

The Pattern and Outcome of Severe Trauma from a Dedicated Trauma Centre in Nigeria: An Observational Study

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Abstract

Background: Trauma is a leading cause of mortality and a major contributor to disability in various parts of the world. The pattern of trauma and outcome of trauma differ in various parts of the world. Despite that the Trauma burden in the country is high and there are limited published studies on the pattern and outcome of severe trauma in Nigeria presently.

Aim: To evaluate the pattern and outcome of severe trauma at dedicated regional trauma centre in Port Harcourt, Nigeria.

Method: Data of patients presenting with severe trauma between January 1, 2007 and December 31, 2007 at the hospital was collated and analysed. Trauma demographics, type of care and the outcome of care of the recruited patients was evaluated and presented as descriptive statistics.

Result: Seven hundred and sixty two patients were seen with severe trauma but data of 746 patients had enough information was analysed. These represents 12.3% of the total number of patients with trauma seen at the hospital (n = 6180). Most of the patients with severe trauma seen at the centre were males with a mean age \pm standard deviation, 28.5 ± 11.3 years. Road traffic collision was the commonest cause of injury (41.2%) but gunshot wounds contributed a sizable number of the injuries (36.7%). The median Injury Severity Score (ISS) was 20 (range = 16 – 75) while the mean Revised Trauma Score (RTS) \pm SD was 7.1 ± 1.3 . Mortality among patients with severe trauma was 90 (12.1%). Three hundred and forty two patients (45.1%) had satisfactory and good outcome whereas 260 patients (34.9%) had fair and poor outcome. Some patient (n=24 {3.2%}) discharged themselves from the hospital against medical advice, Head injury was the highest contributor to mortality

Conclusion: Trauma burden is an identified problem in Port Harcourt Nigeria. Road traffic crashes and gunshot wounds were the highest contributor of severe trauma at the centre. Severe trauma constitutes only 12% of trauma cases seen at the centre and mortality from severe trauma was 12%.

Keywords: Trauma, Severe Trauma, Trauma Pattern, Outcome, Nigeria

INTRODUCTION

Trauma is one of the leading causes of death in patients below the age of 45 years (Krug et al 2000, Hetzel 2001, Hall et al 2001). It has been projected that mortality from trauma will rise in the global burden of disease ratings in the years to come WHO (2004). In the developing world, whereas infectious diseases and malnutrition currently contribute to high mortality, the mortality and disability arising from trauma appears to be neglected Penden et al (2004). Trauma has been described as a neglected disease of modern society National Committees on Trauma and Shock (1966), Gwinnutt (2001) with a reported mortality of 7% to 45 % for the severely injured Baxt and Moody (1987), Chawda et al (2004). Even terror groups have identified and adopted various forms of trauma as serious weapons of terror across the globe. Trauma prevention and remediation strategies now forms pivot of most government policies in different nations.

Whereas in most developed world, the burden of trauma has been identified and given appropriate attention both in prevention and in the remediation of trauma incidents, the experience from most developing countries is far from been the same [Mock et al (1998). The trauma burden in most developing countries is often underestimated as such little emphases are placed towards preventing and remediating effects of trauma. Levels of trauma preparedness appear to correlate positively with the levels of development of most nations WHOI (2008) Paniker et al (2015). The reason for this attention may be related to the devastating effects trauma has on the work force of most nations.

One of the initial steps in the prevention of trauma is identifying the actual trauma burden and pattern of trauma in the region. Identification of resources available for treating trauma and outcome of trauma in any locality and region helps in planning for trauma prevention and remediation of devastating effects of trauma.

The aim of this study is to evaluate the pattern of presentation of severe trauma, treatment given and outcome of care given to severely injured patients in a dedicated regional trauma centre in Port Harcourt, Nigeria.

METHODOLOGY

STUDY DESIGN

Retrospective evaluation of the pattern of presentation, care given and outcome of patients with severe trauma at Teme Hospital, a regional Trauma centre in, Nigeria was undertaken. The Hospital is an 85 bed centre dedicated to only management of injuries only. Non-trauma cases were not accepted at the centre which was supported by funding from an International NGO dedicated to saving lives of injured victims. Patients were treated free of charge for services provided at the centre. The centre had full trauma teams composed of national and international staff including trauma surgeons (Orthopaedic surgeons, General Surgeons), anaesthetists, nurses, radiographers, pharmacist, intensivists, medical record personnel who are non resident but on 24-hour call and received patients from all over Nigeria especially from South South region of the country.

The data used in this retrospective evaluation was sourced from the trauma registry prospectively developed by International Trauma Care and Development (ICAMCAD) from January 1, 2007 to December 31, 2007. Severe injury was defined as Injury Severity Score (ISS) higher than 15. Baker et al (1974).

INCLUSION CRITERIA: Data from all patients admitted during the period under evaluation with ISS higher than 15 was collated.)

EXCLUSION: Cases with missing data and those with ISS below 15.

OUTCOME ASSESSMENT: Outcome was categorised as having satisfactory and good outcome if the patient survived the injury, soft tissue wounds healed within 4 weeks of injury, associated fracture healed or reached advanced stage of healing at 6 months after injury and there was no complications. Outcome was categorised as fair if the soft tissue wounds healed between 4 weeks and 3 months after the injury, associated fracture healed after 6 months but before 1 year of injury or there was some complications which healed with minimal treatment not requiring readmission or repeat surgery. Outcome was categorised as poor if the soft tissue wound was not healed after 3 months or fracture failed to heal after 1 year or ended as non-union and any other complication requiring re-operation or readmission. Outcome was categorised as fatal if the patient died from direct consequences of the primary injury or complications of the injury.

STATISTICS: Power calculation was undertaken to determine the appropriate sample size required to identify statistical significant differences, at a Confidence level of 95%, alpha of 0.05 and (+/- 5) Confidence Interval (CI), using the National Statistical Service statistical software freely available online. The sample size of 462 was determined as adequate. Severe injury is defined as ISS greater than 15. The Injury Severity Score (ISS) of each patient was calculated based on the pattern described by Baker et al Baker et al (1974) from the Abbreviated Injury Score (AIS) recorded of the three body regions with the most severe injury (American Association for Automotive Medicine, 1990). Descriptive statistics was generated using frequency distribution tables, cross tabulations, and scientific figures as considered appropriate. Averages such as mean with corresponding standard deviation, median and inter quartile range were used to present continuous variables while categorical variables were presented as proportions and percentages used to Observed differences were tested for statistical significance using X^2 for categorical variables and Student's t test to compare means of numerical and interval scale variables.

RESULTS

The result shows that between 1st January 2007 and 31st December 2007, a total of 762 patients with ISS, 16 and above were seen at the Hospital. This figure represents 12.3% of the total number of patients with trauma seen at the hospital (n = 6180) and 36.3% (n= 2100) of the patients that required hospitalisation because of the severity of their injury. Of the identified cases, 14 patients had incomplete data required to calculate of ISS or RTS which are used to determine the severity of injury. Such patients with incomplete data were excluded from outcome analysis. Seven hundred and forty six cases were analysed and the result presented.

Age distribution

The bulk of the patients were in the age range of 21years to 30 years (51.6%), followed by those between the ages of 31years and 40 years. The extremes of age were the least affected. The Mean age \pm SD was 28.5 years \pm 11.3 years. The median age was 27 while the age of the patients ranged from 2 years to 95 years (table1)

TABLE 1. Age distribution

AGE RANGE	Frequency	%
0-10 years	27	3.6
11-20 years	110	14.7
21-30 years	385	51.6
31-40 years	137	18.4
41-50 years	57	7.6
51 years and above	30	4.0
Total	746	100.0

$X^2 = 212.179$, $P < 0.00001$

Gender distribution

The majority of the patients were males (n= 632 {84.7%}), while females were (n=114{15.3%}). The male to female ratio is 5.5:1.

Cause of injury

Majority of the injuries were caused by road traffic crashes (RTC) (n=307{41.2%}), this is followed closely by gunshot injuries (GSI) (n = 274{36.7%}). Injuries from assault constituted 12.5% of the cases (n = 93), while injuries from falls and domestic accidents were seen in 25(3.4%) and 23(3.1%) respectively (table 2).

Table 2.Cause of injury

CAUSE	nos	%
Assault	93	12.5
Blast	8	1.1
Boat accident	3	0.4
Burns	5	0.7
Domestic accident	23	3.1
Fall	25	3.4
GSW	274	36.7
Industrial accident	8	1.1
RTC	307	41.2
Total	746	100.0

$X^2 = 246.7$, $P < 0.00001$

Distribution of Injury severity Score (ISS)

The mean injury severity score was 23.6 ± 10.5 , while the median ISS was 20 with a range between 16 and 75. The distribution of the ISS shows that most of the patients had ISS between 16 and 25 (n = 587 {78.7%}) and RTS higher than 7.0 (528 {70.7}). Only 21.3% had ISS higher than 25 of which 5% (n = 36) had ISS higher than 45 whereas only 73 patients has RTS lower than 5.0 (table 4).

Table 4. Distribution of Injury Severity Score & Revised Trauma Score (RTS)

ISS Range	Nos	%	RTS Range	Nos	%
16 to 25	587	78.7	0 – 5.0	73	9.8
25 to 35	78	10.5	5.0 – 6.0	46	6.2
36 to 45	45	6.0	6.0 – 7.0	99	12.2
Greater than 45	36	4.8	Above 7.0	528	70.7
Total	746	100.0	Total	746	100

Types of injury

Four hundred and thirty two injuries (57.9%) resulted from blunt mechanism while 314 injuries (42.1%) were caused by penetrating mechanism. The (mean \pm SD) of ISS for blunt trauma was (23.8 ± 10.7) while that for penetrating injuries was (23.7 ± 10.9) ($p > 0.05$). The median ISS for both blunt trauma and penetrating injuries was the same (20).

Definitive intervention given

Wound care by way of debridement and later wound cover was the definitive intervention given in majority of the cases (n= 171). Exploratory laparotomy was done in 101 patients while skeletal stabilisation by external fixation (EXFIX) (n= 53), open reduction and internal fixation (ORIF) (n = 68), traction (n= 28) or by manipulation under anaesthesia and casting (MUA and POP) (n= 41) (table 5). Most of the patients had multiple interventions as a result of multiple injuries.

Table 5. Definitive intervention given

Definitive intervention	Frequency
Amputation	28
Chest Drain	45
Exploratory laparotomy	101
External Fixation	53
ORIF	68
MUA + POP	41
Traction	28
Wound care	171
Nursing care	108
Others	122

Most of the patients had multiple interventions.

Outcome of care assessed by the condition of the patients at time of discharge

Three hundred and forty two percent of the patients (45.8 %) had good or satisfactory outcome as at the time of discharge from the hospital or the fracture clinic. Ninety patients (12.4%) died in the hospital while 55 patients (7.4%) had poor result at discharge from the hospital. Twenty four patients (3.2%) of the patients were discharged from the hospital against medical advice, whereas 4 patients absconded from hospital while receiving treatment (table 6).

Table 6. Condition of patient at discharge.

Condition	nos	%
Absconded	4	0.5
DAMA*	24	3.2
Fair	205	27.5
Good	342	45.8
Poor	55	7.4
Transferred	26	3.5
Dead	90	12.1
Total	746	100.0

*DAMA (Discharge against medical advice)

Mortality and body location of main injury

Head injury was the highest contributor to overall mortality (4.2%) and presented the highest case fatality rate (18%). Injuries to the extremity contributed 3.6% of the overall mortality and 9.3% of case fatality. There was no mortality recorded from injuries to the face (Table 7).

Table7. Relationship between body location and mortality

Body location of main injury	Nos	Case fatality (%)	% All mortality
Head and Neck	172	31 (18.0)	4.2
Face	25	0 (0)	0
Chest	101	13 (12.9)	1.7
Abdomen	124	14 (11.3)	1.9
Extremity	291	27 (9.3)	3.6
External	33	5 (15.2)	1.0
Total	746	90	12.4

$\chi^2=13.903$

$P = 0.076.$

DISCUSSION

Trauma is a leading cause of death among people aged below 45 years worldwide [2] [3]. A sizable proportion of persons that survive the trauma event are left disabled from poorly treated or non treated injuries Yates et al (1992)

Hall et al (2000). These survivors contribute to the high levels of Disability Adjusted Life Years lost to injury and disease (DALYs) seen in developing countries Mathers & Loncar (2006). This study showed that a total of 6180 patients were seen with significant injuries at the hospital during the period under study, with 2100 requiring admissions giving an average of 6 admissions per day. This number can be considered high and busy for an 85-bed district facility which may at best qualifies as Americans College of Surgeons (ACS) level II trauma centre ACS (1998). The American College of Surgeons criteria for designation of Level 1 trauma centre include having trauma admissions of greater 1200 per annum and having up to 240 admissions of severe injuries measured by ISS higher than 15 per annum ACS (1998). The centre where this study was undertaken meets and

surpasses both criteria.

Amongst the admitted patients, seven hundred and sixty two (762) patients (12.3%) who were recruited for the study had ISS greater than 15. This figure is similar to the 17% reported by Yates et al (1992) of patients with trauma had ISS more than 15 in the UK MTOS. A later report by Christensen et al (2008) confirmed that 33% of patients with blunt trauma in England and Wales had ISS more than 16. The finding in this study corroborates the findings of earlier studies from Nigeria (Obalum et al 2008, Enweluzo et al 2008, Thanni 2011). Although the reported figures from the various quoted studies indicate that severe injury, defined by ISS higher 15 constitute minor fraction of the injuries at most centres, but they contribute the greatest mortality amongst patients with trauma (Champion et al 2011, Christensen et al 2008, ACS 2005). This justifies preparedness for severe injuries in terms of the provision of resources and funding if mortality from such injuries can be reversed.

The age and gender distribution of the patients in this study are similar to the results published from other studies (Champion et al 2011, Murlidhar & Roy 2004, Rabbani & Moini 2007, Zafar et al 2002). Specifically, the mean age incidence of 28years \pm 11.3 years observed in this study is similar to that from other developing countries such as 31 years in India Murlidhar & Roy (2004), 28years in Iran Rabbani & Moini (2007), 33 years in Pakistan Zafar et al (2002) and 31 years observed in Kenya by Odero Odero (1995). Obalum et al Obalum et al (2008) had observed a mean age incidence of 32.2 years from Nigeria while Sholagberu et al (2003) had observed a mean age incidence of 36.3years for trauma deaths in Nigeria. This confirms that trauma is a disease of active young male below the age of 45 who are the workforce of any economy Peden et al (2002). The impact of severe trauma in various national economy measured by its effect on the Gross National Income (GNI) can be huge The World Bank (2014), WHO (2012).

Road Traffic Crashes was the commonest cause of injury observed in this study ($n = \{41.2\%$ }), followed closely by gunshot injuries ($n = \{36.7\%$). Traffic related injury was the commonest injury reported in most studies (Champion et al 1990, Murlidhar & Roy 2004, Zafar et al 2002, Sholagberu et al 2003, Enweluzo et al 2008, Thanni 2011). Motorcyclist engaging in commercial transportation locally called *Okada riders*, who often do not have any formal training on the skill of motorcycle riding contributed to a sizable number of injuries. Christensen et al (2008) in their report noted that falls was the commonest cause of blunt injury (50%) in England & Wales and this was trailed distantly by road traffic collisions (33%). The role of road traffic crashes in the aetiology of severe injuries in this and many other studies in the region may not be unconnected to the increasing number of vehicles on the roads, poor road networks, inadequate road safety legislation Agbonkhese et al (2013), inappropriate behaviours of various road users in the region Eke et al (2000) as well as increasing use of intoxicants by young road users Greaves et al (2000).

Most of the recorded injuries were caused by blunt mechanisms (57.9%). This is a common finding from other studies (Thanni 2011, Champion et al 1990, Murlidhar & Roy 2004, Sholagberu et al 2003). The incidence of penetrating injury in this study appears quiet high as compared to the figures of 21% reported from the MTOS (US) Champion et al (2011), 26% reported from Pakistan Zafar et al (2002) and that reported by Christensen and his colleagues when they evaluated the penetrating injury in England and Wales Christensen et al (2008 B). These penetrating injuries in this study are mainly results of the high number of GSI recorded among the patients. The role of GSI as a major cause of severe injury in this study is worth noting, the observed figure of 36.7% appears to be among the highest reported in most series in a country not involved in a war. This figure is different from those from earlier reports from Nigeria (Sholagberu et al 2003). The reason for this changing pattern may be related to the upsurge in the incidence in militancy and armed agitation recorded in the Niger Delta, Nigeria where this study was undertaken during the period of this study. Apart from GSI, assaults by stabbing were also a key contributor to the number of penetrating injuries recorded. This is contrary to the observation by Christensen et al (2008 B), in which 78% of the penetration injuries were due to stabbings whereas GSI accounted for only 19% of the injuries. The observed difference in pattern in the aetiology of penetrating injuries between the UK and Nigeria may be related to stricter firearm regulation and control between the two countries.

There was no significant difference in the severity of injury and the observed mortality between patients with blunt injuries and those with penetrating injuries ($p > 0.05$). This differs from the pattern observed by O'Mullane et al (2009) in Victoria, Australia. This observation may be due to the fact that there was no statistical difference in the severity of injuries between the patients with blunt and penetrating mechanism of injury (mean \pm SD of ISS) for blunt trauma (23.8 ± 10.7) and for penetrating injuries (23.7 ± 10.9) ($p > 0.05$). The median ISS for both blunt trauma and penetrating injuries was the same (20). The mean ISS \pm SD of 23.6 ± 10.5 for all patients and the median ISS of 20 with range of 16 to 75 indicates that the bulk of the patients had moderately severe injuries which may not be life threatening. The ISS distribution is similar to that observed in earlier studies from Nigeria (Sholagberu 2003, Thanni (2011) and that from France Orliaguet et al (2001).

The stratification of the ISS groups into (16 – 25), (26 – 35), (36 – 45) and above 45 was to generate categories for ease of statistical calculations, since there is no universally accepted definitive grouping of ISS scores higher than 16 at the moment Stevenson et al (2001).

The most common treatment given to the patients was related to treatment of skeletal fractures by various operative and non operative methods (n=190). This was followed by wound care (n=171). This is not surprising as majority of the injuries involved the musculo-skeletal system. This is similar to the report by Christensen and colleagues (2008) confirming that 47% of their patients with blunt injuries had fracture fixation as the most type of treatment given.

The outcome of treatment show that the crude mortality among patients with severe injury in the centre was 12.1% (n = 90). The mortality reported by Christensen et al (2008), (2008B) were 8% and 7% for penetrating injuries and blunt injuries respectively. However, only 35% and 23% of the patients in the two studies by Christensen and colleagues had ISS higher than 16. Since 640 patients (84.5%) were discharged from admission from the facility within 4 weeks of presentation with almost 50% of the patient discharged during the first week of admission confirms that the quality of care in the centre may not be comparatively too different from that from the developed centres especially considering the limitations arising from the patterns of presentation of trauma and quality of trauma care in the region (Mock et al 1998). Christensen et al (2008 B) had reported a median hospital stay of 9 days and that reported in the MTOS study Champion et al (2011) but these studies included patients with ISS less than 16.

LIMITATION OF STUDY:

This is an observational study which was neither randomised nor blinded in any form as such there is limit to which strong conclusions can be drawn from its observations. However, the study serves to add to the body of knowledge on pattern severe trauma in a region associated with high trauma rate resulting from violence for control of natural resources and occasionally political power. The data upon which the study was undertaken may be considered dated but the considering it was collected about a decade ago. Since this was a retrospective study which tends to highlight the trauma pattern and care in a regional district hospital when the intervention was operational. The study will serve as a baseline for designing better and more current study on trauma pattern and care in the region especially as the pattern of violence in the region has persisted over the decade.

CONCLUSION

The burden of trauma is universal. Mortality and morbidity from trauma can be high especially if appropriate care is not provided. The pattern of severe injury seen at this regional trauma hospital is similar to the pattern observed in other parts of the world. Trauma is the disease of the active young male between the ages of 15 years and 40 years.

Severe injuries constituted about 12% of trauma and most resulted from road traffic related injuries. Gunshot injury was also a major contributor of severe trauma. Head injury was the highest contributor to trauma mortality in the study. The outcomes of trauma in this study compares well with those reported from other developing countries but inferior to the reports from studies from developed countries.

DECLARATIONS

The authors wish to categorically state that this manuscript, including related data, figures and tables has not been previously published and the manuscript is not under consideration elsewhere.

All the information contained in this manuscript are original except otherwise clearly stated and duly acknowledged.

Ethics approvals and consent to participate: Study was approved by the Research and Ethical Review Committee of International Centre for Advanced Medical Care and Development (ICAMCAD) who are the developers of the registry.

Consent for Publication: Not applicable

Funding: None

Conflicting interests: None

Authors' contributions: All the authors made substantial contributions in the study design, implementation and write up.

Acknowledgements

We acknowledge the Board and Management of International Centre for Advanced Medical Care and Development for allowing us access to the data from their trauma registry.

Dr Sydney Ibeanusi,

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