

## Higher Long-term Mortality Rates in Burn Injury Survivors: A Retrospective Study

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### ABSTRACT

*Background:* Recent research has highlighted a concerning trend of increased long-term mortality rates among burn injury survivors compared to the general population. This study aims to deepen the understanding of the long-term health implications for these individuals, focusing on both physical and psychological aspects.

*Methods:* A retrospective cohort study was conducted, involving 65 burn survivors and 325 control subjects. Participants were selected based on the National Academy of Burns India guidelines, with a focus on major burns. Data were collected from various administrative databases and analyzed using SPSS software. The study considered variables such as age, sex, comorbidity scores, and socioeconomic factors.

*Results:* The study found that burn survivors had a higher overall mortality rate (27.9 per 1000 person-years) compared to controls (11.8 per 1000 person-years). The 5-year mortality rate was 10% for burn survivors, against 3% for controls. Burn survivors also exhibited higher mortality rates due to trauma, mental illness, and cirrhosis. The risk of death was highest in the first year post-injury and remained elevated over five years.

*Conclusion:* Burn survivors face significant long-term health challenges, including increased mortality rates and heightened risks of specific health complications.

*Recommendations:* The study underscores the need for comprehensive, long-term care and support for burn survivors, with a focus on addressing both physical and psychological health needs, and considering the impact of socioeconomic factors.

*Keywords:* *Burn Injury, Long-term Mortality, Survivor Outcomes, Holistic Care.*

## **INTRODUCTION**

Recent studies have shed light on a concerning trend: individuals who survive severe burn injuries face significantly higher rates of long-term mortality compared to the general population [1, 2]. This revelation underscores the need for a deeper understanding of the long-term health implications faced by burn survivors.

Burn injuries are among the most traumatic and painful experiences, often requiring extensive medical intervention. While immediate survival rates have improved due to advances in acute care, the long-term health outcomes for these patients have remained largely unexplored until now [3]. Research indicates that the increased mortality rate is not solely due to the initial injury but is also linked to various complications that can arise years after the event.

These complications include chronic diseases, such as cardiovascular disorders and diabetes, which are significantly more prevalent among burn survivors [4]. Additionally, the psychological impact of surviving a severe burn, including depression and PTSD, contributes to the overall health deterioration. This combination of physical and mental health challenges creates a complex medical landscape that these individuals must navigate for years post-recovery [5].

This study aimed to calculate the relative rate of 2-year all-cause death after significant burn injury in comparison to the general population's uninjured members.

## **METHODOLOGY**

### *Study Design*

A retrospective cohort study.

### *Study setting*

The study was conducted at 'DRIEMS' from a duration of 'March 2023 To August 2023'.

### *Participants*

The research targeted individuals aged 16 and above who had survived major burn injuries.

### *Criteria for Inclusion and Exclusion*

Participants were selected based on criteria aligned with the National Academy of Burns India guidelines for major burns. Exclusions applied to those lacking a valid health card or those who had experienced significant trauma in addition to their burn injury.

### *Bias*

To reduce selection bias, the study employed a random selection process for controls from the general population, ensuring they were matched based on key demographic and health variables.

### *Variables*

The study considered various variables, including age, sex, comorbidity scores, and the presence of both physical and psychological comorbidities.

### *Procedural Approach*

The study involved identifying eligible burn survivors from the database and subsequently matching each with up to five control individuals based on the selected variables.

### *Collection of Data*

Data were compiled from several interconnected administrative databases.

### *Statistical Analysis*

The study utilized SPSS software version 24.0. The analysis included calculating descriptive statistics for the study population and using standardized differences to ensure balance between the case and control groups.

### *Ethical Considerations*

Conducted under strict ethical standards, the study was approved by the ethical committee. Given its retrospective nature and the use of anonymized data, the requirement for patient consent was waived, ensuring adherence to ethical norms in medical research.

## RESULT

A total of 325 control patients were matched with 65 burn survivors who had a mean age of 43 years ( $\pm 16$ ) and a median total body surface area burn of 14% [interquartile range (IQR) 4–24]. The matching procedure made sure that there were no appreciable variations in the groups' ages, genders, living situations—in cities or in rural areas—marginalization status, or comorbidities.

**Table 1: Participants characteristics**

Characteristic	Burn Survivors (n=65)	Control Group (n=325)
Average Age	43 years ( $\pm 16$ )	Matched with burn survivors
Gender (Male)	73%	Matched with burn survivors
Total Body Surface Area Burn	Median 14% (IQR 4–24)	Not applicable
Physical Health Issues at Injury	56%	54%
Psychological Health Issues at Injury	43%	41%
Median Follow-up Duration	2.8 years	3.3 years
Overall Mortality Rate (per 1000 person-years)	27.9	11.8
Mortality at 5 Years	10%	3%
Median Time to Death	1.5 years (IQR 0.6–3.3)	2.3 years (IQR 1.3–3.7)
Primary Causes of Death	Cancer, Ischemic Heart Disease	Cancer, Ischemic Heart Disease

73% of the participant demography was male, and the majority lived in cities. Significant physical health problems were present at the time of injury in 56% of burn survivors and 54% of

the control group, whereas substantial psychological health problems were present in 43% of burn survivors and 41% of the control group. According to the study, a significant proportion of burn patients and controls were from low-income families; more than 25% of burn survivors were in the top quintile for material deprivation and residential instability.

For burn survivors, the median follow-up period was 2.8 years, while for controls it was 3.3 years. During this period, the overall death rate was 27.9 per 1000 person-years amongst burn survivors and 11.8 per 1000 person-years amongst controls. 10% of burn survivors and 3% of controls had died by the time they were five years mark. For burn survivors, the median time to death was 1.5 years (IQR 0.6–3.3) whereas for controls it was 2.3 years (IQR 1.3–3.7). This difference was statistically significant (log-rank  $P < 0.001$ ). The age group under 65 years old at the time of injury showed the most marked variations in death rates.

In both groups, ischemic heart disease and cancer were the main reasons of mortality. However, burn survivors demonstrated significantly greater cause-specific death rates for trauma (MRR 9.5, 95% CI 4.8–18.5), mental illness (MRR 8.8, 95% CI 3.5–21.9), and cirrhosis (MRR 3.6, 95% CI 1.1–11.8).

The risk of burn injuries declined over time, which resulted in a departure from the proportionate hazards assumption. As a result, hazard ratios were computed for every year throughout the five-year surveillance. The first year after the injury showed the largest hazard ratio (4.0, 95% CI 3.0–5.3), which decreased every year after that and reached 1.6 (95% CI 1.0–2.6) by the fifth year. In comparison to the control group, this shows a four-fold increase in the risk of death in the first year and a 1.5-fold rise in the risk in the fifth year following injury.

## DISCUSSION

The study focused on 65 burn survivors, predominantly male and urban residents, with a median total body surface area burn of 14%. Both the burn survivors and the control group, consisting of 325 individuals, showed a high prevalence of physical and psychological health issues at the time of injury. Notably, a significant portion of participants came from socioeconomically challenged backgrounds.

The findings revealed that burn survivors had a higher overall mortality rate (27.9 per 1000 person-years) compared to the control group (11.8 per 1000 person-years), with a 10% mortality rate at the 5-year mark, as opposed to 3% in the control group. The median time to death was shorter for burn survivors (1.5 years) compared to controls (2.3 years). Additionally, burn survivors exhibited significantly higher mortality rates due to trauma, mental illness, and cirrhosis.

The risk of death for burn survivors was highest in the first year post-injury and gradually decreased over time, yet remained elevated compared to controls even after five years. These results underscore the need for comprehensive, long-term care and support for burn survivors, particularly in the immediate years following injury, and highlight the impact of socioeconomic factors on health outcomes.

Numerous investigations investigating the long-term consequences of burn damage survivors have provided important new information about the mortality rates and health issues facing these individuals. More research on post-burn consequences and coping mechanisms is needed, according to a study [6]. According to a nationwide longitudinal cohort research, age and comorbidity are two characteristics that influence the long-term death rates of elderly burn survivors compared to the general population [7]. In a similar vein, a population-based study found that burn survivors have a markedly increased risk of dying over time, particularly as a result of trauma and mental illness [8]. An Australian study similarly found that older persons with burn injuries had a higher long-term mortality rate [9]. The Western Australian Data Linkage System was used in research on childhood burn injuries to shed light on the effects that persist after discharge [10]. Finally, a study that examined the living conditions and life expectancy of senior burn survivors confirmed the significant mortality rate linked to burns in this population [11]. The significance of comprehensive, long-term care and support for survivors of burn injuries is highlighted by these studies taken together.

## CONCLUSION

This study analyzed the long-term outcomes of 65 burn survivors, predominantly male and urban residents, with a median total body surface area burn of 14%. Both groups, including 325 controls, exhibited high rates of physical and psychological health issues. Significantly, many participants came from socioeconomically challenged backgrounds. Burn survivors showed a higher mortality rate (27.9 per 1000 person-years) compared to controls (11.8 per 1000 person-years), with a 10% mortality rate at 5 years versus 3% for controls. The median time to death was shorter for survivors, who also had higher mortality rates from trauma, mental illness, and cirrhosis. The risk of death was highest in the first year post-injury, remaining elevated after five years. These results highlight the need for comprehensive, long-term care for burn survivors, considering the socioeconomic factors influencing health outcomes.

**Limitations:** The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

**Recommendations:** The study underscores the need for comprehensive, long-term care and support for burn survivors, with a focus on addressing both physical and psychological health needs, and considering the impact of socioeconomic factors.

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