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ORIGINAL RESEARCH

Use of abbreviated burn severity index as prognostic factor for outcome of burn patient admitted in RIMS, Ranchi

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ABSTRACT

Background: Burn injuries require precise assessment for efficient therapy because they are a major cause of morbidity and mortality, especially in environments with limited resources. A popular predictive technique for assessing burn severity and forecasting patient outcomes is the Abbreviated Burn Severity Index (ABSI). This study aims to assess the predictive value of ABSI in determining the prognosis of burn patients admitted to RIMS, Ranchi. **Methods:** This hospital-based prospective observational study was conducted at Rajendra Institute of Medical Sciences (RIMS), Ranchi, from November 2021 to October 2022, including 100 patients with acute second- and third-degree thermal burns. Burn severity was assessed using TBSA (Lund and Browder chart), burn depth, and the ABSI score, while inhalation injury was diagnosed based on clinical signs. Patient outcomes were analyzed to evaluate the impact of burn severity, first aid response, and early medical intervention on prognosis. **Results:** This study found a strong correlation between ABSI scores and mortality, with survival rates decreasing as ABSI increased. Patients with TBSA >40% had significantly higher mortality, reaching 100% for burns >80%. Inhalation injury was associated with a 42.11% mortality rate, while full-thickness burns had a higher fatality rate (46.15%) than partial-thickness burns (13.11%). These findings highlight ABSI, TBSA, inhalation injury, and burn depth as key prognostic factors. **Conclusion:** The ABSI score is a reliable predictor of burn mortality, with TBSA, inhalation injury, and burn depth significantly influencing patient outcomes. Early assessment of these factors can improve prognosis and guide treatment strategies.

Keywords: Burn injuries, ABSI score, Total Body Surface Area (TBSA), inhalation injury, burn depth, mortality.

INTRODUCTION

Burn injuries are one of the leading causes of trauma-related mortality and continue to be a major worldwide health concern, especially in low- and middle-income nations. Each year, more than 200,000 deaths occur due to burn-related complications, with a substantial proportion reported in regions with limited healthcare infrastructure.[1] In South East Asia, including the Indian subcontinent, burns are frequently associated with domestic accidents and suicides. Epidemiological studies suggest that over half of all burn cases arise in economically disadvantaged nations, where access to specialized care is often inadequate.[2] In India alone, nearly one million individuals experience moderate to severe burns annually, leading to considerable physical, emotional, and financial strain on both patients and their families.[3]

The prognosis of burn injuries is influenced by multiple factors, such as the extent of total body surface area (TBSA) affected, burn depth, age, comorbid conditions, and the presence of inhalation injuries.[4] Severe burns not only pose a challenge for survival but also have long-term repercussions on a patient's overall quality of life, necessitating a comprehensive and multidisciplinary approach to treatment. Several scoring systems have been developed to assess burn severity and predict patient outcomes, among which the Abbreviated Burn Severity Index (ABSI) is widely used.[5,6] This index incorporates key clinical parameters—such as patient age, gender, burn size, inhalation injury, and burn depth—to generate a score that correlates with survival chances. A higher ABSI score typically indicates an increased risk of mortality, making it an

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essential tool in triaging patients and determining the intensity of medical intervention required.

Assessing burn severity accurately is crucial for guiding clinical management, including resuscitation protocols, infection prevention, and surgical intervention. The Rule of Nines remains a standard method for estimating TBSA involvement, and when combined with ABSI, it provides valuable prognostic insights that assist in planning individualized treatment strategies.[4] Elderly patients, in particular, face greater risks due to underlying medical conditions and a diminished physiological response to burn injuries, making recovery more challenging.[7,8]

Despite advancements in burn care, gaps still exist in the early recognition of high-risk cases, efficient triage, and optimal utilization of healthcare resources. This study aims to assess the predictive value of ABSI in determining the outcomes of burn patients admitted to RIMS, Ranchi. By examining the relationship between ABSI scores and patient survival, this research seeks to improve clinical decision-making, refine burn management protocols, and identify areas where targeted interventions can enhance treatment efficacy and patient recovery.

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 Population

The study included patients with acute burn injuries 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 over a period of one year, from November 2021 to October 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

This study included patients who sustained second- and third-degree thermal burns and were admitted to the burn unit for treatment. Only individuals who met these criteria were considered for further evaluation and data collection.

Exclusion Criteria

Patients with chemical, electrical, or radiation burns were excluded from the study to maintain a uniform patient population. Additionally, individuals with pre-existing medical conditions such as diabetes, malignancy, or immunosuppression were not included, as these factors could influence burn outcomes. Patients with concurrent traumatic injuries and pregnant women were also excluded. Furthermore, individuals who were admitted more than 24 hours after sustaining burns or those who refused treatment were not considered for participation in the study.

Data collection

Data Collection and Clinical Assessment

Upon admission, demographic information and medical history were documented. A comprehensive physical examination was conducted to evaluate the severity of burns, including the depth of injury, presence of inhalation injury, and the percentage of total body surface area (TBSA) affected.

Identification of Inhalation Damage

Clinical signs and symptoms were used to identify inhalation damage. These included hoarseness, face burns, singed nasal hair, carbonaceous sputum, airway oedema, and respiratory distress, including dyspnoea and wheezing. To verify the existence of inhalation damage, a combination of these indications was employed.

Burn Surface Area Assessment

The extent of burns was calculated using the Lund and Browder chart, a standard tool for determining TBSA involvement. For pediatric patients, TBSA was estimated using age-specific calculations. For example, in infants, the head accounts for a larger proportion of TBSA compared to older children and adults. Similarly, the proportions for the thighs and lower legs vary based on age.

Burn Depth Classification

Burn injuries were categorized based on their depth:

- **Superficial Burns (First-Degree):** These burns appeared dry without blisters or significant edema and had an erythematous coloration. They were typically painful.
- **Partial-Thickness Burns (Second-Degree):** These burns presented with moist blisters and had a mottled white to pink or cherry-red coloration. They were associated with significant pain.
- **Full-Thickness Burns (Third-Degree):** Characterized by dry, leathery eschar and a mixed white, waxy, or darkened appearance, these burns often exhibited little to no pain due to nerve

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damage. Hair in the affected area could be easily pulled out.

Calculation of ABSI Score

The ABSI score was computed for each patient based on five key parameters: age, sex, presence of full-thickness burns, TBSA percentage, and inhalation injury. The total ABSI score was derived using the following equation:

ABSI Score=Age+Sex+Full-thickness burn+TBSA+Inhalation

Patients were categorized into ABSI score groups, and predicted survival probabilities were compared with actual outcomes to assess prognostic accuracy.

Statistical analysis

For statistical analysis, all gathered data was loaded into SPSS software version 22.0, while categorical variables were represented as frequencies and percentages. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

The results of this study demonstrates a clear association between higher ABSI scores and increased mortality. Patients with an ABSI score of 2–3 had a 100% survival rate, while those with a score of 4–5 exhibited a low mortality rate of 3.45%. As the ABSI score increased, mortality also rose significantly, reaching 76.92% for patients with a score of 10–11 and 100% for those with a score ≥12. These findings highlight the prognostic value of ABSI in predicting burn-related outcomes (Table 1).

Table 1: Correlation Between ABSI Score and Mortality

ABSI Score (Mean = 7.3)	Number of Patients (%)	Discharged	Expired (% Mortality)	Expected Survival (%)	P-value
2-3	4 (4%)	4 (100%)	0 (0.00%)	>99%	<0.0001
4-5	29 (29%)	28 (96.55%)	1 (3.45%)	98%	
6-7	31 (31%)	27 (87.10%)	4 (12.90%)	80–90%	
8-9	14 (14%)	12 (85.71%)	2 (14.29%)	50–70%	
10-11	13 (13%)	3 (23.08%)	10 (76.92%)	20–40%	
≥12	9 (9%)	0 (0%)	9 (100%)	<10%	
Total	**100 (100%)**	**74 (74%)**	**26 (26%)**	—	

Mortality rates showed a strong correlation with increasing TBSA percentage. Patients with burns covering ≤10% TBSA had a mortality rate of 11.11%, while those with 11–30% TBSA had minimal mortality. However, mortality significantly increased in patients with TBSA exceeding 40%, reaching 60% at 41–50% TBSA and 100% at TBSA >80%. These findings emphasize TBSA as a crucial predictor of survival in burn patients (Table 2).

Table 2: Correlation Between TBSA and Mortality

TBSA (%)	Number of Patients (%)	Discharged	Expired (% Mortality)	P-value
≤10	9 (9%)	8 (88.89%)	1 (11.11%)	<0.001
11–20	12 (12%)	12 (100%)	0 (0.00%)	
21–30	20 (20%)	19 (95.00%)	1 (5.00%)	
31–40	24 (24%)	21 (87.50%)	3 (12.50%)	
41–50	10 (10%)	4 (40.00%)	6 (60.00%)	
51–60	11 (11%)	5 (45.45%)	6 (54.55%)	
61–70	5 (5%)	2 (40.00%)	3 (60.00%)	
71–80	4 (4%)	1 (25%)	3 (75%)	
81–90	3 (3%)	0 (0.00%)	3 (100%)	
91–100	2 (2%)	0 (0.00%)	2 (100%)	
Total	**100 (100%)**	**74 (74%)**	**26 (26%)**	—

Patients with inhalation injury had a markedly higher mortality rate (42.11%) in contrast to those without (16.13%), underscoring the impact of respiratory involvement on burn prognosis. Similarly, full-thickness burns were associated with significantly higher mortality (46.15%) than partial-thickness burns (13.11%). These results suggest that inhalation injury and burn depth are critical determinants of patient outcomes and should be considered in burn severity assessment (Table 3).

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Table 3: Correlation Between Inhalation Injury, Burn Depth, and Mortality

Variable	Number of Patients (%)	Discharged	Expired (% Mortality)	P-value
Inhalation Injury				
With Inhalation	38 (38%)	22 (57.89%)	16 (42.11%)	0.007
Without Inhalation	62 (62%)	52 (83.87%)	10 (16.13%)	
Degree of Burn				
Full-thickness	39 (39%)	21 (53.85%)	18 (46.15%)	0.002
Partial-thickness	61 (61%)	53 (86.89%)	8 (13.11%)	
Total	**100 (100%)**	**74 (74%)**	**26 (26%)**	—

DISCUSSION

The findings of this study highlight that elderly patients (>60 years) showed the largest mortality rate, while teenagers had the lowest (11%). Despite a higher incidence of burns in males, female patients exhibited greater mortality, except in the elderly group. Rani and Schwacha (2012) attributed this to age-related immune decline, increasing infection risk and delayed wound healing.[9] McGwin et al. and O'Keefe et al. similarly reported a higher mortality risk in female burn patients, particularly between 30-59 years.[10,11] Gender disparities in healthcare access, referral patterns, and sociocultural factors may further contribute to this trend.[12]

Burn severity and inhalation injuries significantly influenced outcomes. Full-thickness burns were associated with the highest mortality, particularly when TBSA exceeded 80%. Inhalation injuries also worsened prognosis, with a 42.11% fatality rate compared to 16.13% in non-inhalation cases ($p < 0.05$). Carbon monoxide exposure and subglottic airway injury exacerbated respiratory complications, necessitating early interventions such as bronchoscopy and nebulized therapies.[13] Previous studies confirm that extensive burns trigger a severe hypermetabolic response, further increasing mortality risk.[14]

Burn depth and delayed wound healing played a crucial role in survival. Full-thickness burns required early surgical excision and grafting to prevent complications such as hypertrophic scarring and contractures.[15,16] Without timely intervention, prolonged healing beyond three weeks significantly increased scarring risk (78%).[16] Similar findings were reported by Chen et al., where third-degree burns had a fatality rate of 20.50%, emphasizing the importance of specialized burn care.[17]

The ABSI score proved to be a strong predictor of mortality, with survival rates dropping sharply from 85.71% at an ABSI score of 8-9 to 23.08% at 10-11. This aligns with Gutierrez et al.and Nthumba et al., who reported similar declines in survival based on ABSI scoring.[18,19] Given its high sensitivity (0.96) and specificity in this study, ABSI remains a valuable tool for assessing burn prognosis. Future studies with larger cohorts are needed to further validate its predictive accuracy.

CONCLUSION

This study highlights the strong prognostic value of the ABSI score, TBSA percentage, inhalation injury, and burn depth in predicting mortality among burn patients. A higher ABSI score and greater TBSA involvement were significantly associated with increased mortality, with patients having ABSI ≥12 or TBSA >80% experiencing 100% fatality. Inhalation injury and full-thickness burns further worsened survival outcomes, emphasizing the need for early and aggressive intervention. These findings emphasize the importance of comprehensive burn assessment and tailored management strategies to improve patient prognosis.

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Author contribution statement

All authors contributed to the study design, data collection, analysis, and manuscript preparation.

Conflict of interest

None.

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