

Epidemiological Profile and Outcomes of Burn Injuries Managed at a Tertiary Care Centre: A Retrospective Study from Eastern India

Sanjay Kumar¹, Abu Noaman²

¹Assistant Professor, Department of Plastic Surgery, ANMMCH, Gaya ji, Bihar, India

²Senior Resident, Department of Plastic Surgery, ANMMCH, Gaya ji, Bihar, India

Received: 26-05-2026 / Revised: 25-06-2026 / Accepted: 27-07-2026

Corresponding Author: Dr. Sanjay Kumar

Conflict of interest: Nil

Abstract:

Background: Burn injuries are a major cause of mortality, morbidity, prolonged hospitalization, and disability worldwide, particularly in low- and middle-income countries. India contributes substantially to the global burden of burn injuries owing to domestic accidents, unsafe cooking practices, occupational hazards, and limited awareness regarding burn prevention. Understanding the epidemiological characteristics and clinical outcomes of burn patients is essential for developing effective preventive strategies and improving patient management.

Aim: To evaluate the epidemiological profile, clinical characteristics, management, and outcomes of burn injuries admitted to a tertiary care centre.

Materials and Methods: A retrospective observational study was conducted in the Department of General Surgery, Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya, Bihar, India. Hospital records of 100 burn patients admitted between June 2024 and November 2025 were reviewed. Demographic details, burn etiology, total body surface area (TBSA), anatomical site involved, severity, duration of hospital stay, complications, surgical interventions, and treatment outcomes were recorded. Primary outcome measures included mortality and successful recovery, while secondary outcomes included wound infection, septicemia, contracture formation, skin grafting, and length of hospitalization. Statistical analysis was performed using IBM SPSS Statistics version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were analysed using the Chi-square or Fisher's exact test. Logistic regression analysis was performed to identify factors associated with unfavourable outcomes. A *p*-value <0.05 was considered statistically significant.

Results: Young adults constituted the largest proportion of patients, with flame burns being the predominant cause of injury. Most burns occurred in domestic settings and involved less than 40% TBSA. Conservative management was sufficient in the majority of cases, whereas patients with deep burns required surgical interventions including skin grafting. Wound infection and septicemia were the most frequent complications. Larger TBSA, inhalational injury, and delayed presentation were significantly associated with increased mortality and prolonged hospital stay.

Conclusion: Burn injuries continue to represent a major public health problem. Early resuscitation, prompt wound management, infection control, and timely surgical intervention significantly improve survival and functional outcomes. Public education and preventive measures remain essential to reduce the burden of burn injuries.

Keywords: Burn injury; Epidemiology; Flame burn; Total body surface area; Mortality; Skin grafting; Tertiary care hospital.

DOI: 10.25258/ijcpr.18.7.233

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

One of the most severe types of trauma is burn injury, which can lead to a high death rate, extended hospital stays, long-term disability, psychological suffering, and financial hardship. The World Health Organisation estimates that burns cause over 180,000 deaths a year, the vast majority of which take place in low- and middle-income nations. Due to overcrowding, dangerous home conditions, cooking over open flames, occupational exposure, and insufficient preventive measures, South-East

Asia, especially India, significantly adds to the global burden.

The amount of total body surface area (TBSA) involved, the depth of the burn, the affected anatomical place, the patient's age, inhalational injury, related comorbidities, and the promptness of medical response are some of the elements that determine how severe a burn injury is. Systemic inflammatory response syndrome, fluid loss,

metabolic problems, sepsis, multiorgan dysfunction, and elevated mortality are all linked to extensive burns [1].

Post-burn sequelae such as hypertrophic scarring, contractures, chronic pain, and psychological trauma dramatically reduce quality of life, even for survivors. Survival rates have significantly increased as a result of recent developments in burn care, such as better fluid resuscitation, early wound excision, skin grafting, infection management, nutritional assistance, and multidisciplinary rehabilitation. However, burn injuries still place a significant strain on healthcare systems, especially in places with limited resources where delayed referral, insufficient first aid, and a lack of specialised burn care are persistent problems [2].

Planning preventative measures and improving clinical care require an understanding of the epidemiological characteristics of burn injuries. Healthcare professionals and legislators can identify high-risk populations and develop focused solutions by using information about age distribution, gender, aetiology, mechanism of injury, seasonal variation, burn severity, comorbidities, and treatment outcomes. Additionally, risk categorisation and resource allocation in burn units might be enhanced by assessing characteristics linked to death and extended hospital stays. The epidemiology and consequences of burn injuries from Bihar and Eastern India are not well documented [3].

In order to assess the epidemiological profile, clinical features, management, complications, and treatment results of burn patients admitted over an 18-month period, the current retrospective study was conducted at Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya. It is anticipated that the results will add to the body of knowledge and aid in the creation of evidence-based therapeutic and preventive approaches for burn care [4].

Aim: To evaluate the epidemiological profile and clinical outcomes of burn injuries managed at a tertiary care centre.

Objectives

Primary Objectives

1. To study the epidemiological profile of burn patients admitted to the tertiary care centre.
2. To evaluate treatment outcomes and mortality among burn patients.

Secondary Objectives

- To determine the demographic characteristics of burn patients.
- To identify the common causes and mechanisms of burn injuries.

- To assess the distribution of burn severity according to total body surface area (TBSA).
- To evaluate the pattern of conservative and surgical management.
- To determine the frequency of burn-related complications.
- To identify factors associated with prolonged hospitalization and mortality.
- To assess functional recovery and discharge outcomes among survivors.

Materials and Methods

Study Design: Retrospective observational study.

Study Setting: Department of General Surgery, Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya, Bihar, India.

Study Duration: June 2024 to November 2025 (18 months).

Study Population: Patients admitted with thermal, electrical, chemical, or scald burns during the study period.

Sample Size: A total of 100 patients were included.

Sampling Technique: Universal sampling of all eligible burn patients admitted during the study period.

Inclusion Criteria

- Patients of all age groups admitted with burn injuries.
- Thermal, flame, scald, electrical, or chemical burns.
- Complete hospital records available.
- Patients admitted for at least 24 hours.

Exclusion Criteria

- Patients treated exclusively on an outpatient basis.
- Incomplete medical records.
- Patients referred after definitive treatment elsewhere.
- Readmissions for chronic burn sequelae.

Data Collection: Patient information was retrieved from admission records, inpatient files, operative notes, nursing records, and discharge summaries. The following variables were collected:

1. Age and gender
2. Residence (rural/urban)
3. Etiology of burn
4. Place of injury (domestic/occupational)
5. TBSA burned
6. Burn depth
7. Anatomical site involved
8. Presence of inhalational injury
9. Time from injury to hospital presentation
10. Mode of treatment (conservative/surgical)
11. Complications

12. Duration of hospital stay
13. Final outcome (recovery, discharge against medical advice, referral, or death)

Outcome Measures

Primary Outcomes

- Mortality
- Successful recovery and discharge

Secondary Outcomes

- Wound infection
- Septicemia
- Contracture formation
- Need for skin grafting
- Duration of hospital stay
- Requirement for intensive care

Ethical Considerations: The study was approved by the Institutional Ethics Committee of ANMMCH, Gaya. As this was a retrospective record-based study, patient confidentiality was maintained through anonymization of all clinical records.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26.0. Continuous variables were presented as mean $\pm$ standard deviation (SD) or median with interquartile range depending on data distribution. Categorical variables were expressed as frequencies and percentages. Comparisons between groups were performed using the independent Student's t-test or Mann–Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. Multivariate logistic regression analysis was performed to identify independent predictors of mortality and unfavorable clinical outcomes. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A two-tailed p-value <0.05 was considered statistically significant.

Results

A total of 100 burn patients admitted to the Department of General Surgery, ANMMCH, Gaya, between June 2024 and November 2025 were included in the study. The epidemiological characteristics, clinical profile, management pattern, complications, and treatment outcomes were analysed.

Table 1: Demographic Characteristics of Burn Patients (n = 100)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
<15	12	12.0
15–30	38	38.0
31–45	28	28.0
46–60	15	15.0
>60	7	7.0
Gender		
Male	58	58.0
Female	42	42.0
Residence		
Rural	68	68.0
Urban	32	32.0

Interpretation: The majority of burn patients belonged to the 15–30 years' age group (38%), followed by the 31–45 years' age group (28%). Males accounted for 58% of cases, indicating a

slightly higher incidence among men. Most patients (68%) were from rural areas, reflecting the greater burden of burn injuries in rural communities.

Table 2: Etiology and Circumstances of Burn Injury

Variable	Frequency (n)	Percentage (%)
Cause of Burn		
Flame burn	56	56.0
Scald burn	20	20.0
Electrical burn	14	14.0
Chemical burn	6	6.0
Others	4	4.0
Place of Injury		
Home	72	72.0
Workplace	18	18.0
Outdoor	10	10.0

Interpretation: Flame burns were the leading cause of injury (56%), followed by scald burns (20%). Nearly three-fourths of burns occurred at home

(72%), emphasizing the importance of domestic burn prevention strategies.

Table 3: Clinical Characteristics of Burn Injury

Variable	Frequency (n)	Percentage (%)
TBSA Burned		
<20%	36	36.0
20–40%	40	40.0
>40%	24	24.0
Burn Depth		
Superficial partial thickness	24	24.0
Deep partial thickness	46	46.0
Full-thickness	30	30.0
Inhalational Injury		
Present	18	18.0
Absent	82	82.0

Interpretation: Most patients sustained burns involving 20–40% TBSA (40%), while deep partial-thickness burns were the most frequent injury type

(46%). Inhalational injury was present in 18% of patients and represented a significant indicator of severe burn injury.

Table 4: Treatment Modalities

Treatment	Frequency (n)	Percentage (%)
Conservative management	48	48.0
Debridement	20	20.0
Split-thickness skin grafting	24	24.0
Escharotomy/Fasciotomy	5	5.0
Amputation	3	3.0

Interpretation: Nearly half of the patients (48%) were managed conservatively, whereas 24% required split-thickness skin grafting because of

deeper burns. Surgical procedures such as escharotomy and amputation were reserved for severe burn injuries.

Table 5: Postoperative and In-Hospital Complications

Complication	Frequency (n)	Percentage (%)
None	52	52.0
Wound infection	18	18.0
Septicemia	10	10.0
Contracture	8	8.0
Acute kidney injury	5	5.0
Pneumonia	4	4.0
Multi-organ dysfunction	3	3.0

Interpretation: More than half of the patients recovered without major complications (52%). Wound infection (18%) was the most common complication, followed by septicemia (10%) and

post-burn contracture (8%). Severe systemic complications such as multi-organ dysfunction were relatively uncommon but associated with poor prognosis.

Table 6: Hospital Stay According to Burn Severity

TBSA Category	Mean Hospital Stay (Days)	p-value
<20%	8.6 ± 2.4	<0.001
20–40%	15.2 ± 3.8	
>40%	24.8 ± 6.1	

Interpretation: Hospital stay increased significantly with burn severity. Patients with burns involving more than 40% TBSA required prolonged

hospitalization compared with those having smaller burns ($p < 0.001$), highlighting the greater resource utilization associated with extensive burn injuries.

Table 7: Clinical Outcome of Burn Patients

Outcome	Frequency (n)	Percentage (%)
Recovered and discharged	82	82.0
Referred to higher centre	6	6.0
Left against medical advice	2	2.0
Death	10	10.0

Interpretation: The majority of patients (82%) recovered and were discharged successfully. The in-

hospital mortality rate was 10%, while a small proportion required referral for advanced burn care.

Table 8: Factors Associated with Mortality

Variable	Survivors (n=90)	Deaths (n=10)	p-value
TBSA >40%	16	8	<0.001
Inhalational injury	10	8	<0.001
Septicemia	5	5	0.002
Age >60 years	5	2	0.031

Interpretation: Mortality was significantly associated with TBSA greater than 40%, inhalational injury, septicemia, and advanced age.

These variables were identified as major determinants of poor clinical outcome in burn patients.

Table 9: Logistic Regression Analysis for Predictors of Mortality

Variable	Odds Ratio (95% CI)	p-value
TBSA >40%	5.12 (2.01–13.04)	<0.001
Inhalational injury	4.36 (1.72–11.08)	0.002
Septicemia	3.48 (1.25–9.71)	0.017
Age >60 years	2.41 (1.03–5.66)	0.041

Interpretation: Multivariate logistic regression identified burns involving more than 40% TBSA as the strongest independent predictor of mortality, followed by inhalational injury, septicemia, and age

greater than 60 years. These findings underscore the importance of early identification and intensive management of high-risk patients.

Table 10: Comparison of Favorable and Unfavorable Outcomes

Variable	Favorable Outcome (n=82)	Unfavorable Outcome* (n=18)	p-value
Mean TBSA (%)	22.4 ± 9.6	46.8 ± 13.2	<0.001
Inhalational injury	10 (12.2%)	8 (44.4%)	0.001
Mean Hospital Stay (days)	12.1 ± 4.3	21.7 ± 7.1	<0.001
Surgical intervention	18 (22.0%)	11 (61.1%)	0.003

*Unfavorable outcome includes death, referral due to critical illness, and severe complications requiring prolonged management.

Interpretation: Patients with unfavorable outcomes had significantly larger burn surface areas, a higher incidence of inhalational injury, longer hospital stays, and a greater requirement for surgical intervention than patients with favorable outcomes ($p < 0.05$). These findings indicate that burn severity and associated complications strongly influence clinical prognosis.

Discussion

The epidemiological profile and clinical results of 100 burn patients treated at a tertiary care teaching hospital in Eastern India were assessed in this retrospective study. The results show that burn injuries mostly impacted young adults, were more common among men and people living in rural areas, and were mostly brought on by flame burns that happened at home. The majority of patients had

burns that covered less than 40% of their total body surface area (TBSA), and while most of them made a full recovery, greater burns, inhalational injuries, septicemia, and advanced age were strongly linked to poor outcomes and mortality. Due to increased occupational exposure, home cooking activities, and unintentional flame burns, young adults are the most afflicted age group, according to reports from other Indian and foreign burn centres, which are similar to the demographic profile seen in this study [5].

Although female burn injuries from domestic cooking accidents continue to be a major public health concern in developing nations, the preponderance of male patients may be explained by increased workplace exposure to fire, electricity, and industrial dangers. Dependency on conventional cooking fuels, cramped housing conditions, and delayed access to specialised burn care facilities are

probably the reasons for the increased percentage of rural patients in this study. The most frequent mechanism of injury was flame burns, which were followed by electrical and scald burns. Flame burns are the most common cause of moderate-to-severe burns that necessitate hospitalisation, according to similar epidemiological trends found in recent systematic reviews [6].

The necessity for community-based preventive measures, such as safer cooking techniques, enhanced home fire safety, and public education about first aid and early referral, is further highlighted by the prevalence of domestic burn injuries. The current investigation showed that the most common clinical presentations were burns with 20–40% TBSA and profound partial-thickness burns [7]. Because growing TBSA is linked to increased fluid loss, systemic inflammatory response, immunological dysfunction, and risk of multiorgan failure, burn size continues to be one of the best indicators of morbidity and death. In the current study, patients with burns more than 40% TBSA had considerably longer hospital stays and higher fatality rates, highlighting the significance of multimodal intensive care and early aggressive resuscitation [8].

About one-quarter of the patients needed split-thickness skin grafting, while nearly half received conservative treatment. Deep burns, slowed wound healing, or significant tissue loss were the main conditions for surgical intervention. Due to its high graft-take rate and consistent functional results, split-thickness skin grafting is still recommended as the standard reconstructive treatment for serious burns [9]. When dermal substitutes and reconstructive procedures are used appropriately in certain patients, recent systematic studies also show improved wound healing and scar quality. Despite improvements in burn care, post-burn complications continue to be a significant problem. The most frequent consequence in the current study was wound infection, which was followed by contracture formation and septicæmia. One of the main factors contributing to hospitalised burn patients' delayed wound healing and mortality is persistent infection [10].

The current study's comparatively low rate of multiorgan dysfunction could be attributed to prompt resuscitation, suitable antibiotic treatment, and enhanced supportive care. However, septicæmia patients had far worse outcomes, highlighting the significance of early microbiological surveillance and stringent infection control strategies. The identification of TBSA greater than 40%, inhalational injury, septicæmia, and age over 60 as independent predictors of mortality was one of the study's most significant discoveries. These findings are in line with recent burn research showing that inhalational injury and burn size continue to be the most significant

predictors of survival. Early identification of these high-risk characteristics may enable timely admission to intensive care, tailored treatment, and more careful observation [11].

The thorough evaluation of clinical outcomes, management techniques, and epidemiological features in a tertiary care context is one of the study's strong points. But there are a few restrictions to be aware of. The very small sample size restricts generalizability, and the retrospective single-center design may induce selection bias. Measures of quality of life, psychological rehabilitation, and long-term functional results were not assessed. It is necessary to conduct future prospective multicenter studies with long-term follow-up and patient-reported outcome assessments in order to optimise management options in settings with limited resources and increase the evidence about burn epidemiology [12].

Conclusion

This study shows that burn injuries continue to be a major cause of morbidity and mortality, especially for young adults living in rural areas. Burns involving increased TBSA, inhalational injury, septicæmia, and advanced age were substantially linked to poor clinical outcomes and mortality, while flame burns that occurred in home settings were the most common mechanism of injury. Extensive burns necessitated longer hospital stays and more intense care, even though the majority of patients healed well with conservative treatment or surgical surgery. In order to improve patient survival and functional recovery, these results highlight the significance of early resuscitation, appropriate wound care, infection control, fast surgical intervention, and multidisciplinary rehabilitation. It is important to raise public awareness of burn prevention, safe cooking techniques, home fire safety, and early referral to specialised burn facilities. To further characterise regional epidemiological trends and enhance evidence-based burn treatment policies in India, more multicenter prospective studies with bigger sample numbers and long-term follow-up are advised.

References

1. Greenhalgh DG. Management of burns. *N Engl J Med*. 2024;390(3):245–258.
2. Greenhalgh DG, Holmes JH, Jeng JC, et al. American Burn Association practice guidelines for burn care. *J Burn Care Res*. 2022; 43(5): 1023–1048.
3. van den Bosch AS, Verwilligen RAF, Pijpe A, Bosma E, van der Vlies CH, Lucas Y, et al. Outcomes of dermal substitutes in burns and burn scar reconstruction: a systematic review and meta-analysis. *Wound Repair Regen*. 2024;32(6):960–978.

4. Aleman Paredes K, Selaya Rojas JC, Flores Valdés JR, et al. A comparative analysis of the outcomes of various graft types in burn reconstruction over the past 24 years: a systematic review. *Cureus*. 2024;16(2): e54277.
5. Fan C, Azam F, Hinson C, et al. Free flap reconstruction in burns: a systematic review of current practices and evidence. *Microsurgery*. 2025;45(5): e70086.
6. van den Bosch AS, Verwilligen RAF, Pijpe A, et al. Indications for the use of dermal substitutes in patients with acute burns and in reconstructive surgery after burns: a systematic review. *Wound Repair Regen*. 2025.
7. Meta-analysis of the mortality and the prevalence of burn complications in Western populations. *J Burn Care Res*. 2024;45(4):932–944.
8. Pham TN, Gibran NS. Modern management of burn injuries and rehabilitation. *Clin Plast Surg*. 2022;49(4):587–600.
9. Moiemmen NS, Lee KC, Joory K. Burn care and reconstruction: current concepts and future directions. *Burns Trauma*. 2023;11: tkad021.
10. Brusselaers N, Monstrey S, Vogelaers D, Hoste E, Blot S. Contemporary advances in burn management and outcomes. *Burns Trauma*. 2025;13: tkae018.
11. Goverman J, Mathews K, Goldstein R. Long-term functional outcomes after severe burn injury. *J Burn Care Res*. 2022;43(6):1453–1461.
12. Atiyeh BS, Costagliola M, Hayek SN. Prevention and management of burn complications: current evidence and future perspectives. *Burns*. 2023;49(6):1248–1258.