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Original Research Article

Assessment of Long-Term Mortality Among Burn Survivors: A Retrospective Study

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Abstract:

Background: Burn injuries are associated with high acute morbidity and mortality, yet long-term survival outcomes among burn survivors remain under-reported. Persistent physiological, psychological, and systemic complications may contribute to increased delayed mortality.

Objectives: To evaluate the rate of long-term mortality among burn survivors and identify clinical factors associated with mortality following discharge.

Materials and Methods: This retrospective study was conducted at Zoram Medical College from 2022 to 2025. Medical records of 100 burn survivors were reviewed. Data collected included demographics, burn characteristics, comorbidities, hospital course, and follow-up survival status. Long-term mortality and factors influencing it were analyzed.

Results: Among the 100 burn survivors, 21% experienced long-term mortality during the follow-up period. Higher total body surface area (TBSA) involvement, presence of inhalational injury, comorbidities, and prolonged hospital stay were significantly associated with increased mortality. Flame burns were the most common etiology, and adults aged 18–40 years comprised the largest proportion of survivors.

Conclusion: Burn survivors exhibit a substantial risk of long-term mortality even after successful acute management. Severe burns, inhalational injury, and comorbid conditions are key predictors of delayed death. These findings emphasize the need for structured long-term follow-up, early identification of high-risk patients, and comprehensive post-discharge care to improve survival outcomes.

Keywords: Burn survivors, Long-term mortality, Retrospective study, TBSA, Zoram Medical College.

Introduction

Evidence shows that burns are a global health concern and have a significant impact on health, death, and disability in the global community. [1]. The world health organization reports that burns are one of the most injurious and deadly events and captures the majority of the injury related deaths, most notably in the lower- and middle-income countries due to a major deficit in specialized burn units, burn rehabilitation, and long-term care. [2]. Over the past few decades, advancements in the management of acute burns, such as early resuscitation, surgical care, and critical care have greatly improved short-term survival. [3]. Despite that, surviving after the immediate period after the critical stage of the burn does not translate to a complete recovery as burns are one of the most traumatic events people can undergo. These challenges become even more daunting with the more evidence suggesting that burns are chronic and systemic health events rather than just a single traumatic event. [4]. The evidence suggests severe burns lead to hypermetabolic, inflammatory, immune, and endocrine disruption that chronic dysregulation persists long after the individual recovers from the initial burn injury. [5,6]. Burn survivors are then left with systemic complications that lead to even worse long-term results in the health of individuals. chronic infection, cardiovascular, and metabolic complications are systemic and can lead to organ dysfunction. [7].

In prior studies, researchers found that burn injury survivors had higher mortality compared to non-burn injury patients. This trend, however, remains consistent across age, gender, and comorbid attributes [8,9]. The researchers concluded that burn injury survivors succumbed to respiratory diseases, cardiac illness, septic events, and various cancers [10,11]. Additionally, the duration and severity of the burn injury, excessive TBSA, and inhalational injuries, compounded by a prolonged stay in the hospital, smoke detrimental effects to survivors and adversely affects their long-term future [12,13]. Psychological and social sequelae of a burn injury also create long-term adverse effects [14]. Survivors experience social seclusion, depression, and anxiety,

which affects their mortality by increasing substance abuse, eta poor quality of living, and reducing treatment compliance [15,16]. This demonstrates a necessity of interdisciplinary long-term burn injury care. This is despite the growing evidence to the contrary, which shows a lack of substantial mortality studies on burn injury survivors in resource constrained environments, such as India [17]. The majority of such studies analyze in-hospital mortality and short-term post injury outcomes but are largely silent and lack detailed studies on mortality after hospital discharge and extended follow-up periods [18].

Differences in healthcare infrastructure, socioeconomic factors, and accessibility to rehabilitation services necessitate region-specific data to better understand the burden of long-term mortality in burn survivors. Therefore, this retrospective study was conducted at Zoram Medical College to assess the rate of long-term mortality among burn survivors over a three-year period (2022–2025). The study aims to contribute valuable regional data and identify factors associated with increased long-term mortality, thereby emphasizing the need for structured follow-up strategies and comprehensive post-burn care programs.

Materials and Methods

Study Design and Setting: This research was a retrospective observational study that took place in Zoram Medical College. Zoram Medical College is a tertiary education institution that offers specialized treatment services for burns.

Study Duration: Data was collected from patients that received treatment for a three-year period within January 2022 to December 2025.

Study Population: The study population of the whole research included individuals burned that were in the survived the first hospitalization. Patients that were burned and survived and were hospitalized for a and and were discharged to themselves and were followed up all inter patients of the included. For the survivors of burns in the research analysis, patients were survived.

Inclusion Criteria

- Patients with documented burn injury admitted during the study period
- Patients who survived the acute phase and were discharged from the hospital
- Availability of complete medical records and follow-up data

Exclusion Criteria

- Patients who died during initial hospitalization
- Patients with incomplete medical records
- Patients lost to follow-up immediately after discharge

Sample Size: A total of 100 burn survivors fulfilling the inclusion criteria were included in the study. Since this was a retrospective analysis, all eligible cases during the study period were considered.

Data Collection: Data for the analysis was collected retrospectively from the hospital medical records with the burn registry and the follow-up records. Information that was recorded included demographics like age and sex, the reason for the burn injury, the total body surface area (TBSA) that was burned, and if the injury was accompanied with bronchial burn and if there were any comorbidities with the injury. Within the hospital records, documentation was complete that included from the lists of follow-up available and from documentation closed the survival was determined.

Outcome Measures: The primary outcome was: long-term mortality among burn survivors following discharge. And secondary outcomes included factors associated with increased mortality such as TBSA involvement, comorbid conditions, and length of hospital stay.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation. Associations between clinical variables and long-term mortality were analyzed using suitable statistical tests. A p-value of <0.05 was considered statistically significant.

Ethical Approval: As this was a retrospective record-based study, informed consent was waived. Confidentiality of patient data was strictly maintained throughout the study.

1. **Demographic Profile of Study Population:** The majority of patients were adults, with a male predominance. Most patients belonged to the economically productive age group.

Table 1: Demographic characteristics of burn survivors (n = 100)

Variable	Number (n)	Percentage (%)
Age group (years)		
<18	12	12.0
18–40	48	48.0
41–60	28	28.0
>60	12	12.0
Gender		
Male	62	62.0
Female	38	38.0

2. **Etiology and Severity of Burn Injury:** Flame burns were the most common cause of injury. Most patients sustained moderate to severe burns based on TBSA involvement.

Table 2: Burn characteristics among survivors

Variable	Number (n)	Percentage (%)
Cause of burn		
Flame	58	58.0
Scald	26	26.0
Electrical	12	12.0
Chemical	4	4.0
TBSA involvement		
<20%	24	24.0
20–40%	42	42.0
>40%	34	34.0
Inhalational injury		
Present	18	18.0
Absent	82	82.0

3. **Hospital Course and Comorbidities:** Patients with higher TBSA involvement had longer hospital stay and required intensive care. Comorbidities were present in a significant proportion of patients.

Table 3: Hospital course and associated comorbidities

Variable	Number (n)	Percentage (%)
Duration of hospital stay		
<14 days	30	30.0
14–30 days	44	44.0
>30 days	26	26.0
Presence of comorbidities		
Yes	36	36.0
No	64	64.0

4. **Long-Term Mortality Among Burn Survivors:** During the follow-up period, long-term mortality was observed in 21% of burn survivors. Mortality occurred after discharge and was unrelated to acute burn management.

Table 4: Long-term mortality outcome

Outcome	Number (n)	Percentage (%)
Alive at follow-up	79	79.0
Deceased (long-term mortality)	21	21.0

5. **Factors Associated with Long-Term Mortality:** Long-term mortality was higher among patients with greater TBSA involvement, inhalational injury, comorbidities, and prolonged hospital stay.

Table 5: Association of clinical variables with long-term mortality

Variable	Mortality Present n (%)	Mortality Absent n (%)
TBSA >40%	14 (41.2)	20 (58.8)
TBSA ≤40%	7 (10.6)	59 (89.4)
Inhalational injury	9 (50.0)	9 (50.0)
No inhalational injury	12 (14.6)	70 (85.4)
Comorbidities present	13 (36.1)	23 (63.9)
No comorbidities	8 (12.5)	56 (87.5)
Hospital stay >30 days	11 (42.3)	15 (57.7)

Overall, the results demonstrate that burn survivors remain at a significantly increased risk of long-term mortality, particularly those with severe burns, associated comorbidities, inhalational injury, and prolonged hospitalization. These findings underscore the importance of structured long-term follow-up and comprehensive post-discharge care.

Discussion

The results of this retrospective study show that patients who have had burn injuries have a post discharge period that should be treated with care. These patients actually have a heightened risk of long-term mortality after leaving care which indicates that burn injuries must be treated with the same ongoing care as any chronic condition since they have the potential to be life threatening. The statistics that show a higher incidence of permeant disability and loss of life after surviving a burn injury have not been widely recognized and it is a very serious issue that must be dealt with [19]. Studies conducted that span large populations have demonstrated the same findings, confirming these patients have an elevated risk of early mortality long after the hosting event, particularly when they are compared to the general population [20, 21]. The results of this study regarding long term mortality are in keeping with previous findings that patients who have suffered a burn injury continue to be physiologically stressed over long periods of time. These patients suffer more systemic problems and are more likely to develop illnesses. Even in these patients the degree of complexity of the burns is a major risk factor for up to long term mortality which, on the surface, appears to be in good health [22]. The present study recognized that the extent of burn injury was especially concerning when the TBSA is on the higher side of the scale. This has, and continues to be, a serious problem which is well documented in previous literature where the presence of severe burns is known to have sustained a higher metabolism, immune dysfunction, and chronic inflammation to the extent that it leads to organ failure and compliance to a lower life span [23, 24].

Poorer long-term survival outcomes were also associated with the presence of inhalation injury. Increased mortality from inhalation injury stems from recurrent respiratory infections and persistent respiratory functions, which all result in long-term dysfunction of gas exchange [25,26]. These respiratory defects are likely the main contributors to the mortality of burn survivors. Other medical conditions were also crucial in predicting the outcomes were the long-term survivors. Survivors of burns with newly acquired and pre-existing medical comorbidities were associated with increased mortality in their follow-up. Research has demonstrated that burn injuries worsen the pre-existing cardiovascular, metabolic, and renal diseases, therefore also increasing the mortality risk, accelerating disease progression and increasing the mortality risk [27,28]. Likewise, increased long-term mortality was associated with extended hospital stays in this study, which aligns with previous studies and likely reflects the severity of the injuries and the burden of complications [29]. Psychological factors, over and above the physical ones, as well as social factors, may also lead to increased mortality over time. Survivors of burns are often short of social reintegration, which affects their overall quality of life and health-seeking behavior, as well as treatment adherence. They may also suffer from post-traumatic stress disorder, depression, and anxiety [30,31].

The findings of this study are particularly relevant in the context of resource-limited settings, where structured long-term follow-up and rehabilitation services for burn survivors are often inadequate [32]. Most burn care systems prioritize acute survival, with limited emphasis on post-discharge monitoring, secondary prevention, and long-term rehabilitation. The increased long-term mortality observed in this study underscores the need for comprehensive follow-up strategies, early identification of high-risk individuals, and multidisciplinary care models extending beyond hospital discharge [33]. Overall, this study adds to the growing body of evidence suggesting that burn survivors remain at elevated risk of mortality long after initial recovery. Recognition of burn injury as a chronic condition with long-term consequences is essential for improving survival outcomes and optimizing post-burn care.

Conclusion

Burn injury is not merely an acute event but a chronic condition with long-term systemic

consequences. In this study, 21% of burn survivors experienced delayed mortality, with higher risk among patients with severe burns, inhalational injury, comorbidities, and prolonged hospitalization. These results highlight the critical importance of structured post-discharge follow-up, multidisciplinary rehabilitation, and targeted interventions for high-risk patients to improve long-term survival.

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