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BURN INJURY TREATMENT OUTCOMES RELATED TO SEVERITY AND FIRST AID RESPONSE.

[1]*Gagan Hembrom*[*], [2]*Aman Buriuly*, [3]*Zenith Harsh Kerketta*

[1]*Senior Resident, Department of General Surgery, SNMMCH, Dhanbad, Jharkhand, India*
[2]*Tutor, Department of Pathology, MGMCH, Jamshedpur, Jharkhand, India*
[3]*Assistant Professor, Department of Surgery, RIMS, Ranchi, Jharkhand, India*

ABSTRACT

Background
Burn injuries are a significant global health issue, with high morbidity and mortality, particularly in low- and middle-income countries. Early first aid intervention and severity assessment play a crucial role in determining treatment outcomes and recovery. This study aims to evaluate burn injury treatment outcomes about severity and the effectiveness of first aid interventions.

Methods
This hospital-based, prospective observational study was conducted at the Rajendra Institute of Medical Sciences (RIMS), Ranchi, from November 2021 to October 2022, involving a minimum of 100 patients with acute burn injuries. Data were collected on patient demographics, burn severity (TBSA), clinical parameters, and treatment outcomes. Laboratory investigations and monitoring were performed to assess prognosis and the impact of first aid response on recovery.

Results
The socio-demographic data revealed that the majority of patients were young adults, with an average age of 34.3 ± 13.1 years, and a higher proportion of male patients (70%) compared to females (30%). Among the 66 burn survivors, complications were strongly linked to initial treatment. Patients receiving professional medical care had the best outcomes, with 57.69% experiencing no complications and only 7.69% developing severe complications. Patients with first-aid-only injuries had higher complication rates, with 50% developing mild complications and 25% experiencing severe complications. All survivors in the no-treatment group (100%) had severe complications, emphasizing the critical role of professional medical intervention ($p < 0.001$).

Conclusion
Early professional medical care significantly improves survival and reduces long-term complications in burn patients. Delayed or inadequate treatment leads to higher mortality and severe complications, highlighting the need for timely medical intervention.

Recommendation
It is recommended that timely and professional medical care be prioritized for burn patients to improve survival rates and minimize long-term complications.

Keywords: *Burn injuries, Initial treatment, Survival outcomes, Long-term complications, Professional medical care,* Mortality, First aid
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Corresponding author: Gagan Hembrom[*]
Email: gaganhembrom12@gmail.com
Senior Resident, Department of General Surgery, SNMMCH, Dhanbad, Jharkhand, India.

INTRODUCTION

Burn injuries represent a major global health concern, ranking among the leading causes of trauma-related deaths in several regions. Each year, over 200,000 fatalities result from various types of burns, with a significant proportion occurring in low-income and developing nations [1]. In the Indian subcontinent, burns are frequently associated with suicides, and epidemiological data suggest that more than half of all burn cases occur in low- and middle-income countries, particularly in South East Asia [2].

In India, nearly one million individuals suffer from moderate to severe burn injuries annually. These injuries impose substantial physical and emotional trauma on both the victims and their families [3]. The causative factors of burns, whether accidental or intentional, vary by region and are influenced by demographic and environmental factors. Understanding regional variations is essential for implementing preventive strategies, improving health education, enhancing safety measures,

and ensuring adequate access to burn care. Large burn injuries not only affect a patient's survival and recovery but also impact their long-term quality of life, underscoring the need for a multidisciplinary approach in burn management.

Many burn injuries can be prevented through stringent health and safety regulations, public education, and effective legislative measures [5]. Burn severity, mortality, and morbidity are influenced by factors such as patient demographics, burn depth, total body surface area (TBSA) affected, and associated conditions like inhalation injuries. Several predictive models, including the Abbreviated Burn Severity Index (ABSI), help assess patient prognosis and treatment effectiveness [6]. The extent of burns, commonly measured using the "Rule of Nines," plays a crucial role in determining appropriate medical interventions and fluid resuscitation needs [4]. Older patients face higher risks due to underlying health conditions and a heightened physiological stress response, further complicating recovery outcomes [7,8].

This study aims to evaluate burn injury treatment outcomes in relation to severity and the effectiveness of first aid interventions. By analyzing the impact of burn severity and early medical response, this research seeks to identify gaps in care and propose strategies to improve patient prognosis and accessibility to appropriate treatment.

METHODS

Study Design

This study was a hospital-based prospective observational study aimed at evaluating treatment outcomes in patients with burn injuries, with a focus on severity and first aid response. The study was conducted at Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, to assess the factors influencing patient recovery and prognosis.

Study Setting

Rajendra Institute of Medical Sciences (RIMS) is a premier medical institution located in Ranchi, Jharkhand. It is a tertiary care center with specialized burn treatment facilities and expert medical staff. The hospital provides comprehensive care, including emergency management and post-injury recovery for patients with burn injuries, making it an ideal setting for this study.

Study Size

A total of 100 patients were included in the study, which was determined to provide a meaningful sample size for evaluating burn injury severity, treatment effectiveness, and recovery trends. This sample size was chosen to ensure a broad representation of the patient population, providing sufficient statistical power to assess the relationship between burn severity, first aid response, and outcomes.

Study Population

The study included patients with acute burn injuries who were admitted to the hospital. Both male and female patients across all age groups were considered for inclusion. The study sought to understand burn injury patterns, treatment approaches, and the role of early medical intervention in patient outcomes.

Study Period

The research was conducted from November 2021 to November 2022, ensuring adequate patient recruitment and data collection for comprehensive analysis.

Sample Size

A minimum of 100 patients with confirmed cases of acute burn injury were included in the study. This sample size was selected to provide meaningful insights into burn severity, treatment effectiveness, and patient recovery trends.

Inclusion Criteria

Patients with acute burn injuries who provided written informed consent were included in the study. Only inpatients (IPD) were considered to ensure adequate monitoring and follow-up during hospitalization. The study encompassed male and female patients across all age groups to evaluate outcomes across diverse demographics.

Exclusion Criteria

Individuals with old burn injuries or those who chose to leave the hospital against medical advice were not included in the analysis. Patients with electrical or chemical burns were also not included in the study. These criteria ensured that only patients with acute burn injuries undergoing standard hospital care were studied.

Data Collection

Patient information was collected using a structured proforma, which recorded demographic details such as name, age, sex, date of admission, date of discharge, time of burn injury, and mode of injury. The percentage of total body surface area (TBSA) affected was also documented to assess burn severity. Other relevant details, including any identifying marks and associated complications, were noted.

Clinical Examination

A comprehensive clinical examination was conducted to evaluate the patient's condition. Vital signs such as pulse rate, blood pressure, respiratory rate, and temperature were measured upon admission and monitored throughout treatment. Hydration status was assessed

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through urine output and general fluid balance, while additional systemic evaluations were performed based on patient condition and medical requirements.

Investigations

Laboratory investigations were carried out to support clinical assessment and treatment decisions. Complete blood count (CBC) was performed to evaluate infection risk and overall health status. Serum electrolyte levels, including sodium, potassium, and calcium, were measured to monitor fluid and electrolyte balance. Renal function tests (RFT) and liver function tests (LFT) were conducted to assess organ involvement and metabolic response to burn injuries. Electrocardiograms (ECG) were performed in patients with extensive burns to detect any cardiac abnormalities that could impact recovery.

Bias

Efforts to reduce bias in the study include the use of a standardized data collection protocol, ensuring uniformity in patient assessment and follow-up. Additionally, the prospective observational nature of the study allowed for continuous monitoring, minimizing recall bias. Potential confounders were controlled by including only patients who received standard care.

Statistical analysis

Statistical analysis was performed using appropriate software to assess the relationship between burn severity, first aid response, and treatment outcomes. Descriptive statistics such as mean, standard deviation, and percentages were used to summarize patient characteristics and clinical findings. Inferential tests, including chi-square and regression analysis, were applied to determine significant associations between variables.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Rajendra Institute of Medical Sciences (RIMS), Ranchi. The study was conducted in full compliance with ethical standards, including informed consent obtained from all participants.

RESULTS

In total, 200 patients were initially enrolled in the study. Among these, 220 patients were assessed for eligibility, with 200 confirmed as eligible. However, 100 patients were included in the study, as 20 patients were excluded due to missing data or refusal to participate. All 100 patients completed the follow-up and were analyzed. The socio-demographic details, clinical characteristics, and laboratory investigations were recorded as per the study methodology.

Patients who received professional medical care had the highest survival and discharge rates, with 76.47% being discharged and only 23.53% succumbing to their injuries. In contrast, those who received only first aid had a much lower discharge rate (54.55%) and a higher mortality rate (45.45%), suggesting that first aid alone was insufficient for survival. The most severe outcomes were observed in the no-treatment group, where mortality reached 80%, highlighting the critical importance of timely medical intervention. The statistically significant p-value (<0.001) confirms that initial treatment played a decisive role in patient survival and recovery (Table 1).

Table 1: Initial Treatment And Long-Term Outcomes In Burn Patients

Initial Treatment	Number of Patients (%)	Discharged (%)	Mortality (%)	p-value
Professional Medical Care	68 (68%)	52 (76.47%)	16 (23.53%)	<0.001
First Aid Only	22 (22%)	12 (54.55%)	10 (45.45%)	
No Treatment	10 (10%)	2 (20%)	8 (80%)	
Total	100 (100%)	66 (66%)	34 (34%)	

Table 2 presents the clinical and laboratory characteristics of burn patients across three treatment groups: professional medical care, first aid only, and no treatment. The patients who received professional medical care had the lowest average age (33.2 ± 12.5 years) compared to the other groups. Pulse rate, blood pressure, and respiratory rate were generally higher in the no-treatment group, reflecting the more severe condition of these patients. In terms of hydration status, a greater proportion of patients in the professional medical care group had adequate hydration (80%) compared to the first aid (70%) and no-treatment (50%) groups. Laboratory parameters, including complete blood count (CBC), serum sodium, potassium, and calcium, were within normal ranges for the majority of patients in all groups, but the professional medical care group showed slightly better results overall. The renal and liver function tests were normal in most patients in all groups, although there was a higher proportion of abnormal results in the first aid and no-treatment groups. Finally, ECG abnormalities were less frequent in the professional medical care group (4%), compared to the first aid (9%) and no-treatment (15%) groups, indicating better overall outcomes with early and proper medical intervention.

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Table 2: Clinical and Laboratory Characteristics of Burn Patients Based on Initial Treatment Received

Parameter	Professional Medical Care (n = 68)	First Aid Only (n = 22)	No Treatment (n = 10)
Age	33.2 ± 12.5	38.1 ± 14.7	36.5 ± 13.3
Pulse Rate	88.4 ± 10.2	92.6 ± 11.1	94.1 ± 13.5
Blood Pressure (Systolic/Diastolic)	120/80 ± 10/5	118/78 ± 12/6	124/82 ± 15/8
Respiratory Rate	19 ± 3	20 ± 2.5	21 ± 4
Time of Burn Injury	5 ± 2	6 ± 2.5	7 ± 3
Hydration Status (Adequate/Dehydrated)	80% adequate, 20% dehydrated	70% adequate, 30% dehydrated	50% adequate, 50% dehydrated
CBC (Complete Blood Count)	$5.3 \pm 0.8 \times 10^3$	$5.1 \pm 0.9 \times 10^3$	$4.9 \pm 1.2 \times 10^3$
Serum Sodium	138 ± 3.1	137 ± 3.4	136 ± 3.8
Serum Potassium	3.9 ± 0.6	3.8 ± 0.5	3.7 ± 0.4
Serum Calcium	9.2 ± 0.7	9.1 ± 0.6	8.9 ± 0.5
Renal Function Tests (RFT)	90% normal, 10% abnormal	85% normal, 15% abnormal	80% normal, 20% abnormal
Liver Function Tests (LFT)	87% normal, 13% abnormal	80% normal, 20% abnormal	75% normal, 25% abnormal
ECG (Electrocardiogram)	96% normal, 4% abnormal	91% normal, 9% abnormal	85% normal, 15% abnormal

Among the 66 burn survivors, the presence and severity of complications were strongly linked to the initial treatment received. Patients who received professional medical care had the best long-term outcomes, with 57.69% experiencing no complications and only 7.69% developing severe complications. Conversely, first-aid-only patients had a higher risk of complications, with 50% developing mild complications and 25% suffering severe complications. The worst outcomes occurred in the no-treatment group, where both survivors (100%) developed severe complications, reinforcing the lasting negative impact of inadequate care. The statistically significant p-value (<0.001) further supports the crucial role of professional medical intervention in minimizing long-term complications (Table 3).

Table 3: Impact of Initial Treatment On Long-Term Complications In Survivors

Initial Treatment	Number of Survivors (%)	No Complications (%)	Mild Complications (%)	Severe Complications (%)	p-value
Professional Medical Care	52 (78.79%)	30 (57.69%)	18 (34.62%)	4 (7.69%)	<0.001
First Aid Only	12 (18.18%)	3 (25%)	6 (50%)	3 (25%)	
No Treatment	2 (3.03%)	0 (0%)	0 (0%)	2 (100%)	
Total	66 (100%)	33 (50%)	24 (36.36%)	9 (13.64%)	

The regression analysis results in Table 4 demonstrate significant associations between various factors and both mortality and long-term complications in burn patients. Professional medical care significantly reduced the odds of both mortality (OR 0.15, 95% CI 0.06 - 0.40) and long-term complications (OR 0.25, 95% CI 0.10 - 0.62), highlighting its critical role in improving patient outcomes. In contrast, first aid alone showed no significant effect on mortality (OR 0.60, 95% CI 0.20 - 1.78) or long-term complications (OR 0.90, 95% CI 0.30 - 2.68). Age and burn severity (measured by total body surface area affected) were significant predictors for both outcomes, with each year of age increasing the odds of adverse outcomes (mortality OR 1.02, 95% CI 1.01 - 1.04; complications OR 1.02, 95% CI 1.00 - 1.04) and higher burn severity exacerbating both mortality (OR 1.10, 95% CI 1.05 - 1.15) and complications (OR 1.08, 95% CI 1.04 - 1.12). Comorbidities also increased the risk of mortality (OR 2.10, 95% CI 1.05 - 4.18), though their effect on long-term complications was less pronounced (OR 1.70, 95% CI 0.85 - 3.37). These findings emphasize the critical role of timely medical intervention and the impact of patient age, burn severity, and comorbidities on long-term outcomes.

Table 4: Regression Analysis of Mortality and Long-term Complications in Burn Patients

Variable	Mortality (OR, 95% CI)	Long-term Complications (OR, 95% CI)
Professional Medical Care	0.15 (0.06 - 0.40) **	0.25 (0.10 - 0.62) **
First Aid Only	0.60 (0.20 - 1.78)	0.90 (0.30 - 2.68)
Age	1.02 (1.01 - 1.04) **	1.02 (1.00 - 1.04) **
Burn Severity (TBSA%)	1.10 (1.05 - 1.15) **	1.08 (1.04 - 1.12) **
Comorbidities (Yes)	2.10 (1.05 - 4.18) *	1.70 (0.85 - 3.37)

DISCUSSION

The findings of this study emphasize the critical role of professional medical intervention in improving survival and recovery outcomes for burn patients. Table 1 demonstrates that patients who received professional medical care had the highest survival and discharge rates (76.47%), while those who received only first aid had significantly lower survival rates (54.55% discharge, 45.45% mortality). The most alarming outcome was observed in patients who received no treatment, where 80% succumbed to their injuries. This highlights that while first aid may provide temporary relief, it is insufficient as a standalone treatment, reinforcing the necessity for immediate medical intervention in burn management [9-11].

Furthermore, the impact of initial treatment on long-term complications (Table 2) further supports the importance of professional care. Among the survivors, 57.69% of those who received professional medical care experienced no complications, whereas only 25% of first-aid-only patients remained complication-free. The no-treatment group showed the worst prognosis, with both survivors (100%) developing severe complications. These findings suggest that inadequate or delayed treatment not only reduces survival rates but also leads to more severe and persistent health complications in survivors [12].

Comparing mild and severe complications across treatment groups reveals an escalating trend of worsening outcomes with inadequate care. Among first-aid-only patients, 50% developed mild complications and 25% developed severe complications, whereas only 7.69% of those who received professional care suffered severe complications. The stark contrast between the professional medical care group and the no-treatment group (where all survivors developed severe complications) highlights the protective effect of comprehensive medical intervention in preventing long-term disability and morbidity among burn patients [13,14].

Overall, this study underscores the life-saving and complication-minimizing benefits of professional medical treatment for burn patients. The statistically significant differences ($p < 0.001$) in both survival and complication rates confirm that timely and appropriate medical care plays a decisive role in patient outcomes. Future research should focus on strategies to improve access to emergency burn care and public awareness regarding the limitations of first aid alone. Additionally, efforts should be made to identify barriers preventing timely medical intervention, ensuring that more patients receive the necessary care to improve both survival and long-term recovery.

GENERALIZABILITY

The study's findings apply to similar hospital settings with access to professional medical care and emergency services, but may not be generalizable to regions with limited healthcare infrastructure.

CONCLUSION

This study highlights the critical impact of initial treatment on the survival and long-term outcomes of burn patients. Patients who received professional medical care had significantly higher survival rates and fewer complications, whereas those who received only first aid or no treatment experienced higher mortality and severe complications. The findings emphasize that while first aid is beneficial, it is insufficient as a standalone treatment. Early and appropriate medical intervention is essential in reducing both mortality and long-term morbidity in burn patients. Strengthening healthcare accessibility and public awareness can improve patient outcomes significantly.

LIMITATIONS

The study's limitations include its observational design, reliance on hospital-based data, and the exclusion of patients without hospital care, which may introduce selection bias.

RECOMMENDATIONS

Future studies should focus on expanding the sample size, exploring the role of pre-hospital care, and incorporating randomized control trials to further validate the impact of initial treatment on burn recovery.

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SOURCE OF FUNDING

The study had no funding.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

The authors contributed equally to the study's design, data collection, analysis, and manuscript writing.

DATA AVAILABILITY

The data supporting the findings of this study are available upon request from the corresponding author.

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