



Burn Injury Patterns and Validation of the Abbreviated Burn Severity Index as a Predictor of Outcome in a Southwestern Nigerian Hospital

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Abstract

The pattern of burn injuries are dynamic and vary between places being influenced by several factors. This informs the need for periodic review of patterns of burn injuries. Predicting burned patients outcome is important to clinical decision making, prognostication as well as optimal hospital resource allocation. Several models of achieving this have been developed, each with varying strengths and shortcomings. This study aims at describing the current pattern of acute burn injury as well as validates the Abbreviated Burn Severity Index (ABSI) as an outcome predictor in burn patients in the study setting.

This is an observational study from the database of patients with burn injuries managed at the study institution over a 14 year period. The information analyzed was obtained from the clinical database of burn patients, imputed into computer software SPSS software for analysis.

The total number of burn patients seen during the period was 416. Children and teenagers (0 to 20 years) were most commonly affected making up 47.8%. The mean age of patients was 23.4 years (SD=20.1 years). Burn injuries commonly resulted from flame (56%), scald (33%) and electricity (6%). A male, female ratio of 1.7:1. Inhalational injury was present in 15.6% of patients. Overall mortality was 25.2%. ABSI score was effective in the prediction of mortalities.

There is an increase in the frequency of electrical burn injuries, as well as severity of burn injuries at the center and ABSI score is an effective predictor of mortality amongst patients with acute burn injury.

Keywords: Abbreviated burn severity index; Burn injury; Prognostic burn index

Introduction

Burn injury remains a major source of trauma worldwide. The patterns are dynamic [1] and vary with places and socioeconomic levels among other factors. This informs the need to periodically review trends in burn injuries to keep up with effective prevention and management strategies.

Although burn survival has improved over the years due to advances in burn care such as early burn wound excision, the use of silver impregnated dressings, improvement in critical care as well as the use of skin banks and skin substitutes among others [2], the prediction of outcome in acute burn patients is still of interest to the burn surgeon [3]. This is important as it aids triage, guides clinical decision making on prognosis and resource allocation, particularly in resource-limited settings [4,5].

This study therefore aimed at reporting the current trends in the clinical pattern of burn injury in our practice as well as validate the effectiveness of the Abbreviated Burn Severity Index (ABSI) score, as a predictor of outcome.

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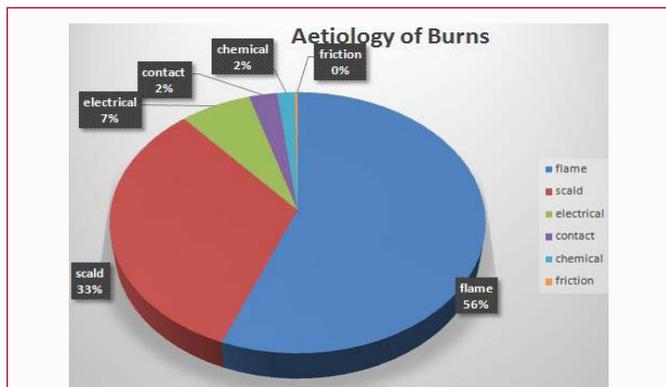


Figure 1: Aetiology of Burn Injuries.

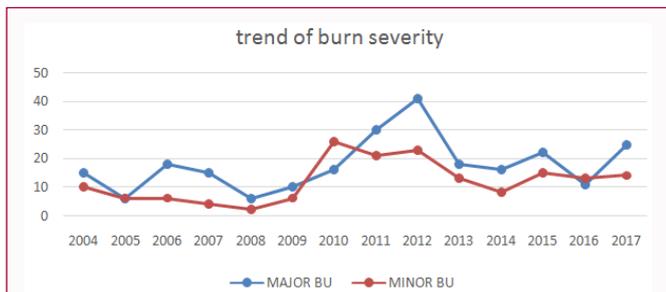


Figure 2: Trend of burn severity.

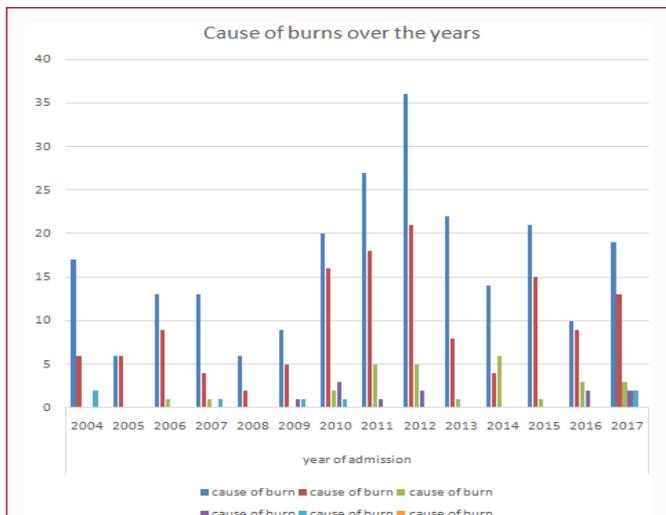


Figure 3: Cause of burns over the years.

Materials and Methods

This observational study of burn patients admitted for care at the Obafemi Awolowo University Teaching Hospital (OAUTHC), Ile Ife, Nigeria, over a 14 year period (January 2004 and December 2017). The information obtained from patients clinical database was utilized for analysis. The Patients’ fluid resuscitation was based on Parkland formula and was monitored by hourly urine output along with the vital signs and oxygen saturation. Burns above 15% total body surface area was considered major. Patients with inhalation injury were assessed clinically. The ABSI score was calculated for each patient using the parameters in table 4, and stratified into six groups; 2 to 3, 4 to 5, 6 to 7, 8 to 9, 10 to 11, ≥ 12. The outcome measures were death and discharge from the hospital. Those who were referred or

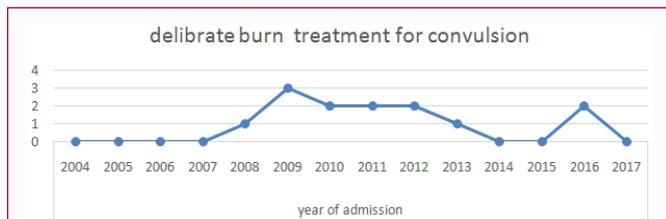


Figure 4: Deliberate burn treatment for convulsion.

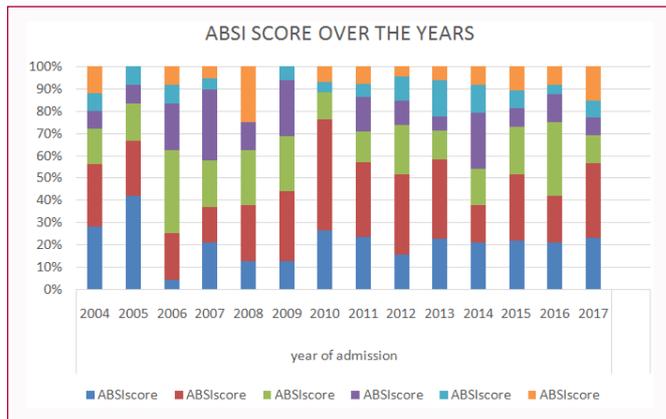


Figure 5: ABSI score over the years.

Table 1: Demographics of patients with burn injuries.

	Frequency (n)	Percentage (%)	
AGE			Mean: 24.2 Yrs
0 - 20	199	47.8	
21 - 40	142	34.1	
41 - 60	58	13.9	
61 - 80	11	2.6	
81 - 100	6	1.4	
SEX			M:F=1.7:1
Male	261	62.7	
Female	155	37.3	

transferred to other hospitals or who discharged against medical advice were noted. Statistical analysis was with SPSS software.

Results

A total of 416 burn patients were managed during the period. Their age and gender distribution is shown in Table 1. The mean age of patients was 24.2 years with a range of 3 months to 90 years. Children below 15 years of age made up 38.2% and male gender constituted 62.7%. The peak age of patients was the 0 to 20 years age-group (47.8%). The etiology of burn injuries is shown in Figure 1. All causes of burn were more common in males except chemical burns which were more common in females but the numbers were few.

The average extent of burn was 27.5% (28.2% for males and 26.4% for females), 249 patients (59.9%) had burns greater than 15%. The details of total body surface area burned and the frequency is shown in Table 2. The pattern of severe burns above and below 15% TBSA over the period is as shown in Figure 2.

The burn injuries were accidental in 400 patients (96.2%) and deliberate in 16 (3.8%), the latter being made of 13 (3.1%) patients who had feet burns following attempts to resuscitate a convulsive

Table 2: The Extent of Body Surface Area (BSA) involved among the patients.

BSA	Frequency (n)	Percentage (%)
1 - 10	123	29.6
11 - 20	83	20
21 - 30	67	16.1
31 - 40	45	10.8
41 - 50	36	8.7
51 - 60	13	3.1
61 - 70	15	3.6
71 - 80	17	4.1
81 - 90	8	1.9
91 - 100	9	2.2
Total	416	100

episode and 3 (0.7%) patients who were assaulted, 2 cases from scald and 1 was chemical burn. The trends for all causes of burns is shown in Figure 3, while that for patients who had deliberate burns following convulsive episodes over the years in shown in Figure 4. Inhalational injury was present in 15.6%.

The overall mortality was 25.2%, (25.7% in males and 24.5% in females) while mortality from flame burns was 59.6%, electrical burns 16.7%, scald 11.5%. There were no mortalities from chemical and contact burns. The average TBSA among survivors was 16.1%, while among the dead was 55.8%.

The patients who were discharged home were 66.6% of the total, and others were transferred to other facilities for further care. The outcome of acute burns and the prediction of survival using the ABSI score is shown in Table 3. The mean ABSI among survivors was 4.7 while that for mortality was 9.8. The pattern of severity using the ABSI score is shown in Figure 5.

Discussion

The pattern of burn injuries have changed in some respects and unchanged in others, over the last 14 years compared to previous reports [6,7].

The ratio of males to females has remained unchanged at 1.7:1 to 1.8:1, flame burns remains the highest cause but is slightly lower than in the past. The average total body surface area burned has increased from 25.4 in 1997 and 25% in 2004 to 27.2%. The frequency of electrical burn injuries has increased from 0.7% to 1.5% of total to 6% of patients with burns. The mean age of burn injuries is also

higher from 19.5 years and median age of 18.5 years to 24.2 years. Scald injuries which constituted 40.5% of cases have reduced to 33%. The overall mortality which was 21.8% in 1997 but increased to 30.9% in 2004 is now 25.2% and could be considered an improvement. A survival rate of 66.6% is less than the 69% previously reported as 8.1% were either referred to other facilities for further care or discharged themselves from our care and their eventual outcome could not be ascertained.

Chemical burns have remained few and far between but the practice of deliberate burn for patients with febrile convulsion appears to be on the decline as shown in Figure 4. This practice which was observed to be common in many parts of the country may be on the decline due to improving public health awareness [8].

The severity of burn injuries at the center also appears to be on the increase along with an upsurge observed around the year 2011. These are probably due to increased incidence of burns observed during periods of premium motor spirit scarcity, with attendant poor safety precautions at such times. The more severe burns are also presented to the center which is a tertiary health facility while burns of less severity may be managed at other primary and secondary health facilities. This may account for the higher mortality seen in the study.

The prediction of mortality from burns continues to be of interest and the validation of the ABSI is presented in this study. The ideal formula for the prediction of mortality from burns should be simple; based on a minimal set of easily obtainable variables [9]. Various scores have been in use over the years [10]. The Burn Index, which is the sum of the total full thickness TBSA and half of the partial thickness TBSA is well known [2].

The Baux score which is the patient’s age in years plus the percentage of the Body-Surface Area (BSA) burned is easy to remember and is useful for early outcomes assessment but said to have various limitations regarding long-term survival or mortality prediction [11,12]. It is widely accepted and was regarded as a landmark scoring system in the field of burn research in the United States of America [13].

The Prognostic Burn Index (PBI), is as a combination of the burn index and the age of the patient (in years). It is argued to be more pathophysiologically adequate than the Baux score [14], in addition to it’s being simple to calculate; this has led to its popularity in Asia. It shares some similarity in the positive prediction of in-hospital mortality with the ABSI score [15]. Other prognostic scoring systems have been developed for burns, when compared with the Baux score

Table 3: Outcome of patients and ABSI score prediction.

ABSI SCORE PREDICTION									
ABSI	Threat to Life	Expected Percentage of survival (%)	Frequency	Outcome/Survival (%)	Death	Discharged	Discharged against medical advice	Referral	predictive value
2 - 3	Very low	≥ 99	87	85/87 (97.7)	2	78	5	2	98.60%
4 - 5	Moderate	98	130	126/130 (96.9)	4	118	5	3	98.80%
6 - 7	Moderately Severe	80 - 90	80	66/80 (82.5)	14	59	4	3	100%
8 - 9	Serious	50 - 70	51	20/51 (39.2)	31	16	1	3	100%
10 - 11	Severe	20 - 40	34	12/34 (35.2)	22	6	1	5	100%
>12	Maximum	≤ 10	34	2/34 (5.9)	32	0	0	2	100%
Total Percent (%)			416 (100)		105 (25.2)	277 (66.6)	16 (3.8)	18 (4.3)	

Table 4: Abbreviated Burn Severity Index (ABSI).

Parameter	Finding	Points
Sex	Female	1
	Male	0
Age (Years)	0 - 20	1
	21 - 40	2
	41 - 60	3
	61 - 80	4
	81 - 100	5
Presence of inhalational Injury	Yes	1
	No	0
Presence of Full Thickness Burn	Yes	1
	No	0
BSA Burn (%)	1 - 10	1
	11 - 20	2
	21 - 30	3
	31 - 40	4
	41 - 50	5
	51 - 60	6
	61 - 70	7
	71 - 80	8
	81 - 90	9
	91 - 100	10

and the Prognostic Burn index (PBI), and some have been argued to have a better predictive value than the Baux score [2,9,16-19].

The Abbreviated Burn Severity Index (ABSI) has been used for decades in early and long term survival or mortality prediction [20]. The criteria for evaluation are shown in Table 4. The total score and the corresponding threat to life as well as its value as a good predictor of outcomes is shown in this study Table 3.

Evaluation of burn severity in clinical practice should be quick, simple, practical and easy to interpret [13]. A good clinical judgment is still essential in mortality prediction and mathematical scoring should not be taken in isolation.

In this study, individual factors that were responsible for mortality include age, percentage of the TBSA, presence of inhalation injury and the presence of full thickness burn (P<0.05).

Conclusion

There is increasing incidence of electrical burn injuries, as well as in severity of burns. Most burns continue to occur in the younger age group. The comparative relative frequency of burns across gender is unchanged. The Abbreviated Burn Severity Index (ABSI) score is a good predictor of the outcome of patients with acute burns and its use is recommend.

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