



# Characteristics and Outcome of Trauma Patients in a Mixed ICU: A Retrospective Review

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## Abstract

**Background:** Trauma is a major public health challenge in Nigeria and many victims of trauma are brought to the hospital critically ill, thereby increasing the burden of critical illness in the country. **Aim:** To characterize the pattern of injuries, causes and outcome among trauma patients admitted into the general ICU of a tertiary care hospital in north-central Nigeria. **Materials and Methods:** All trauma admissions into the ICU of Jos University Teaching Hospital over a 14-year period were retrospectively reviewed. Information obtained included the patients' demographics, diagnosis, aetiology, complications, interventions, outcome and length of stay in the ICU. **Results:** Trauma admission during the period was 396 which was 29.66% of total ICU admissions in the same period. The male:female ratio was 3:1 and the age range was 2 months to 75 years (median 25 years). 78.54% of trauma admissions were from the accident and emergency, 15.66% from the theatre and 5.80% from the ward. The most common cause of injury was burn 160 (40.40%), followed by road traffic crashes 152 (38.38%) and the least common cause of injury was gunshot 28 (7.07%). Mortality rate among trauma patients was 48.74% while mortality in the ICU within the same period was 34.08%. Burns accounted for 50.78% of deaths while head injury accounted for 33.68% of deaths. Mortality was higher in the age groups 16 - 30 years and greater than 45 years ( $p = 0.03$ ). **Conclusion:** Trauma constitutes a significant cause of admission into our general ICU and mortality in these patients is higher than in the general population of ICU patients. Establishing trauma ICU would lead to streamlining of facilities which could improve outcome.

## Keywords

Trauma Admissions, General ICU, Outcome

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## Subject Areas: Emergency & Critical Care

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### 1. Introduction

Trauma is a major public health challenge and a leading cause of deaths, morbidity and disability in Nigeria and most parts of the developing world. Motor vehicular crashes are a major cause of trauma in these countries. While developing countries are said to account for 48% of motorized vehicles, they account for 91% of fatalities due to road traffic crashes per annum [1]. It is estimated that if this trend is not reversed, trauma due to road traffic crashes is set to rank among the top three causes of Disability Adjusted Life Years (DALYS) lost in the next 15 years. Nigeria is said to have the third highest number of deaths yearly from road traffic accidents in the world and the highest in Africa [2]. However, Nigeria is also faced with other causes of injuries like armed conflicts that are prevalent in the north and petroleum pipeline explosions that keep recurring in the south.

Many of the victims of these road traffic crashes are brought to the hospital critically ill, thereby increasing the burden of critical illness in the country. This is despite other factors like urbanization, emerging epidemics and increasing access to hospitals which are also increasing the burden of critical illness in many developing countries [3]-[5]. Trauma centres and trauma intensive care are not common practice in Nigeria and critically ill trauma patients have to compete with other critically ill patients for intensive care beds in mixed ICUs. This is against the backdrop of increasing mortalities of severely injured patients in the ICU [6] [7].

Although there are increasing attempts at trauma data keeping such as the Jos University Teaching Hospital trauma registry, it is necessary for centres that manage critically ill trauma patients to highlight their experiences. The primary objective of this study is to characterize the pattern of injuries, causes and outcome among trauma patients admitted into the general ICU of a tertiary care hospital in north-central Nigeria.

### 2. Materials and Methods

Approval for the study was obtained from the hospital ethics committee and all trauma admissions into the intensive care unit of Jos University Teaching Hospital from 1<sup>st</sup> January, 1994 to 31<sup>st</sup> December, 2007 *i.e.* over a 14 year period formed the population for this study. Jos is a city located in north-central Nigeria.

The hospital has a 500 bed capacity with a general intensive care unit that has six beds. The ICU admits patients from various specialties including medicine, surgery and obstetrics and gynaecology. It is managed by consultant anaesthetists, residents and doctors in the various specialties and manned by trained ICU nurses.

Data were obtained from the ICU records and patient case files. These were retrospectively reviewed. Information obtained included the patients' demographics, diagnosis, aetiology, complications, interventions, outcomes and length of stay in the ICU. Case files that were missing or without adequate records were not included in the study.

Data were analyzed using Epi info version 7 statistical package. The categorical data were presented as percentage while the continuous data were presented as mean and standard deviation. Student t-test was used to compare categorical data while Mann-Whitney test was used to compare continuous data. Statistical significance was defined as a p value <0.05.

### 3. Results

There were 1335 admissions in the ICU during the period of study out of which 422 were as a result of trauma but 396 of these had adequate records and were analyzed. This was 29.66% of the total ICU admissions. There were 297 (75%) males and 99 (25%) females with a male to female ratio of 3:1. The male to female ratio for the total ICU admissions during the same period was 1.1:1. The age range was from 2 months to 75 years with a mean age of  $26.9 \pm 16.4$  years (median 25 years). Of the admissions 311 (78.54%) were from accident and emergency while 62 (15.66%) were from the theatre and 23 (5.80%) from the ward and 381 (96.20%) of admissions were emergencies (Table 1).

The most common cause of injury was burn 160 (40.40%) followed by road traffic accident (RTA) 152 (38.38%) and the least common cause of injury was gunshot 28 (7.07%) (Table 2). 83 (54.52%) of the RTAs were motorcycle related while 69 (45.48%) were due to motor vehicular crashes.

**Table 1.** Demographic and clinical characteristics of ICU trauma admissions.

Variable	Trauma admissions	Total admissions
Number [n(%)]	396 (29.66)	1335 (100)
Sex (male:female ratio)	3:1	1.1:1
Age (years)		
mean/media	26.9 ± 16.4/25	29 ± 19.7/27
Modal		
LOS in ICU [n(%)]		
<3 days	137 (34.60)	631 (47.26)
≥3 days	259 (65.40)	704 (52.74)
Source of admission [n(%)]		
A & E	311 (78.54)	418 (31.28)
Theatre	62 (15.66)	604 (45.25)
Wards	23 (5.80)	283 (21.22)
Other hospitals	-	30 (2.25)
Type of admission [n(%)]		
Emergency	381 (96.200)	845 (63.32)
Elective	15 (3.80)	490 (36.68)
Mortality (%)	193 (48.74)	455 (34.08)

Keys: LOS = Length of stay; A & E = Accident and Emergency.

**Table 2.** Causes of trauma.

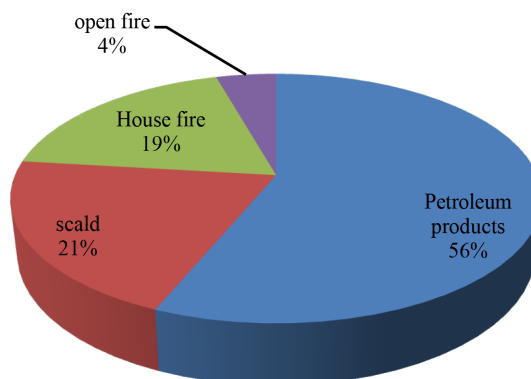
Cause of injury	Frequency	Percentage
Burns	160	40.40
Road traffic accidents	152	38.38
Assaults & Conflicts	52	13.13
Gunshots	23	5.82
Others	9	2.27

**Figure 1** shows the causes of burn in the patients. Petroleum product explosions and scald were the most common causes of burn in 90 (56.25%) and 33 (20.63%) of patients respectively.

Isolated injuries occurred in 270 (68.18%) patients while multiple injuries occurred in 126 (31.82%) patients. The most common site of injury was the head and neck in 302 (76.25%) followed by abdominal injuries in 107 (27.02%) and musculoskeletal in 78 (19.70%) patients (**Table 3**). The most common type of injury was soft tissue injuries followed by burn and craniocerebral injuries with 372 (93.93%), 160 (40.40%) and 121 (30.55%) of patients affected respectively (**Figure 2**).

The length of stay (LOS) was from a few hours to 49 days with a medium LOS of 7 days. Sixty three (15.91%) had a LOS of less than one day and 297 (75%) of patients had a LOS of less than 7 days (**Table 4**).

Of the 396 patients admitted, 193 died giving a mortality rate of 48.74% while 203 (51.26%) were transferred out of the ICU alive. Mortality rate in the ICU during the same period was 34.08%. Of the deaths, 71.50% occurred in males but was not significantly different from the mortality in the female population. Burn contributed 50.78% of the deaths while head injury contributed 33.68%. Mortality in the age ranges 16 - 30 years and greater



**Figure 1.** Causes of burn.

**Table 3.** Sites of injury.

Site of injury	Frequency (n = 396)	Percentage (%)
Head & neck	302	76.25
Abdominal	107	27.02
Chest	63	15.90
Spine	7	1.77
Musculoskeletal	78	19.70
Pelvis	5	1.26

**Table 4.** Length of stay among trauma patients in the ICU.

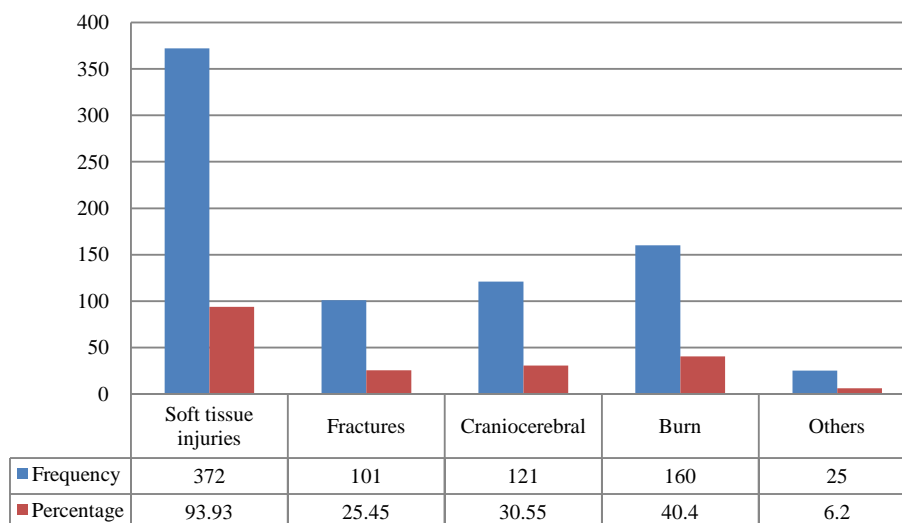
Length of stay (Days)	Frequency (n = 396)	Percentage
<1	63	15.91
1 - 7	234	59.09
8 - 14	55	13.89
15 - 21	25	6.31
>21	19	4.80

than 45 years was higher than the general mortality ( $p = 0.03$ ). Mortality was also higher in patients with LOS  $\leq$  7 days ( $p = 0.00$ ) (**Table 5**).

#### 4. Discussion

We discovered an ICU admission rate of 29.66% among trauma patients with a mean age of  $29.9 \pm 16$  years. The most common causes of injuries were burn and road traffic accident and the median length of stay was 7 days.

Trauma admission rates in general ICUs from previous studies in our nation vary considerably with reports ranging from 20% to 68% [6]-[8]. It is known that location of health facilities as regards proximity to major motor ways usually influence the rate of trauma admissions in these facilities. This may among other factors account for the sharp differences in the rates of trauma admissions we see in our ICUs across the country. The male preponderance in our study like in most other studies is probably due to the fact that males are most likely to engage in high risk activities. Our trauma patients were also young. They were generally younger than patients in the study by Olajumoke *et al.* [7], and Adenekan & Faponle [8] in Nigeria but comparable to the patients in the studies by Chalya *et al.* [9] in Tanzania.



**Figure 2.** Types of injury.

**Table 5.** Variables of trauma patients admitted into the ICU indicating outcome mortality.

Variable	Outcome	
	Survivor (n = 203)	Non-survivor (n = 193)
<b>Sex [n(%)]</b>		
Male	159 (78.33)	138 (71.50)
Female	44 (21.67)	55 (28.50)
<b>Diagnosis [n(%)]</b>		
Burn	62 (30.54)	98 (50.78)
Head injury	56 (27.59)	65 (33.68)
Abdominal trauma	15 (7.39)	4 (2.07)
Chest trauma	18 (8.87)	5 (2.59)
Polytrauma	47 (23.15)	19 (9.84)
Spine trauma	5 (2.46)	2 (1.04)
<b>Age ranges in years [n(%)]</b>		
0 - 1	10 (4.93)	8 (4.15)
2 - 15	47 (23.15)	31 (16.06)
16 - 30	76 (37.44)	98 (50.78)*
31 - 45	44 (21.67)	29 (15.03)
>45	26 (12.81)	27 (13.99)*
<b>LOS in days [n(%)]</b>		
0 - 7	130 (64.04)	167 (86.53)*
8 - 14	34 (16.75)	21 (10.88)
≥15	39 (19.21)	5 (2.59)

Key \* =  $p < 0.05$ , LOS = Length of stay.

Unlike other studies from Nigeria within the same period which had most of their trauma admissions in the ICU being due to road traffic accident [6]-[8], majority of our trauma ICU admissions were due to burn. This though may not be a reflection of the proportion of trauma patients in the hospital generally because only the severe cases are admitted into the ICU. Majority of the burn cases in our series resulted from poor handling of petroleum products, some of the products were adulterated. A lot of people were storing petroleum products in residential places due to scarcity that was recurring and many of the victims were also dealers in the products in the black market who sold the products in jerry cans and gallons and also stored them in their residence. A previous study from the same centre on burn patients in the ICU made a similar observation with this study on the most common cause of burns [10]. Since the hospital did not have a burns unit most patients who could not be managed in the ward were admitted into the ICU. Like in findings from other ICUs in the country [6]-[8], and in other parts of Africa and the world road traffic accidents (RTAs) was a major cause of injury among our patients [9] [13]. Also like in previous studies from the same centre [11] [12] and from another study from Tanzania [9] and in parts of Asia [14], a high proportion of the RTAs were due to motorcycle crashes. Following the outlawing of motorcycles as a means of public transport in some parts of the state some years ago this pattern may have changed but RTAs still constitute a major reason for trauma admissions into our ICU.

Head injury was the most common reason for admission resulting from RTA. This was similar to findings from within and outside our region [7]-[9] [13]. The failure of authorities concerned to enforce the use of crash helmets by motorcycle riders is probably a factor in the high number of head injuries seen in our series and those from other developing nations. It must be said that this pattern of trauma admission in the ICU does not necessarily represent the general population of trauma patients in the hospital since only the severely injured were admitted into the ICU. Indeed previous studies involving trauma patients in our centre and from other hospitals in our region have found lacerations and fractures of the limbs as the most common forms of injuries presenting at the emergency departments [11] [15]-[18].

Mortality in our study was lower than that found in some ICUs in our country [8], but higher than reports from other ICUs within Africa and other parts of the world [9] [19] [20]. The high level of mortality in our study could be attributed to the low level of facilities and qualified personnel in our ICU. At the time of this study our ICU had only one ventilator which meant that some patients who required mechanical ventilation were denied this service. This inadequacy was also true for many other facilities both diagnostic and therapeutic in the ICU. Since injury scores were not generally applied in our patients we were not able to compare the severity of injury in our patients with patients in other ICUs. Mortality among trauma patients was higher than the overall mortality among ICU patients during the period. There is no dedicated trauma ICU in Jos University Teaching Hospital and as such all critically ill trauma patients are cared for in the general ICU. It is still debatable whether trauma patients do better in trauma ICUs compared to general ICUs. The study by Duane *et al.* [20] suggests that severely injured patients do better when managed in trauma ICUs. The study also stressed the importance of qualified, experienced personnel above location in the less severely injured patients.

Most of our patients had a length of stay (LOS) of 7 days and below and in agreement with other studies, survivors had a longer LOS [7]-[9]. A possible reason why many of our patients died early was due to lack of pre-hospital care and ambulance services. Often victims were transported to hospitals under suboptimal conditions and resuscitation and care only started when they arrived alive in the hospital thereby losing precious time.

Our study found a bimodal pattern of deaths with regards to age. The high mortality within the age range 16 - 30 years may be attributed to the severity of injury among this group while the high mortality that occurred after 45 years may be due to the high level of co-morbidity in this age group.

## 5. Limitations

There are several scoring systems applied in trauma patients which could predict outcome in these patients. They were not applied in our patients except for Glasgow coma scale in patients with head injury. Their application would have given us the opportunity to compare predicted outcomes with observed outcomes. Also being a retrospective study some missing data precluded some patients from being part of the analysis for this study.

## 6. Conclusion

Trauma constitutes a significant cause of admissions into the general ICU and mortality in these patients is much higher than in the general population of ICU patients. Improved pre-hospital care and ambulance services would

ensure the victims arrive hospitals earlier and in better conditions while better facilities in the hospitals and ICUs would ensure better in-hospital care. Establishing trauma ICUs would lead to stream lining of facilities which could improve outcome.

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