

A study to assess clinico-epidemiological profile and determinants of delay in hospitalization of burn patients admitted in a medical college hospital of Pune

Abhishek Deore¹, Bharatbhushan B. Telang^{2*}, Jagannath V. Dixit³ and Vinay Kumar⁴

¹Department of Community Medicine, Government Medical College, Dhule-424002, Maharashtra, India, ²Department of Community Medicine, V.D. Government Medical College, Gandhi chowk, Latur-413512, Maharashtra, India, ³Department of Community Medicine, B.J. Government Medical College, Jai Prakash Narayan Road, Agarkar Nagar, Pune-411001, Maharashtra, India and ⁴Department of Community Medicine, Saraswati Institute of Medical Science, Hapur-245304, Uttar Pradesh, India

Received: 09th August 2026; Accepted: 23rd September 2026; Published: 01st October 2026

Abstract: *Background:* Burn injuries are universal in occurrence, adversely affecting human kind by causing serious pathological injury that leads to severe morbidity and significant mortality. Despite the huge burden posed by burn injuries on health care services, research on this subject is still in its infancy in India. This study was therefore undertaken to assess the clinico-epidemiological profile and duration of hospital stay of burn patients, and to determine the delay in transportation and hospitalization, among patients attending a tertiary care hospital. *Methods:* In this cross-sectional study, burn patients admitted in the plastic surgery ward and fulfilling the inclusion criteria were included. Socio-demographic data, total body surface area, location, mode and cause of burn, time of incident, time taken to reach the health facility, and outcome were recorded and analysed. *Results:* Of the 243 burn patients studied, the majority were males. Most of the burns were accidental (86%) and were due to flame injury. The average length of hospital stay was 6.06 days, with a case fatality rate of 25.5% that was directly proportional to the body surface area involved. Most deaths occurred due to sepsis (66.7%). A delay in reaching hospital was perceived by more than 80% of patients, the major cause being difficulty in transportation. *Conclusion:* Burn injuries remain a major public health problem in India, associated with substantial morbidity and mortality. This study highlights the importance of early hospitalization, infection control, and burn-prevention strategies in reducing this burden.

Keywords: Burn, Delay, Sepsis, Epidemiology, Total Body Surface Area (TBSA).

Introduction

Burn injuries are universal in occurrence, adversely affecting human kind. Burn injury causes serious pathological injury, not only leading to severe morbidity and significant mortality, but also considerably impacting health economics. Burn injuries rank among the most severe and painful types of injuries suffered by the human body. The frequency of paediatric burns is also higher in developing countries, resulting in a higher incidence in these countries compared to developed countries [1-2].

India, being a nation of differing societies and traditions, requires clinical and epidemiological studies to assess the variables determining burn

incidence. The annual burn incidence from data pooled from major hospitals is about 6–7 million, making it the second most common cause of injury after road traffic accidents [3]. Compared to other developing countries, India faces the highest number of self-inflicted burns, causing one of the highest fatality rates [4].

Nearly 10% of these are life-threatening, while 25% of those hospitalized succumb to their injuries. Seventy percent of burn victims are in the age group of 15–40 years, and most of them belong to poor socioeconomic strata [1]. The commonest mode of burn injury is a flame burn, most such occurrences being

related to faulty kerosene stoves. These are cheap contraptions without safety features, and burns occur when carbon deposits block the fuel vapour outlets [4].

Patient-specific risk factors, such as the time taken to reach a point of care, severity, mechanism, and type of burn, primarily affect the prognostic outcome and thereby the morbidity of the patient. This is of utmost importance, especially in India, where the incidence is high, literacy is low, a large number of people live below the poverty line, and reliance on traditional cooking methods such as stoves and chulhas creates an unsafe environment. Despite the huge burden posed by burn injuries on health care services, research is still in its infancy in India. Therefore, this study was undertaken to find out the clinico-epidemiological and demographic profile of patients with burn injuries attending a tertiary care hospital, along with the duration of hospital stay.

Objectives: The objectives of this study were to assess the clinico-epidemiological profile and duration of hospital stay of burn patients admitted to the hospital, and to determine the delay in transportation and its contributing factors.

Material and Methods

The study was a hospital-based observational descriptive study conducted from January 2024 to June 2024, over a period of six months, in a tertiary care hospital in Pune. The study was carried out in the Burn Ward of the Department of Plastic Surgery, where burn patients were admitted and treated. The purpose of the study was to assess the clinico-epidemiological profile of burn patients, identify delays in hospitalization, and study the factors influencing the duration of hospital stay.

The study included 243 burn patients, and the sampling technique used was duration-based convenient sampling. All patients in whom informed consent and a detailed history of the cause of burns could be obtained were included in the study. Patients in whom it was not possible to obtain a history were excluded from the study.

Before starting the study, ethical clearance was obtained from the Institutional Ethics Committee. Informed consent was obtained from the patients

or from their guardians in the case of paediatric patients. Data collection consisted of in-depth interviews with patients. The data collected included demographic data (age, sex, education level, and marital status), burn data (cause of burn injury, percentage of total body surface area affected, and severity of burn injury), and data on hospitalization (time taken to reach the hospital, duration of hospitalization, complications developed during hospitalization, and survival or non-survival). The mode and nature of burn injury (accidental, suicidal, or homicidal) were also noted.

The duration for each patient was noted from the day of admission to the hospital to the day of discharge or death. Patients were classified according to the duration of hospital stay as <5 days, 6–10 days, 11–15 days, and >15 days, to assess the association between severity and duration of hospital stay. Delay in hospitalization was also noted for each patient, where the time gap between the occurrence of injury and hospitalization was recorded and classified as <2 hours, 2–4 hours, 4–6 hours, and >6 hours.

Data analysis was done using Microsoft Excel for data entry and SPSS software version 29 for statistical analysis. Descriptive statistics, including mean, median, and standard deviation, were computed for continuous variables, while categorical variables were summarized as frequencies and percentages. The Chi-square test was used to determine associations between categorical variables, and logistic regression analysis was performed to determine predictors of mortality. Statistical significance was set at $p < 0.05$.

Results

We studied 243 burn patients in total, of whom 161 (66.30%) were males and 82 (33.70%) were females. Most patients were in the 1–10 years age group (33%), followed by 21–30 years (17%), with the average age being 22 years. The average age for males was slightly higher, at 23 years, while for females it was 19 years. The detailed sociodemographic profile of the study population is shown in Table 1.

Table-1: Sociodemographic profile of burn patients			
Characteristics	Category	N	Percentage
Gender	Male	161	66.30%
	Female	82	33.70%
Age (years)	1–10	78	33%
	11–20	37	15%
	21–30	43	17%
	31–40	31	12.70%
	41–50	29	12%
	51–60	12	5%
	>60	13	5.30%
Education	Non-school going	63	26%
	Up to SSC	43	17.7%
	Up to HSC	44	18.1%
	Graduate and above	93	38.2%
Marital status	Married	122	50.2%
	Unmarried	109	44.8%
	Not applicable	12	5%
Place of incidence	Home	152	62.6%
	Workplace	81	33.3%
	Other	10	4.1%

The death rate in this study was 25.93% (63 deaths), with sepsis being the major cause of death in 42 patients (Table 2). It was noticed that most deaths occurred within the first five days of hospitalization; 40 patients died during this period. Patients with a TBSA of more than 40% had a much higher chance of dying, accounting for 53 of the 63 deaths, whereas patients with a TBSA of less than 40% had a much better chance of survival, with only 8 deaths in this group.

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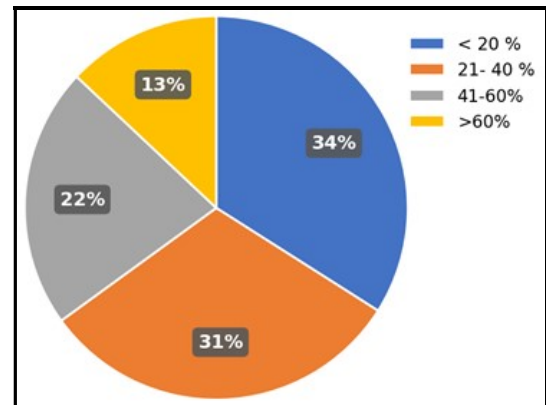
Table-2: Various factors and outcome				
Factor	Category	Death (n)	Alive (n)	χ^2
TBSA	<40%	10	149	$\chi^2=92.35$ P <0.0001
	>40%	53	31	
Nature of burn	Accidental	39	170	$\chi^2=41.06$ P <0.0001
	Suicidal/ Homicidal	24	10	
Mode of burn	Flame	40	71	$\chi^2=2.71$ P 0.0001
	Other modes	23	109	
Complication	Sepsis	42	52	$\chi^2=28.08$ P <0.0001
	No sepsis	21	128	

The cause and nature of burn were also examined in this study. Most burns were accidental (86%), followed by suicidal (10.7%) and homicidal burns (3.3%). Among all burns, flame burns were the most common cause, affecting 46% of patients, followed by scald burns (hot liquids) and electrical burns. The place of occurrence was also important; 62.6% of burns took place at home, 33.3% at the workplace, and 4.1% at other places (Table 1). Regarding delay in reaching hospital, only 3.7% of patients reached within 1–2 hours, and 21.4% within 2–4 hours. The majority of patients (52.6%) reached hospital between 4–6 hours after the incident, indicating a considerable delay in seeking help. Reasons for this delay included lack of adequate transport and inadequate awareness.

The duration of hospital stay depended on the severity of the burn (Figure 1). Of patients with a TBSA of less than 20%, 71.8% stayed for 1–3 days. Among those with a TBSA of 21–40%, 36.5% stayed for 1–3 days, while those with a TBSA of more than 40% stayed for a prolonged period or died. Statistical analysis showed that the duration of hospital stay was strongly linked to

the severity of the burn and the outcome, with shorter stays associated with higher mortality.

Fig-1: Distribution of burn patients according to total body surface area (TBSA) involved



Further analysis using logistic regression was performed to predict mortality (Table 3). Patients with a TBSA greater than 40% had a 28.91 times higher chance of death ($p = 0.001$). Sepsis also increased the risk of death, with affected patients being 28.12 times more likely to die ($p < 0.0001$).

Table-3: Logistic regression with outcome (alive/death) as dependent variable						
Characteristic	Category	B	P value	Odds ratio	95% CI Lower	95% CI Upper
Age (years)	Below 18	Reference	-	-	-	-
	Above 18	0.526	0.135	1.693	0.849	3.377
Sex	Male	Reference	-	-	-	-
	Female	0.192	0.707	1.212	0.445	3.297
TBSA	Below 40%	Reference	-	-	-	-
	Above 40%	3.340	0.001	28.907	10.022	83.374
Mode of burn	Flame	Reference	-	-	-	-
	Electric	0.213	0.875	1.238	0.086	17.775
	Scald	-1.067	0.191	0.344	0.070	1.703
	Other	0.507	0.399	1.660	0.512	5.388
Delay in hospitalization	No delay	Reference	-	-	-	-
	Delay	-0.359	0.655	0.699	0.145	3.368
Sepsis	No sepsis	Reference	-	-	-	-
	Sepsis	3.663	0.001	28.119	6.754	117.079

Discussion

This study highlights burn injury as a major problem in a tertiary care hospital in India. The

results are in line with those of other studies, i.e., burn injuries affect men and younger individuals more often. Although some

studies have reported that more women sustain burns because of cooking at home, this study found that 66.30% of burn patients were male. This male preponderance is similar to the findings of Bhansali et al. (2017) [5], who reported that working-age men sustain burns more often due to occupational hazards and risk-taking behaviour. However, other studies, such as that of Kumar et al. (2018) [6], have shown that more women sustain burns, especially in rural areas, where unsafe cooking practices contribute to many burn injuries.

This study showed that children aged 1–10 years were most affected (33%), followed by young adults aged 21–30 years (17%). Children sustain burns frequently because of inadequate supervision, unsafe cooking practices at home, and accidental spillage of hot substances. Chen et al. (2007) [1], in their study on burns among children, also found that younger children are at greater risk because of their delicate skin and inability to escape dangerous situations. Akhtar et al. (2014) [7] reported similar findings, noting that many children sustain burns from hot liquid spillage.

One of the major concerns in this study was the high case fatality rate (25.93%), predominantly due to sepsis (42 cases). Sepsis remains a leading cause of death among burn patients, consistent with the findings of Brusselaers et al. (2010) [8], who emphasized that infections in burn patients increase the risk of organ failure and death. Similarly, Ahuja and Bhattacharya [2], in their study on burns in developing countries, highlighted inadequate infection control as a major contributor to high mortality. The mortality rate was considerably higher among patients with a TBSA greater than 40%, among whom 53 of 63 patients did not survive. Roy et al. [4] reported similar findings, noting that a higher TBSA is associated with greater morbidity and mortality, particularly where adequate burn care is not readily available. This is also corroborated by Aggarwal et al. (2020) [9], who observed a mortality of 56.25% among patients with a TBSA greater than 40%, compared to 9.44% among those with lesser TBSA involvement.

Flame burns were the most common mode of injury (46%), followed by scald and electrical burns. This finding agrees with Laloë (2004) [10],

who reported that flame-related burns are the most common in developing countries because of unsafe cooking practices and kerosene stoves. Similar findings were reported by Khushalani and Srivastava (2023) [11], who observed flame burns in 49.6% of cases in a tertiary burn centre in Rajasthan. Akhtar et al. [7] also reported flame burns in over 50% of cases, with scald burns being the next most common, particularly among children.

Only 3.7% of patients reached hospital within 1–2 hours, and the majority (52.6%) arrived between 4–6 hours after sustaining the burn. Delay in reaching hospital is critical, as early medical attention improves survival. Roy et al. (2022) [4] found that nearly 45% of burn patients reached hospital within 1–2 hours, considerably faster than observed in the present study. Such delays occur due to inadequate transport, financial constraints, and limited awareness about burn treatment facilities. Barakat et al. [12] emphasized that early fluid resuscitation and infection control within the first few hours after a burn can reduce mortality, underscoring the importance of prompt medical attention.

Patients with a TBSA of less than 20% had shorter hospital stays, with 71.8% discharged within 1–3 days, whereas those with a TBSA between 21–40% stayed considerably longer, and those with a TBSA greater than 40% required prolonged hospitalization or did not survive. Bhansali et al. [5] reported similar trends, noting that patients with minor burns are discharged within a few days, while those with major burns require intensive care and prolonged hospital stay. Mahalingam et al. (2023) [13], in their study from a tertiary care emergency department in South India, similarly found that a substantial proportion of burn patients (74.6%) required a hospital stay of more than one week, with female gender and facial or inhalational burns independently associated with a longer duration of stay.

Logistic regression analysis identified several predictors of mortality. Patients with a TBSA greater than 40% were almost 29 times more likely to die compared to those with less extensive burns, and sepsis substantially

increased the risk of death, underscoring the importance of early infection control in burn management. Brusselaers et al. [8] similarly reported that patients with a TBSA greater than 40% have mortality rates exceeding 50%, which worsens further with superimposed infection. Another important observation was that homicidal burns carried the highest risk of death, consistent with the findings of Laloë [10], who noted that homicidal burns are often associated with delayed medical care, deeper burns, and intent to cause serious harm, leading to poorer outcomes.

Comparing our findings with other studies, Bhansali et al. [5] reported a higher proportion of burns among adults (50.5% above 35 years) and among women, whereas our study found a higher proportion among children (33%) and men (66.30%). Similarly, our study showed that 86% of burns were accidental, 10.7% suicidal, and 3.3% homicidal, which is comparable to the findings of Akhtar et al. (2014) [7], who reported 58% accidental and 29% homicidal burns. A recent study by Sharma et al. (2025) [14], from a tertiary care hospital in rural North India, also reported a similar predominance of accidental flame burns among young adult males, reaffirming the consistency of these epidemiological patterns across different regions of India.

Financial Support and sponsorship: Nil

The findings of this study highlight the urgent need for burn-prevention measures, including public education on fire safety, improved emergency medical response, and strengthened burn-care facilities. George et al. (2014) [15], in their work on survival analysis methods, emphasized that early hospitalization, prompt medical care, and effective infection control reduce mortality from burns. Governments and hospitals must prioritize burn-prevention programmes, stricter safety regulations, and specialized burn-treatment units to improve patient outcomes and reduce the burden of morbidity and mortality due to burns.

Conclusion

Burn injuries are still a major public health problem in India, associated with substantial morbidity and mortality. This study shows how crucial it is to ensure early hospitalization, control infections, and implement burn-prevention plans.

Recommendations:

- *Public Awareness:* Educate the public on burn prevention and first-aid measures.
- *Better Access to Care:* Improve emergency medical services.
- *Infection Control Measures:* Strengthen burn care protocols to prevent sepsis.

Conflicts of interest: There are no conflicts of interest.

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Cite this article as: Deore A, Telang BB, Dixit JV and Kumar V. A study to assess clinico-epidemiological profile and determinants of delay in hospitalization of burn patients admitted in a medical college hospital of Pune. *Al Ameen J Med Sci* 2026; 19(4): 317-323.

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*All correspondences to: Dr. Bharatbhushan B. Telang, Assistant Professor, Department of Community Medicine, V.D. Government Medical College, Gandhi Chowk, Latur-413512, Maharashtra, India. Email: bharatbhushantelang@gmail.com