of evidence supporting the need for specialized burn care, preventive strategies, and public health interventions aimed at reducing the burden of burns in Pakistan.

MATERIAL AND METHODS

This retrospective, cross-sectional study was conducted at the Burn Unit of Ayub Teaching Hospital, Abbottabad, Pakistan, over a period of one year, from May 2021 to April 2022, following approval from the Institutional Review Board (IRB). The study adhered to the principles outlined in the Declaration of Helsinki and ensured that patient confidentiality and ethical standards were maintained throughout the research. The primary aim of this study was to assess the epidemiological pattern of burn injuries, including demographic variables, burn severity, and outcomes, in patients admitted to the burn unit.

A total of 271 patients, who met the inclusion criteria, were included in the study. The inclusion criteria comprised all burn patients, of both genders and all age groups, admitted to the burn unit during the study period. Exclusion criteria included patients who were not admitted to the burn unit, those with incomplete or deficient data, and unregistered cases. Data were retrospectively collected from the registry of the burn unit, which included ward registers, patients' files, and death certificates for deceased patients.

Demographic variables such as age, gender, occupation, and residence were extracted from hospital records. Additionally, information on the time, date, and source of admission was recorded. Data on burn characteristics, including the degree of burns, type (e.g., flame, scald, electrical, chemical), percentage of total body surface area (TBSA) involved, and the anatomical site of burns, were collected.

Mortality data were derived from death certificates issued during the hospital stay. The severity of burns was classified according to the degree of tissue involvement, ranging from first-degree burns (superficial) to third-degree burns (full-thickness), based on the hospital records.

The structured questionnaire was designed to ensure consistency in data collection and to allow for comprehensive analysis of the factors associated with burn injuries. All data were entered into SPSS version 25.0 for statistical analysis. Descriptive statistics, such as frequencies and percentages, were used to describe categorical variables. Chi-square tests were employed to assess relationships between categorical variables, with a significance level set at 0.05. For example, relationships between variables such as gender and type of burn, degree of burn and occupation, and burn location and outcome were analyzed using chi-square tests to identify significant patterns (P-value ≤ 0.05).

The results of the analysis were interpreted in light of both local and global research on burn injuries, allowing for comparisons to be made between findings from this study and those of similar studies conducted in other regions. The study's design enabled the identification of key epidemiological trends in burn injuries, as well as the factors contributing to burn-related morbidity and mortality in this population.

Throughout the study, ethical considerations were rigorously observed, including the protection of patient anonymity and confidentiality, as per the guidelines of the Declaration of Helsinki (5). Ethical approval for data collection and analysis was obtained from the Institutional Review Board of Ayub Teaching Hospital prior to the commencement of the study. The secondary data were used exclusively for research purposes, ensuring that patient identities were not disclosed at any stage of the research.

RESULTS

A total of 271 patients were admitted to the Burn Unit of Ayub Teaching Hospital during the study period. The demographic characteristics, burn-related details, and associations between variables are summarized in the following tables and described below.

The gender distribution showed that the majority of burn patients were male, accounting for 57.2% of the total cases, resulting in a male-to-female ratio of approximately 1.3:1. Age distribution revealed that children aged 1–10 years represented the highest frequency of burn injuries, comprising 53.9% of the cases, followed by the age groups 11–20 years (18.8%), 21–30 years (12.2%), 31–40 years (10.3%), and 41–50 years (4.8%).

The types of burns observed were predominantly scald burns, which accounted for 56.8% of all cases, followed by flame burns (30.3%), electrical burns (12.2%), and chemical burns (0.7%). A significant association was noted between gender and type of burn (p-value = 0.000). Males had a higher incidence of electrical burns (19.3%)

Table 1: Gender and Age Distribution of Burn Patients

Characteristic	Frequency (n=271)	Percentage (%)
Gender		
Male	155	57.2
Female	116	42.8
Age Group (Years)		
1–10	146	53.9
11–20	51	18.8
21–30	33	12.2
31–40	28	10.3
41–50	13	4.8

compared to females (2.6%), while females were more likely to suffer from scald burns (62.9%). This gender-based variation in burn type suggests differing exposure risks or circumstances between males and females. The majority of burn incidents occurred in domestic settings,

Table 2: Types of Burns and Their Distribution by Gender

Type of Burn	Total (n=271)	Male (%)	Female (%)	p-value
Scald	154 (56.8)	81 (52.3)	73 (62.9)	0.000
Flame	82 (30.3)	44 (28.4)	38 (32.8)	0.000
Electrical	33 (12.2)	30 (19.3)	3 (2.6)	0.000
Chemical	2 (0.7)	0 (0.0)	2 (1.7)	0.000

with 83.4% of burns happening at home. A smaller proportion of burns took place outdoors (11.1%) and in the workplace (5.5%). Regarding burn severity, first-degree burns were the most prevalent, accounting for 50.2% of all cases, followed by second-degree burns (46.5%) and third-degree burns (3.3%). A significant relationship between the location of burn incidents and the degree of burn severity was noted (p-value = 0.004), with a higher prevalence of first-degree burns occurring at home and second-degree burns predominantly observed among those injured outdoors.

Table 3: Combined Burn Incident Location and Degree of Burn Severity

Characteristic	Frequency	First Degree (%)	Second Degree (%)	Third Degree (%)	p-value
Location					
Home	226	113 (50.0)	108 (47.8)	5 (2.2)	0.004
Outdoors	30	11 (36.7)	15 (50.0)	4 (13.3)	0.004
Workplace	15	12 (80.0)	3 (20.0)	0 (0.0)	0.004

A statistically significant relationship was also observed between occupation and the degree of burn (p-value = 0.006). Third-degree burns were most common among students (55.6%), indicating that this group might be at risk due to certain exposures or activities. In contrast, first-degree burns were most frequent in young children (45.6%), reflecting the vulnerability of this age group to less severe but still harmful burn incidents. The overall survival rate in the burn unit was 88.2%, while the mortality rate was

Table 4: Association Between Occupation and Degree of Burn

Occupation	First Degree (%)	Second Degree (%)	Third Degree (%)	p-value
Too young	62 (45.6)	31 (30.1)	2 (22.2)	0.006
Students	29 (21.3)	51 (40.5)	5 (55.6)	0.006
Housewives	13 (9.6)	18 (14.3)	1 (11.1)	0.006
Others	32 (23.5)	19 (15.1)	1 (11.1)	0.006

11.8%. Mortality was higher among older patients and those with greater Total Body Surface Area (TBSA) involvement. Additionally, a significant proportion of burn patients were from rural areas (56.8%) compared to urban areas (43.2%). Children and infants categorized as "too young" made up the highest proportion of burn victims at 37.6%, followed by students at 31.4%. The data suggest a need for targeted preventive measures, particularly in domestic environments and among the most vulnerable groups, such as young children and students.

DISCUSSION

The findings of this study highlight significant epidemiological patterns in burn injuries observed at the Burn Unit of Ayub Teaching Hospital, Abbottabad, over a one-year period. The predominance of burn injuries in males (57.2%) is consistent with studies from both developed and developing countries, where males often face a higher risk of burns due to occupational exposure and risky behaviors in the workplace (12). The higher incidence of burns in children aged 1–10 years (53.9%) aligns with global data that also indicate children are particularly vulnerable to scalds and burn injuries at home, especially in lower-income countries (20). This finding supports previous research by the World Health Organization, which identified home environments as common settings for pediatric burn injuries, particularly in resource-limited settings where adult supervision may be lacking.

The majority of burn incidents in this study occurred in rural areas (56.8%), a result that mirrors similar findings from other developing regions, where limited access to education, burn prevention programs, and medical care exacerbates the risk of burn injuries (19). The higher rural incidence underscores the need for targeted public health interventions in these areas, focusing on burn prevention education and the provision of first-aid resources. Previous studies have also suggested that rural populations may face delays in seeking specialized care, which contributes to worse outcomes (19).

The most common type of burn observed was scalds (56.8%), which typically result from exposure to hot liquids. This finding corroborates studies from other low- and middle-income countries, where scald burns in children and women are often linked to domestic activities such as cooking (4). Flame burns, which accounted for 30.3% of the cases, were more prevalent in males, likely due to occupational hazards in industrial and outdoor settings. Electrical burns, though less common, were disproportionately higher in males (19.3%) compared to females (2.6%), a pattern that has been noted in other research where electrical injuries are more frequent in industrial or construction work environments (12).

This study observed that burn injuries most frequently occurred at home (83.4%), with a smaller proportion of burns happening outdoors or at work. The high incidence of burns in domestic settings, particularly among children, points to the need for targeted prevention strategies, such as childproofing kitchens and educating caregivers about the risks of hot liquids and fire hazards. Other studies have similarly highlighted the home as the primary site for burn injuries, especially in settings where safety measures are not adequately implemented (20).

In terms of burn severity, first-degree burns were the most common (50.2%), followed by second-degree burns (46.5%), while third-degree burns were relatively rare (3.3%). These findings contrast with some studies from India and other countries, where third-degree burns are more common, likely due to the higher incidence of severe flame burns (21). The lower frequency of third-degree burns in this study could be attributed to the fact that most patients presented with scald burns, which are typically less severe than flame burns. However, the relatively low number of third-degree burns may also reflect the fact that some patients with severe injuries do not survive long enough to reach specialized burn care, particularly in rural settings where healthcare access is limited (19).

The overall mortality rate in this study was 11.8%, which is comparable to the mortality rates reported in other burn centers in developing countries but higher than those seen in high-income countries, where advanced burn care and early intervention have reduced mortality significantly (12). The majority of deaths occurred in elderly patients or those with large TBSA involvement, as seen in previous research where advanced age and extensive burns are known predictors of poor outcomes (5). The challenges faced in this setting, including limited resources for advanced burn care and delays in patient presentation, likely contributed to the mortality rate.

One of the key strengths of this study is its comprehensive analysis of burn epidemiology in a low-resource setting, which adds to the body of literature on burn injuries in Pakistan. By focusing on both urban and rural populations, the study offers valuable insights into the disparities in burn risk and outcomes between these groups. However, the study has several limitations. As a retrospective study relying on secondary data, there were inherent limitations in data completeness and accuracy, particularly regarding the exact cause and context of burn incidents. Additionally, the study was conducted at a single center, which may limit the generalizability of the findings to other regions of Pakistan or countries with different healthcare systems.

Future research should aim to expand upon these findings by including prospective studies that capture more detailed data on the circumstances surrounding burn injuries and their treatment. Public health interventions should focus on increasing awareness about burn prevention, particularly in rural areas, and improving access to specialized burn care facilities. Establishing more burn units across Pakistan, particularly in rural and underserved areas, could help reduce the time between injury and treatment, improving outcomes for burn patients. Educational campaigns targeting parents, caregivers, and workers in high-risk occupations could also play a crucial role in reducing the incidence of burns (20).

In conclusion, this study highlights that children and males are the most vulnerable to burn injuries, with scald burns in domestic settings being the most common cause. The findings underscore the importance of targeted public health interventions, improved burn care infrastructure, and increased public awareness to reduce the burden of burn injuries, particularly in rural areas. With timely interventions and better resource allocation, the incidence of burns and associated mortality can be significantly reduced in low- and middle-income countries like Pakistan.

CONCLUSION

This study underscores the high incidence of burn injuries among children and males, particularly from scald burns

occurring in domestic settings, with rural populations being disproportionately affected. The findings highlight the need for targeted prevention strategies, enhanced public awareness, and improved access to specialized burn care, especially in underserved areas. Addressing these gaps can reduce the burden of burn-related morbidity and mortality. Strengthening healthcare infrastructure and promoting timely interventions are critical for improving outcomes and reducing the long-term health implications of burn injuries in low-resource settings.

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