The profile of trauma-related mortality in Benue State University Teaching Hospital, Makurdi, Nigeria

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Abstract

Background: Trauma is globally associated with significant mortality with developing countries bearing a disproportionately high burden. This study aims to elucidate the pattern of trauma-related deaths in Benue State University teaching hospital (BSUTH), Makurdi, Nigeria.

Methods: A review of all trauma-related in-hospital deaths from July 2012 to December 2014 was carried out. Patients' socio-demographic and injury-related data were extracted and analyzed using IBM SPSS Statistics for Windows, Version 21.0.

Results: One thousand and nine trauma patients were attended to during the study period of which 87 (8.7%) died during the hospital stay. Eighty-five trauma-related deaths were included in the study comprising of 67 males (78.8%) and 18 females (21.2%). The predominant age group involved was 20-29 years. Road traffic injuries (RTI) were the leading cause of fatal injuries accounting for 76.5% of deaths (n=65). They were followed by burns (n=8, 9.4%) and gunshot injuries (n=6, 7.1%).. The locations of deaths within the hospital were the Accident and Emergency Department (A&E) (n=60, 70.6%), wards (n=18, 21.2%) and intensive care unit (n=, 7.4%). The main causes of death were traumatic brain injury (TBI) (n=60, 71.4%), exsanguination (n=8, 9.5%), chest injury (n=5, 6.0%) and multiple organ dysfunction syndrome (MODS); n=3, 3.6. Fifty-three patients (62.4%) died within the first 24 hours of arrival at the hospital (early deaths). Patients with TBI were more likely to die within 24 hours of admission than those who have stayed for more than 24 hours in the hospital. (p = 0.001).

Conclusions: Trauma-related mortality in BSUTH affected 20 - 39 year old males predominantly. Majority of lethal injuries were caused by road traffic accidents with traumatic brain injury being the leading cause of death.

Keywords: Trauma, Injury, Deaths, Pedestrians, Pediatric deaths

Highland Med Res J 2016;16(2):66-69

Introduction

Injuries account for a significant health burden on all populations regardless of age, sex, income, or geographical region[1]. They account for an estimated 16 000 deaths per day globally and for each death, there are dozens of hospitalizations, hundreds of visits to emergency rooms and thousands of medical appointments[1,2]. Worldwide, injuries cause approximately half of all mortalities among young males aged 10 to 24 years[3].

Developing countries bear the brunt of injuries. While global injury disability-adjusted life years (DALYs) lost rates declined significantly by 30.9% between 1990 and 2013, most low-income and middle-income countries showed a lesser decline or even an increase in DALYs rates[3]. Over the same period, global road traffic injuries DALYs rates decreased but still made the largest contribution to the global injury burden[3]. The World Health Organization reported that although low- and middle-income countries account for only 54% of the world's vehicles, they habour 90% of all road traffic deaths[4]. Such countries are found not to have comprehensive road traffic laws (like urban speed limit, seat belt, motorcycle helmet and/or drink-drive laws) or poor enforcement if the laws exist[3].

The temporal distribution of trauma deaths was first described by Baker et al in North America[5]. This study formed the basis for the establishment of the historical "trimodal distribution of trauma deaths"[6] Deaths were said to occur in peaks with the majority (53%) occurring in the first. These 'immediate deaths' were mostly in the prehospital setting and said to be caused by non-survivable central nervous system injuries and rapid exsanguination. This model held sway for some years but is being questioned in current trauma settings. In a study done in 1995, only 34% of deaths occurred in the prehospital setting.[7] These authors speculated that marked improvements in emergency medical services might have been responsible for the reduction in prehospital deaths, even though the samples differed a little in the types of trauma represented.

Injury mortality is concentrated among young adults with almost 50% of global burden occurring in the productive 15- to 44-year age group[8,9]. Living and

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working conditions are precarious in most developing countries. Efficient preventive policies can only be formulated on a background of local and regional data on trauma. This study aims to characterize the pattern of trauma-related mortality at Benue State University Teaching Hospital (BSUTH), Makurdi, Nigeria.

Materials and Methods

Study design and setting

This is a review of trauma deaths occurring at BSUTH from July 2012 to December 2014. BSUTH is a tertiary care centre and teaching hospital for the Benue State University. It is a 350-bed hospital and serves as the major treatment center for trauma patients over an area with a population of about 240 000. There is no organized prehospital Emergency Medical Services systems in the city as such injured patients are transported to the Accident and Emergency Department (A&E) by relations, law enforcement agents or by-standers. The A&E receives about 2500 surgical and medical emergencies annually. On arrival, trauma patients are triaged according to injury severity to identify those who need intervention. Trained trauma team leaders supervise the trauma patients' assessment, which is carried out by a team composed of residents from surgery, internal medicine and family medicine. Other specialties are available in-house. The A&E has a dedicated operating room (OR) with ready-access to five others in the hospital. It has 24-hour laboratory and radiology services. There is a 4-bed intensive care unit (ICU) manned by trained ICU nurses and headed by a consultant anaesthetist.

Study population

The case records of all in-hospital deaths from trauma during the study period were retrieved from the Medical Records Department. Ethical clearance was obtained from BSUTH Hospital Research and Ethics Committee. Data extracted were patients' demographics, time of death, location of death within the hospital, cause of injury, mechanism of injury (i.e. blunt or penetrating) and cause of death. In road traffic injury (RTI) cases, the status of the patient was obtained, i.e., driver/rider, passenger or pedestrian.

Time of death was calculated from arrival in the A&E until clinical death with the time of death taken as the time documented by the physician who certified clinical death. Causes of death were classified into exsanguination, traumatic brain injury (TBI), multiple organ dysfunction syndrome (MODS), chest injury, pneumonia/respiratory insufficiency and others. The cause of death was determined by verbal autopsy. Death due to exsanguination was defined as bleeding chest, abdominal and extremity injuries. TBI as a cause of death was regarded as head injury with any of: a period of loss of consciousness, altered level of consciousness measured on Glasgow Coma Scale and focal neurological deficits. MODS was determined using the Multiple Organ Dysfunction Score [10]. Chest injury was defined as any injury to the chest that led to death, excluding exsanguination. Deaths due to pneumonia/ respiratory insufficiency without chest injury were categorized in a separate group. Deaths due to sepsis following pneumonia were included in this category. 'Others' included deaths due to cardiac failure, burns, liver, kidney failure, sepsis due to infections other than pneumonia and neglected animal bites.

All trauma patients (excluding drowning and poisoning) who died during their hospital stay in BSUTH over the study period were included. Excluded were patients brought in dead and those with incomplete or missing medical records.

Statistical analysis

Data were analyzed using the software IBM SPSS Statistics for Windows, Version 21.0. (Armonk, NY: IBM Corp.) Descriptive statistics were used to display single variable quantities using means and standard deviations (SD) for continuous variables or proportions for categorical variables unless otherwise stated. Categorical variables were compared with the Chi-square test. The significance of statistical differences was attributed to a p-value <0.05.

Results

The A&E attended to 1009 trauma patients during the study period of which 88 (8.7) died during the hospital stay. Three of the dead subjects were excluded as a result of incomplete medical records resulting to 85 as the study population. There were 67 males (78.8%) and 18 females (21.2%) with a mean age of 35 ± 17 years. The predominant age group involved was 20-29 years. RTIs were the main cause of fatal trauma accounting for 76.5% (n=65) of overall mortality. This was followed by burns (n=8, 9.4%) and gunshot injuries (n=6, 7.1%). Table 1 shows the distribution of causes of lethal injuries in relation to age groups. Pedestrians were involved in 38.5% (n=25) of road traffic-related deaths; passengers and drivers/riders each accounted for 30.8% (n=20). Eleven patients aged 19 years or less incurred fatal injuries of which 8 (61.5%) were due to RTIs. Of those lost to RTIs, 7 (87.5%) were pedestrians at the time of injury. Tables 2 shows the distribution of patients involved in fatal road traffic injuries according to age groups. The location of deaths in the hospital were the A&E (n=60, 70.6%), wards (n=18, 21.2%) and intensive care unit (n=, 7.4%). With respect to the time of death, 53 (62.4%) died within 24 hours of hospital admission; 14 (16.4%) within 24-72 hours and 18 (21.2%) after 72 hours. The causes of death were TBI (n=60, 71.4%),

exsanguination (n=8, 9.5%), chest injury (n=5, 6.0%), MODS (n=3, 3.6%), pneumonia/respiratory insufficiency (n=1, 1.2%) and others (n=7, 8.3%). Patients with TBI were more likely to die within 24 hours of admission than those who have stayed for more than 24 hours in the hospital. (n (%) needed here p = 0.001).

Table 1: The distribution of causes of lethal trauma with relation to age groups

Age group (yrs)	[a]RTI	Burns	Gunshots	Assault	Falls	Total (%)
0-9	2	1	-	-	1	4 (4.7)
10-19	6	1	-	-	-	7 (8.2)
20-29	15	1	5	3	2	26 (30.6)
30-39	12	3	1	-	-	16 (18.8)
40-49	8	1	-	-	-	9 (10.6)
50-59	17	-	-	-	-	17 (20.0)
60-69	3	1	-	-	-	4 (4.7)
70-79	2	-	-	-	-	2 (2.4)
Total(%)	65 (76.5)	8 (9.4)	6 (7.1)	3 (3.5)	3 (3.5)	85 (100.0)

a – Road traffic injuries

Table 2: The distribution of patients involved in fatal road traffic injuries according to age groups

Age group	Riders/Drivers	Passengers	Pedestrians	Total (%)
0-9	-	-	2	2 (3.1)
10-19	-	1	5	6 (9.2)
20-29	6	5	4	15 (23.1)
30-39	4	4	4	12 (18.5)
40-49	3	2	3	8 (12.3)
50-59	6	7	4	17 (26.2)
60-69	1	-	2	3 (4.6)
70-79	-	1	1	2 (3.1)
Total(%)	20 (30.8)	20 (30.8)	25 (38.5)	65 (100.0)

Discussion

Reduction of trauma deaths can only be achieved by employing preventive measures and prompt treatment of trauma victims. Knowledge of the spectrum of trauma, in particular related to fatal outcome, is the backbone for trauma system planning and injury prevention [11].

In line with similar studies, [11, 12] RTIs were the most predominant cause of death in this study. They are said to be the leading cause of injury-related mortality in both developed and developing countries with developing countries accounting for a disproportionately high share of the burden [4]. While traffic-related mortality has been declining in developed countries over the last decades, it is on the rise in developing countries because of growth in motor vehicle numbers, poor enforcement of traffic safety regulations and inadequacy of public health infrastructure in providing treatment for traffic injuries [13, 14]. The absence of a formal pre-hospital trauma care in the study area is likely to be a contributing factor to the high proportion of fatal RTIs. Improving road traffic infrastructure, enforcing traffic regulations, establishing an efficient pre-hospital trauma care system and prompt treatment of the injured may help reduce road traffic-related deaths in Makurdi.

RTIs claimed the lives of 61.5% of patients aged 19 years or less in this study. Most of the individuals in this age bracket were pedestrians knocked down by automobiles and motorcycles. Lack of pedestrian walkways and a school bus transport system in the study area increase the vulnerability of children to motorized vehicles. To significantly reduce pediatric transport-related deaths in the study area, factors that encourage pedestrian knockdowns ought to be tackled. Modification of busy roads commonly used by school children by placing and enforcing speed limits, installing speed breaks and increasing the number of pedestrian ('zebra') crossings are some of the ways to reduce pedestrian knockdowns [15]. These crossings could be augmented with traffic lights and crossing guards during peak times when children are crossing the roads [18].

BI was the most common cause of death, a finding similar to that of a study done in Brazil. In a review of the outcome of severe head injury by Marshall et al [16], the leading cause of in-hospital deaths after TBI was secondary brain injury. Secondary brain injury does not occur at the time of injury but evolves over time with possible fatal consequences. The risk of secondary brain injury is significantly increased by hypoxemia and hypotension which commonly occur before the patient reaches hospital[17]. A better outcome could be obtained by prompt and efficient pre- and in-hospital care. Unfortunately, the poor state of prehospital services in the study area can only increase the likelihood of fatal outcomes. Providing efficient neurosurgical services in the hospitals across the country and an organized emergency medical response system may help reduce mortality from traumatic brain injuries.

Blunt trauma, mostly from road traffic accidents, was the more common mechanism of fatal trauma noted. This is in contrast to a study[6] from the United States of America were most trauma deaths resulted from penetrating gunshot injuries. The high prevalence of gun ownership and much less restrictive gun laws are may explain why gunshot injuries in the U.S. are more lethal[18,19]. Considering the occult nature of blunt trauma improving human and material resources to aid diagnosis and prompt treatment of critical injuries in the study area may also help prevent death.

More than 60% of deaths occurred within the first hour of arrival to the hospital. This is representative of the temporal pattern seen in the studies by Baker et al [8]. and Trunkey [6] which formed the basis for the formulation

of most trauma systems decades ago. The fact that the pattern in this study reflects that obtained in settings before implementation of organized trauma systems indicates the necessity for improvement. As in most African settings, prehospital care is almost non-existent with the injured being transported to accident and hospitals by untrained friends and family in private vehicles [20, 21]. Dedicated trauma centers equipped to cater for the severely injured are very few. This is likely to result in a poor outcome for trauma patients.

Limitations and Strengths

The study population size was small. The study period may need to be extended further or the study made a multi-center one so as to recruit more subjects. This study was carried out retrospectively, thus there were some clinical data missing. On the other hand, it showed that road traffic injuries were the leading cause of injury and TBI as the main cause of death.

Conclusion

Trauma-related deaths in our environment predominantly affected males aged 20 - 39 years. Road traffic injuries were the leading causes of lethal injuries. TBI was the leading cause of death. Improvement in road safety and establishment of an emergency prehospital care system in the study area are recommended.

Acknowledgement

The authors are grateful to the staff of Records Department, BSUTH for retrieving case notes.

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