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Original Research Article

Analysis of Adult Cases of Burn Injury Pattern

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Abstract

Introduction: Even in India, because of a combination dry heat and burns from flames, over 1 million burn victims are recorded each year causing massive trauma. Women were more likely to be burnt during cooking, whereas men faced the main risks from electricity or construction work. 0800 843 A person may also experience pain from a fourth-degree burn in which the skin is visibly charred and likely to need surgery or prolonged treatment. Preventing burns and their complications is by prevention, early intervention as well as raising community Awareness.

Aims and Objective: To analyze the demographic and clinical features of the cases of burn injury among adult patients in this hospital.

Method: This is a prospective observational study where burn injury patterns in adults (n = 45) were analyzed at the department of Forensic Medicine, from July 2021 to April 2023 [Hind Institute of Medical Sciences, Sitapur (Lucknow)]. Data were collected with ethical approval and patient consent from hospitals, family members or witnesses (in the event of a deceased arrest) and post-mortem examinations. This only included adults with burn injuries. Wallace rule of nine was utilized to estimate the total body surface area (TBSA) involved. The data was analyzed and observed in MS Excel.

Result: The study found that the majority of burn injuries occurred among individuals aged 11-20 (26.66%) and 21-30 (22.22%), with 55.55% of victims being unmarried. Fire-related accidents (37.78%, $P<0.05$) and scalds (26.67%, $P<0.05$) were the leading causes of burns. Burns primarily occurred in the afternoon (31.11%) and in domestic settings, particularly kitchens (42.22%). Extensive burns covering 51-60% BSA were most frequent, affecting 10 patients.

Conclusion: The study has concluded that burn injuries are most common among younger individuals, housewives, and government employees, predominantly occurring in domestic settings, especially the kitchen.

Keywords: Burn Injury, Injury Pattern, Trauma, Scald.

Introduction

In today's world, fire is the most essential element to be used in daily life whether in cooking, religious or cultural practices and in lightning lamps. Despite the essential use, fire can burn millions of lives, destroy properties and is the reason of human resource waste. In India, every year almost over a million individuals experience moderate to severe burn incidents [1]. Burn injury has certain patterns depending on geographical, cultural, types of burn incidence, socio-economic or gender distribution. Most of the burn injuries occur due to dry heat contact such as flames, radiant heat or heated material encompassing the body [2,3] . The term burn refers to the local consequences of dry heat. By legislation, all dry heat lesions are classified as burns. Burn injuries can be considered as the most traumatic incident one can experience in their life. In a modern day, accidental flames could be the common reason of burn injuries. Worldwide, it has been noticed that many of the burn incidents are seen in suicidal or homicidal cases for example dowry, adultery within the marriage, sexual jealousy, and the mother-in-law's oedipal control over the grooms [4] . Women experience burn incidents mostly during cooking whereas for male burn injuries come from electric or construction work. Burns can be considered as the 4th most frequent trauma globally, following the traffic accidents, falls and interpersonal violence. Burns are a major medical and legal concern in India, where they are frequently reported as the primary cause of unnatural death [5] . Burns due to scalds are seen among all ages due to hot water or hot tea spill. These could be considered as unintentional or accidental burn. In general hospital admitted burn

cases involve multiple location- head, neck, trunk, upper limbs, lower extremity, depending on types of injury that includes heat sources or spill injuries [6].

Burns in the outer epidermis are called as superficial or first degree burn. Second degree burns are painful and involves leaky fluid. Full-thickness burns are called as third degree

burns where entire dermis is affected but not painful due to destruction of nerve endings and require special care since they tend to develop infections in the burn injury sites. Fourth degree burns involve deeper tissue and may need amputation. First and second degree burns may heal without surgery; others need surgery and special care. Burn patterns also depend on total body surface area or TBSA and transfer methods of burn cases in facilities totally relies on TBSA percentage. The minor burns cover only 10% of TBSA whereas major burns are more than 10% of TBSA [7] .

Complications are common in burn patients due to amputation, anxiety, infection or post-burn contracture and mortality in burn patients can be increased due to such complications [6]. Burn complication and the duration of hospital stay are instant outcomes that reflect opportunity to get the high-quality medical care by burn victims. Long hospital stays often cause social, economic mental pressure in patient's family making them difficult to take proper care of the patients. There is a need for public awareness on fire safety so that preliminary intervention like using cold water or prompt healthcare facilities can be provided to the patients [6] .

Burn injuries not only harm physically but also worsen the economic situation of an individual. Post burn patient experiences trauma or infection. It is needful to understand that such patients need extra care and a specific treatment strategy. Our study analyses burn injury patterns among adults highlighting the prevention protocol and safety awareness to reduce such incidents.

Method

Research Design: This is a prospective observational study of the patients having injury due to burning. The study was done among 45 patients suffering from burn injury and their burning patterns were observed and analysed. The study was performed in a [Hind Institute of Medical Sciences, Sitapur(Lucknow)] during the period from July 2021 to April 2023.

The study with the patient of burning issues were considered with proper consent and with approval from ethical committee of the hospital. Various parameters were considered and data were collected from police or the officers for the investigation of the burning incident and were analysed. Data includes the papers from the hospitals, members of the family, availability of friends, presence of individuals at the time of the incident or the person present with the victim. Post-mortem examination were performed and results were analysed thoroughly. Wallace's rule of nine was utilised for calculating the total body surface area (TBSA) after the post mortem examination. The proforma was used for recording all of data collected from 45 burn patients for further analysis.MS excel was utilised for data compilation and was recorded in tabular format for observation and analysis.

Inclusion Criteria

Criteria for inclusion of patients include-

- Adult patients are only allowed for the study
- Patients with burn injury were only allowed for the study

Exclusion Criteria

Criteria for exclusion of the patients include-

- Patient should have proper consent for the study else were excluded.

Statistical Analysis: The statistical analysis for this study was performed using Microsoft Excel for data compilation and SPSS 27 for statistical analysis. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables such as age, gender, cause of injury, place of occurrence, and body surface area (BSA) affected. Chi-square tests were used to determine the significance of associations between categorical variables such as gender, cause of injury, and time of day. A *P*-value of less than 0.05 was considered statistically significant. The results were presented in tables and graphs to illustrate the distribution of burn injuries according to different variables.

Result

The distribution of burn patients by age group shows that the majority of the cases occurred in younger individuals (Table 1). The highest percentage (26.66%) of burn victims belonged to the 11-20 years age group, with 12 patients (5 males and 7 females). This is followed by the 21-30 years age group, comprising 10 patients (5 males and 5 females), accounting for 22.22% of the total. The 31-40 years age group also had a significant representation, with 7 patients (3 males and 4 females), or 15.55% of the total. Both the 0-10 and 41-50 age groups each accounted for 11.11% of the patients. Older age groups, such as 51-60 and 61-70, had fewer cases, each contributing only 6.66% of the total. Overall, younger and middle-aged

groups appear to be more vulnerable to burn injuries in this study.

The majority of burn victims in this study were unmarried, making up 55.55% of the total (25 patients—10 males and 15 females). Among those who were married, patients who had been married for more than 7 years accounted for 17.77% (8 patients—5 males and 3 females). Meanwhile, those married for less than 7 years contributed 13.33% (6 patients—4 males and 2 females). Widows made up 13.33% of the total burn patients, with a notable gender difference, as 5 of the 6 widowed patients were female. This suggests that unmarried individuals and widows, particularly females, are more likely to be victims of burn injuries. Burn injuries occurred predominantly inside the home, with the kitchen being the most common site. Of the 45 patients, 42.22% (19 patients—9 males and 10 females) sustained burn injuries in the kitchen, followed by 35.55% (16 patients—7 males and 9 females) who were burned in other rooms inside the house. Injuries outside the house accounted for 22.22% of the cases, with 10 patients (4 males and 6 females). These results highlight the kitchen as a high-risk area for burn injuries, particularly for females, who make up a large portion of the victims in this setting.

Table 1: Distribution of number of patients according to age group

Age (in years)	**Male**	**Female**	**Total**	**Percentage**
0-10	3	2	5	11.11%
11-20'	5	7	12	26.66%
21-30	5	5	10	22.22%
31-40	3	4	7	15.55%
41-50	2	3	5	11.11%
51-60	1	2	3	6.66%
61-70	1	2	3	6.66%
Marital Status				
Marital status	**Male**	**Female**	**Total**	**Percentage**
widow	1	5	6	13.33
Unmarried	10	15	25	55.55
Married				
>7 years	5	3	8	17.77
<7 years	4	2	6	13.33
Place of occurrence				
Place of occurrence	**Male**	**Female**	**Number**	**Percentage**
Inside of house				
Kitchen	9	10	19	42.22
Other room	7	9	16	35.55
Outside house	4	6	10	22.22

The study shows a distribution of burn patients based on their occupations (Figure 1). The largest groups affected by burn injuries are housewives and government employees, each with 9 individuals, making them significant contributors to the overall sample. This could indicate a higher risk for burn injuries in domestic and government work environments. Private employees account for 7 cases, representing another substantial portion of the sample, while farmers follow with 6 cases. This reflects the occupational hazards associated with both domestic and agricultural work. Daily wage laborers make up 4 cases, suggesting that temporary or low-income work may also pose burn injury risks. Smaller groups include unemployed individuals (3 cases), those categorized as "others" (3 cases), and self-employed individuals (2 cases). Semi-government employees also account for 2 cases. The relatively lower numbers in these groups may indicate less exposure to burn hazards or possibly different working conditions that reduce their risk of burn injuries.

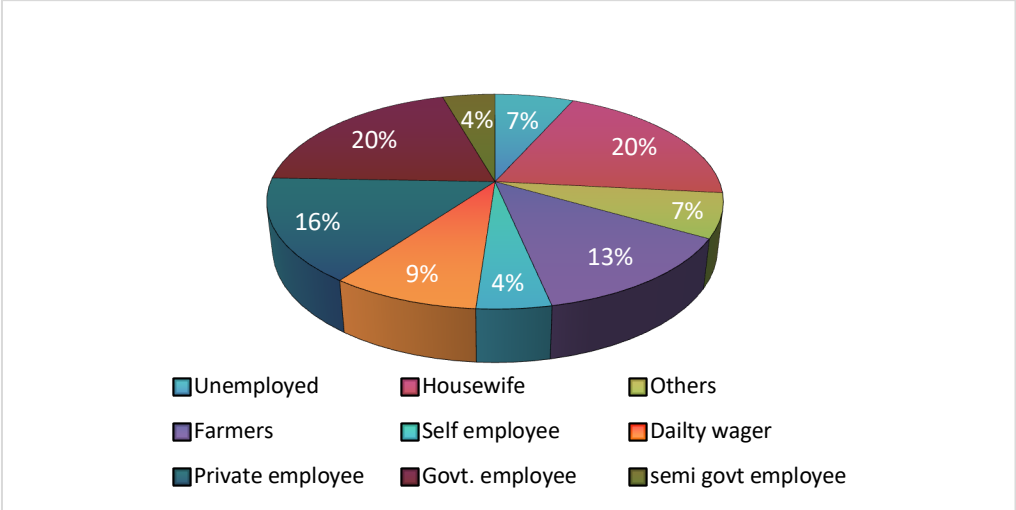

Figure 1: Occupations of the burn patients of this study

Figure 2 represents the distribution of burn patients based on the percentage of their body surface area (BSA) affected by burns. The most common category is for patients with burns covering 51-60% of their body surface area, with 10 patients (the highest in the sample). This indicates a significant number of patients with severe burns that require extensive medical attention. Following this, 8 patients had burns covering 61-70% of their body surface area, while 7 patients experienced burns on 21-30% of their bodies. These figures demonstrate that a considerable portion of patients suffered from moderate to extensive burn injuries. Smaller groups of patients had burns affecting 0-10% (5 patients), 41-50% (5 patients), and 31-40% (3 patients) of their body surface area. Burns covering 11-20% affected 2 patients, and the most severe cases, with burns covering 91-100% of the body, also included 2 patients. Less common were cases where burns affected 71-80% of the body (1 patient) and 81-90% (4 patients). The data suggests a wide range of burn severity among patients, with a significant number experiencing burns over more than half of their body, which may result in higher morbidity and mortality rates. This emphasizes the need for advanced care and specialized treatment for those with extensive burns.

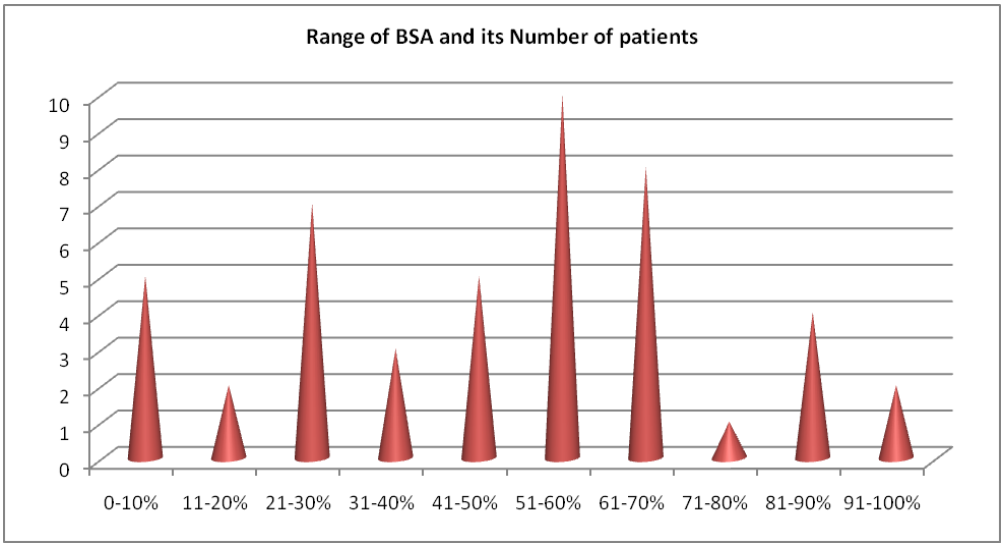

Figure 2: Occupations of the burn patients of this study

The most common cause of burn injuries in this study was fire-related accidents, which accounted for 37.78% of the total cases (17 patients—8 males and 9 females). Scalding from hot liquids or steam was the second most common cause, affecting 12 patients (5 males and 7 females), or 26.67% of the total. Electrical burns were relatively uncommon, comprising 6.67% of cases (3 patients—2 males and 1 female). Chemical burns made up 11.11% of the injuries (5 patients—2 males and 3 females). Lastly, 17.78% of the burn injuries (8 patients—2 males and 6 females) were attributed to other or unknown causes. These findings indicate that fire-related accidents and scalds are the predominant

causes of burns, with females being slightly more affected than males in each category. The significant gender difference in chemical burns and unknown causes (with more females affected) suggests further investigation into the circumstances surrounding these cases (Table 2).

Table 2: Cause of injury in males and females of this study

Cause of Injury	Male	Female	Total	Percentage
Fire-related accidents	8	9	17	37.78%*
Scalds (Hot liquids/steam)	5	7	12	26.67%*
Electrical burns	2	1	3	6.67%
Chemical burns	2	3	5	11.11%
Other/Unknown	2	6	8	17.78%

***P<0.05**

Table 3 shows the distribution of burn injuries based on the time of day shows that most burn incidents occurred during the afternoon (12 PM - 6 PM), accounting for 31.11% of the total cases, with 14 patients (6 males and 8 females). The morning hours (6 AM - 12 PM) saw the second-highest occurrence of burn injuries, with 12 patients (5 males and 7 females), representing 26.67% of the total. Evening time (6 PM - 12 AM) accounted for 24.44% of the cases, with 11 patients (5 males and 6 females). Night-time (12 AM - 6 AM) incidents were the least common, contributing to 17.78% of the total cases, with 8 patients (3 males and 5 females).

These results suggest that burn incidents are more likely to occur during active daytime hours, particularly in the afternoon, which may correlate with household or occupational activities. Females tend to have slightly higher rates of burn injuries across all time periods, especially in the afternoon and morning, reflecting potential gender-based activity patterns such as increased exposure to domestic tasks during these times. Night-time burns, though less frequent, still represent a significant portion of the total cases, indicating that burn risks persist even during rest hours.

Table 3: Cause of injury in males and females of this study

Time of Day	Male	Female	Total	Percentage
Morning (6 AM - 12 PM)	5	7	12	26.67%
Afternoon (12 PM - 6 PM)	6	8	14	31.11%
Evening (6 PM - 12 AM)	5	6	11	24.44%
Night (12 AM - 6 AM)	3	5	8	17.78%

Discussion

In majority of the burn cases, the victims are the women of 21-30 years old age [5,8,9]. These young adult groups are common age groups for marriage [10,11]. Many of them are working women who probably neglect the appropriate safety protocol due to shortage in time or lack of knowledge, leading to such incidents [3,10]. Male individuals are more prone to industrial chemical or electrical burns due to their work pattern. Majority of the victims are from Hindu community, which is considered as the major community in world and burns may occur while practicing rituals or religious belief [12]. Studies have shown that fire accidents during cooking mostly occur due to kerosene stove burst [5]. It is difficult to mention whether the burn is due to accidental or suicidal cause unless there is a presence of eye witness. Although dying declaration can be the only way to identify whether the case belongs to homicide or not, most of the times it is difficult to obtain due to carelessness or ignorance on the part of the police [5]. There are at least 90-100% burns over the body surface area can be observed because of the garment materials used by women such as saree or salware, making them difficult to remove once the cloth is on fire and it causes a huge damage [13].

Only 10-18% of soot particles in the trachea of burn victims had been observed by many studies [5,12,14]. Patients die after treatment in the hospitals where they are mostly treated by intravenous fluid or oral medications. Also in many cases burn victims die in open corridor or balcony. Therefore, soot particles may not be present in trachea. Presence of neurogenic or hypovolemic shock after 1-2 days of burn injury is a common characteristics observed in the patients. Involvement of epidermal injuries could be the cause of neurogenic shock. Burn injuries can be infected frequently leading to septic shock. Majority of the death occurs due to multi-organ failure resulting from septic shock. Mortality rate increases among older patients, total percentage of TBSA and those with pre-existing disease conditions. It is the doctor and care givers duty to take necessary measures so that the site of injury can be prevented from infection [15].

Many of the burn patients come to hospital after using some home remedies like applying turmeric, crushed peepal root or going to the local practitioner. This may worsen the situation and such late presentation of the burn patients occur mostly due to distance health facility or lack of awareness. By the time patient visits the hospital they may come with multiple infections in the burn sites. Thermal injuries are common in lower class individuals and often they develop complications due to not seeking proper help within time [16].

The most necessary steps to be taken to reduce the burn incidents are educating people and practice of the safety precaution such as wearing cotton cloth while cooking, turning of lights while going out or attending a fire source with extra care. Attending burn patients could be expensive and time consuming and therefore taking prevention is better option than cure. Also Governments need to appoint expert doctors in burn units. In rural areas, NGOs and social activist can take initiative to educate people. Minimizing the burn mortality as well as preventing burn incident rates both is crucial in reducing such cases.

Conclusion

The study has concluded that burn injuries are most common among younger individuals, housewives, and government employees, predominantly occurring in domestic settings, especially the kitchen. Fire-related accidents and scalds are the leading causes, with a notable gender difference favoring higher rates among females. The findings of this study reveal significant trends in burn injuries across different age groups, marital statuses, causes, occupations, and times of day. Younger individuals, particularly those in the 11-20 age group, appear most vulnerable to burn injuries, followed by individuals in their 20s and 30s. This indicates that burn prevention efforts should be particularly targeted at younger age groups. Unmarried individuals, especially females, form a significant portion of the victims, with widows also showing higher susceptibility, highlighting potential social vulnerabilities linked to burn incidents. Domestic settings, especially the kitchen, were identified as the primary locations for burn injuries, particularly affecting females, underlining the need for improved safety measures in household environments. Occupation-wise, housewives and government employees were the most affected, suggesting that specific occupational risks should be addressed in both domestic and workplace environments. The study also found that burns covering 51-60% of body surface area were most common, with many patients having severe burns, reinforcing the need for specialized medical care for extensive burns. Burn injuries were most frequently caused by fire-related accidents and scalds from hot liquids or steam, with females slightly more affected in each category. Electrical and chemical burns were less common but still represented a notable portion of the injuries. Burn injuries occurred most frequently in the afternoon and morning, suggesting a correlation with daily household or occupational activities. Females had higher rates of burns across all time periods, indicating gender-related patterns in burn exposure. While night-time burns were less frequent, they still represented a significant number of cases, showing that burn risks persist even during rest hours.

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