*Journal of Advances in Medical and Pharmaceutical Sciences*

***Volume 26, Issue 5, Page 76-84, 2024; Article no.JAMPS.116428***
***ISSN: 2394-1111***

# Trauma-Related Deaths in the Accident and Emergency Department of a Nigerian Teaching Hospital

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/JAMPS/2024/v26i5689

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/116428

***Original Research Article***

***Received: 19/02/2024***
***Accepted: 23/04/2024***
***Published: 25/04/2024***

## ABSTRACT

**Background:** Trauma is a significant contributor to morbidity, disabilities, loss of man hours and mortality in both the developed and developing world with 90% of global trauma deaths occurring in low and middle income countries. The extent of motor vehicular use, degree of adherence to use of safety gadgets, strength of enforcement of industrial safety regulations, level of civil unrest as well as other socio-demographic indices predict the contribution of various etiologic factors. Deaths from the trauma may perhaps have far more psychologic and physical impact on families that from acute/chronic medical cases

**Method:** A retrospective study of the admission records and in-patient records of all trauma related deaths in the accident and emergency unit of the University of Port Harcourt Teaching Hospital from 1st January 2018 to 31st December 2022 was done. Relevant information was extracted and analyzed. Data obtained was analyzed descriptively. Results were presented in tables and charts where necessary. Means and standard deviations were used to represent certain variables.

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**Results:** Total emergencies (medical and surgical) seen within the study period were 42,443, total injuries seen were 10,787 giving a crude injury prevalence rate of 25.4%. There were a total of 766 deaths among injured patients giving a crude mortality rate of 7.1%. Road traffic accidents (RTAs) (46.3%) and Firearm injuries (23.5%) were the most common injury mechanisms seen. Traumatic brain injuries are by far the leading cause of trauma-related deaths in the ER (82.5%) with most deaths (96.1%) occurring within the first 72hours of Admission.
**Conclusion:** Trauma-related deaths occur in 7.1% of all injuries presenting at the study sight. The most common mechanism is RTA while the most affected victim is the young adult male. Traumatic brain injury accounts for more deaths than all others combined with most of the deaths occurring within the first 72hours of presentation. All efforts at reducing these injuries should be encouraged.

*Keywords: Trauma; disabilities; public health crisis; domestic injuries.*

## 1. INTRODUCTION

Trauma is a significant contributor to morbidity, disabilities, loss of man hours and mortality in both the developed and developing world. Ninety percent of global trauma deaths occur in low and middle income countries [1]. Trauma in general contribute to 12% of the global disease burden [2]. It has been regarded as a neglected public health crisis in low and middle income countries [3].

Common causes include, Road traffic accidents (RTAs), fall from height, industrial injuries, occupational injuries, domestic injuries, assault and firearm injuries. The extent of motor vehicular use, degree of adherence to use of safety gadgets, strength of enforcement of industrial safety regulations, level of civil unrest as well as other socio-demographic indices predict the contribution of various etiologic factors.

Road traffic accidents are by far the most common cause of both trauma- related injuries and trauma-related deaths [4-7]. The National Bureau of Statistics in Nigeria reported an increase in road traffic crashes (RTC) by approximately 14% from 2013 to 2019 [8]. These injuries typically affects the young adult male who in most part of the developing world is the most dynamic, most enterprising and most daring [9,10]. Falls from heights are particularly a major concern in the children and in the elderly population. Firearm injuries have also been reported by some authors [6,10] as growing contributors to injuries. The degree to which firearm injuries contribute to trauma depend on the gun control measures and the presence or otherwise of conflicts within the region served by the care facility [4].

In low and middle income countries, trauma systems- a structured framework that provides optimal pre-hospital, intra-hospital and post treatment rehabilitation for the injured patients through appropriate co-ordination of health resources, health care personnel and healthcare facilities- is still at the rudimentary stage [11,12]. This creates a serious intervention gap and could contribute to the poorer outcome of care seen in these regions compared to the more developed world [13].

In addition, available trauma data are not centralized, prehospital care is almost non-existent and prompt/ optimal intra-hospital care is still hindered by poor health insurance coverage and lack of needed resources [14-16]. These may further worsen outcome indices [15].

Disability-adjusted life years (DALYs) which combine the number of years of life lost from premature death with the loss of health from disability among persons with nonfatal injuries is an attempt to measure the non-fatal impact of trauma on a given population [17].

Deaths from the trauma may perhaps have far more psychologic and physical impact on families that from acute/chronic medical cases. The demography of those affected explains the enormity of its impact on Gross domestic product of any nation and the social and mental health implications on family members left behind.

A study of the mortality pattern of such injuries will among other things help detect any change in epidemiologic trend, understand the common injuries that account for trauma deaths and appreciate the demographic distributions with the view of improving the management of trauma within the study area and beyond.

### 1.1 Aim

The aim of this study was to profile trauma-related deaths at the accident and emergency

department of the University of Port Harcourt Teaching Hospital.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

This was a retrospective study of deaths from trauma patients that presented at the accident and emergency department of the University of Port Harcourt Teaching Hospital over a five year period 1st January 2018- 31st December 2022.

### 2.2 Method

The admission records and in-patient records were retrospectively reviewed to extract relevant information on patient's demographics, presenting complain at admission, treatment spectrum, Length of stay in the ward, emergency treatment received and the specialists for definitive treatment. For the purpose of analysis, patient co-morbidity was defined as the presence of pre-existing medical conditions that could alter the outcome of treatment of the traumatic condition. Deaths recorded in this study were those that occurred while the patients were receiving care at the Accident and emergency department. Deaths among trauma patients transferred to other units of the hospital were not included.

Trauma patients brought in dead and those who died on arrival were also excluded from the study. For the purpose of analysis, dead-on-arrival (DOA) refers to patients with severe traumatic conditions who died at the emergency room before commencement of any form of intervention while brought in dead patients were regarded as those who were already dead before arrival at the study site.

### 2.3 Study Location

The University of Port Harcourt teaching Hospital (UPTH) is in Rivers State along East-West Road with coordinates of 4.45305800N and 6.5504300E. UPTH serves as a tertiary referral center and receives referrals from neighboring states such as Bayelsa, Abia, Imo, Akwa-Ibom, Delta, Cross River, and other states in Nigeria. The accident and emergency department is the first point of call for all adult and pediatric trauma emergencies.

The department has medical officers of several categories and varying level of training who provide emergency care for trauma patients before transfer to the more appropriate specialty for definitive treatment. More than 50% of the medical and nursing staff do not have requisite certification in Basic life support (BLS) Advanced cardiovascular life support (ACLS) and Advanced trauma life support (ATLS)

Payment for elective interventions are on out –of-pocket basis for most patients since health insurance coverage is quite low[6]. The emergency care policy of the hospital provides some cover for emergency procedures but drugs and advanced surgical interventions are not included in this policy.

### 2.4 Study Population

Patients who presented at the accident and emergency department of the study center within the study period. Patients with incomplete medical records that will not aid in analysis were excluded.

### 2.5 Data Analysis

Data obtained were analyzed descriptively. Results were presented in tables and charts where necessary. Means and standard deviations were used to represent certain variables. Chi-square test and students' T-test for continuous variables were used where appropriate to test observed differences, and p-value of $<0.05$ was deemed statistically significant.

## 3. RESULTS

A total of 10, 939 patients presented to the accident and emergency department with traumatic injuries. Records of 152 patients were either not completely reported or not found in the archives. Available records from 10,787 were recruited into the study giving 98.6% recruitment rate. Total emergencies (medical and surgical) seen within the study period were 42,443 giving a crude injury prevalence rate of 25.4%.

The age range for all trauma patients within the study period was from 0-96 years with a mean age of 33.17+/-16.1years. The most common age group was the 21-30 year age group. There were 8,342 males and 2,445 females making a male female ratio of 3.4:1.

Road traffic accidents (RTAs) accounted for 46.3% of all injury mechanisms seen. Firearm injuries (23.5%) burns (8.7%) and

assault (6.0%) also made good contributions as stated in Table 2.

**Table 1. Demographics**

| Age (years) | n (%) |
|---|---|
| <1 | 23 (0.2) |
| 1–10 | 302 (2.7) |
| 11–20 | 924 (8.6) |
| 21–30 | 3941 (36.6) |
| 31–40 | 2523 (23.4) |
| 41–50 | 2086 (19.3) |
| 51–60 | 719 (6.7) |
| 61–70 | 117 (1.1) |
| 71–80 | 82 (0.7) |
| 80-90 | 53 (0.5) |
| >90 | 17 (0.2) |
| Sex | |
| Male | 8342 (77.3) |
| Female | 2445 (22.7) |
| Occupation | |
| Preschool Children/students | 1323 (12.2) |
| Driver | 508 (4.7) |
| Civil servant/ self -employed | 2409 (22.3) |
| Unemployed | 5638 (52.3) |
| Businessman | 3981 (36.9) |
| Professionals | 349 (3.2) |
| Others | 60 (0.6) |
| Marital status | |
| Single | 4434 (41.1) |
| Married | 5969 (55.3) |
| Widow | 306 (2.8) |
| Divorced | 78 (0.7) |
| Level of education | |
| Un-educated | 228 (2.1) |
| Primary | 714 (6.6) |
| Secondary | 5717 (53.0) |
| Tertiary | 4128 (38.3) |

**Table 2. Distribution of etiologies for all trauma patients**

| Etiology | *n* (%) |
|---|---|
| Road Traffic Accidents (RTA) | 4993 (46.3) |
| Firearm injuries | 2531 (23.5) |
| Burns | 934 (8.7) |
| Falls | 643(6.0) |
| Sports injuries | 244 (2.3) |
| Industrial injuries | 786 (7.3) |
| Assaults | 637 (6.0) |
| Birth trauma | 19 (0.1) |
| Total | 10,787 (100) |

Skin and subcutaneous injuries (39.5%) were the most commonly injured body region, followed by bone fractures (31.6%).

Most patients were stabilized and transferred to the ward/ theater/ICU (63.7%) while 21.7% of patients were discharged home after initial stabilization as shown in Table 5.

Road traffic accidents (68.3%) and firearm injuries (15.3) made the highest contribution to mortality.

## 4. DISCUSSION

Results from this study showed that 42,443 patients presented to the Accident and emergency department (emergency room) within the five year period under review. of this number 10,787 were injuries giving a crude injury prevalence rate of 25.4%. Both Onyemachi et al. [18] in Enugu (24.3%) and Prekker et al. [10]. (24.4%) in Minnesota, USA reported similar findings.

The crude mortality rate was 7.1%. This is lower than findings from Elachi et al. [4] in Markurdi North central Nigeria (15.2%) and higher than findings from other authors within the region including Thanni and Kehinde [5] (2%) for south-west Nigeria, Solegberu et al. [16] (4.4%) from Lagos, south-west Nigeria, Onyemaechi et al. [18] (4.5%) from Enugu, South-East Nigeria, as well as Egol et al. [19] (4.7%) from USA. The rate disparities may be a reflection of the geographic disparity in the spread of competent emergency and trauma care specialist within the region, the distribution of injury mechanisms as well as the quality of care available at various centers. This disparity also highlights the need for a central national trauma database which among other benefits have the potential of revealing the existing health infrastructure and health man-power gaps across different tertiary heath facilities in the country.

The most common victim of trauma and trauma-related deaths is the adult male of the 21-40years age group. The young adult male have been shown by several studies [2,4,5] as the most vulnerable to injuries and deaths from injuries. This group of patients constitute the large chunk of the demographics of young populations typical of low and middle-income countries and are the most dynamic and most productive fraction of the population in these counties [20-22]. Their loss therefore is not merely a subtraction from the population but a huge bite on the nation's productive capacity and potentially a reduction in its gross earnings.

**Table 3. Distribution of injury mechanisms across age groups for all trauma patients**

| Age group (years) | Etiology | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RTA | Falls | Firearms | Burns | Sports injuries | Industrial injuries | Assaults | Birth trauma | Total |
| <1 | 3 | 1 | - | - | - | - | - | 19 | 23 |
| 1–10 | 29 | 108 | 27 | 34 | 60 | - | 44 | - | 302 |
| 11–20 | 641 | 89 | 5 | 54 | 48 | - | 87 | - | 924 |
| 21–30 | 1501 | 21 | 1418 | 329 | 83 | 283 | 306 | - | 3941 |
| 31–40 | 1412 | 38 | 425 | 117 | 53 | 352 | 126 | - | 2523 |
| 41–50 | 1047 | 81 | 434 | 358 | - | 130 | 36 | - | 2086 |
| 51–60 | 327 | 99 | 217 | 31 | - | 21 | 24 | - | 719 |
| 61–70 | 18 | 79 | 3 | 9 | - | - | 8 | - | 117 |
| 71–80 | 12 | 63 | 1 | 2 | - | - | 4 | - | 82 |
| 80-90 | 1 | 50 | - | - | - | - | 2 | - | 53 |
| >90 | 2 | 14 | 1 | - | - | - | - | - | 17 |
| Total (%) | 4993 (46.8) | 643 (6.0) | 2531 (23.5) | 934 (8.7) | 244 (2.3) | 786 (7.3) | 637 (6.0) | 19 (0.1) | 10,787 (100) |

**Table 4. Distribution of Body regions affected**

| Injury pattern | *n* (%) |
|---|---|
| Bone fractures | 3,405 (31.6) |
| Skin and subcutaneous Injuries | 4,261 (39.5) |
| Traumatic brain injuries | 1894 (17.6) |
| Spinal cord injuries | 910 (8.4) |
| Maxillo-facial injuries | 493(4.6) |
| ENT injuries | 676 (6.3) |
| Ophthalmic injuries | 390 (3.6) |
| Urologic injuries | 341 (3.2) |
| Chest trauma | 681 (6.3) |
| Abdomino-pelvic injuries | 108(1.0) |
| Multiple injuries | 1,994 (18.5) |

**Table 5. Outcome of ER treatment**

| ER treatment outcome | *n* (%) |
|---|---|
| Stabilized and discharged home | 2342 (21.7) |
| Stabilized and transferred to the ward/theatre/ICU | 6867 (63.7) |
| Signed against Medical advice | 249 (2.3) |
| Absconded | 115(1.1) |
| Referred out by specialist team | 445 (4.1) |
| Died in the ER | 766 (7.1) |
| Total | 10,787 (100) |

**Table 6. Distribution of mortality pattern across injury mechanism**

| Etiology | *n* (%) |
|---|---|
| Road Traffic Accidents (RTA) | 523 (68.3) |
| Firearm injuries | 117 (15.3) |
| Burns | 22 (2.8) |
| Falls | 14(1.8) |
| Industrial injuries | 19 (2.5) |
| Assaults | 11 (1.4) |
| Total | 766 (100) |

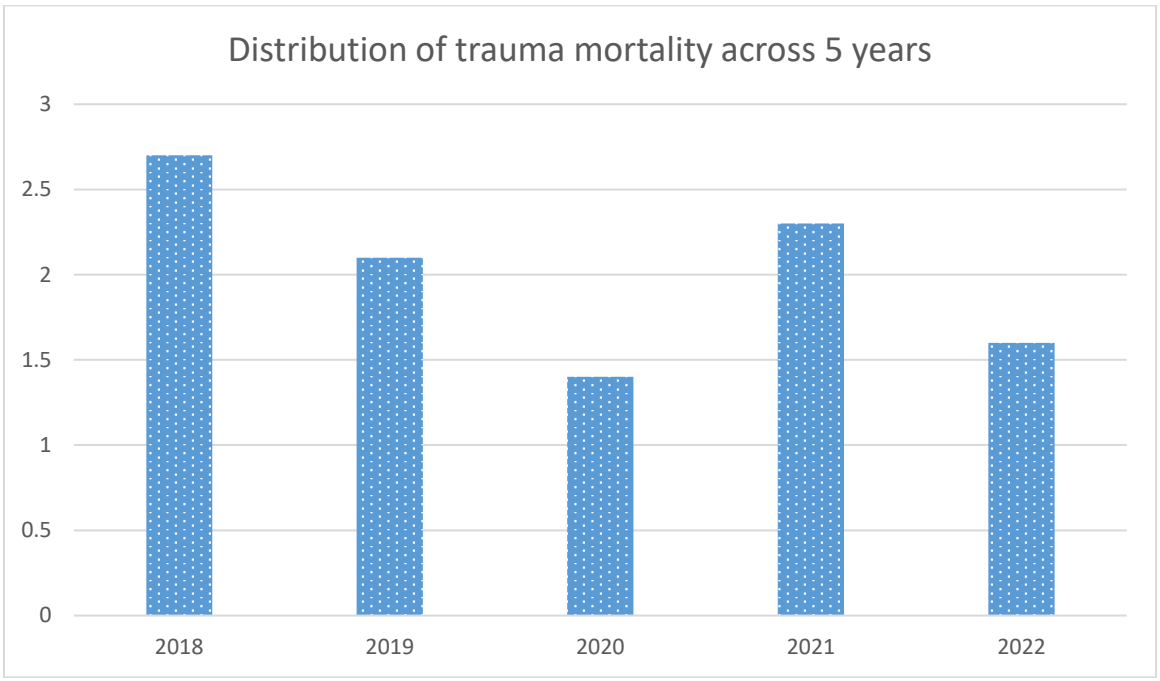


**Fig. 1. Distribution of mortality pattern across five years**

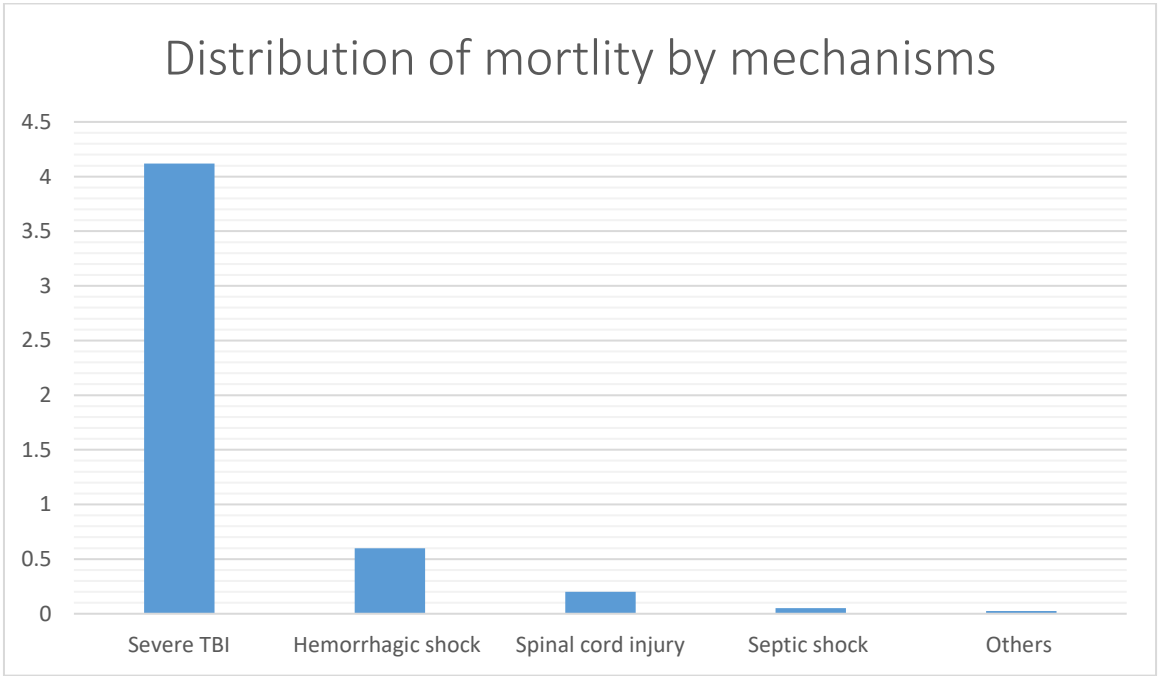


**Fig. 2. Distribution of mechanisms of mortality**

Road traffic accidents accounted for far more deaths (68.3%) than all other injury mechanism combined. Most authors [23-25] have reported the leading role of road traffic accidents in trauma-related injuries and deaths. The fraction of its contribution being a mirror image of the level of urbanization, the extent of motor vehicular use and the degree to which safe driving policies and helmet use is adhered to [26]. Though existent within cities served by the study center, safe driving laws are flagrantly disobeyed by drivers and other road-users, helmet use is poorly implemented and available road networks are in terribly poor conditions.

**Table 7. Distribution of mortality against duration of stay in the ER**

| | Duration of hospital stay | | |
|---|---|---|---|
| | **<24hours** | **24-72hours** | **>72hours** |
| Severe TBI | 458 (59.8%) | 156 (20.4%) | 20 (2.6%) |
| Hemorrhagic shock | 88 (11.5%) | 3 (0.4%) | - |
| Spinal cord injury | 12 (1.6%) | 16 (2.1%) | 2 (0.2%) |
| Septic shock | - | - | 8 (1.0%) |
| Others | 1 (0.1%) | 2 (0.2%) | - |
| Total | 559 (73%) | 177 (23.1%) | 30 (3.9%) |

This study particularly showed a high incidence of deaths from firearm injuries (15.3%) in the region much higher than those from falls, burns, Industrial accidents and assaults put together. This is a clear reflection of the high rate of gun violence in the oil-rich regions of the Niger delta and perhaps the unguided use of weapons by security personnel in the bid to maintain law and order. This also underscores the need to curb the proliferation of illegal weapons and train security personnel on proper use of weapons within their reach.

Distribution of mortality across the five years of the study showed that the number of deaths were lower in 2020 and in 2022 compared to the other three years. The former may have been due to the covid-19 restrictions which limited vehicular movements and crashed trauma incidences and trauma deaths while the latter may be explained by the establishment of a trauma team in the study center earlier that year. The trauma team, though still at its evolving stage was a collection of specialized trauma residents from surgery and related departments pulled to the Emergency room to provide competent first-hand treatment to trauma patients with the aim of achieving prompt resuscitation and stabilization before definitive treatment is carried out by the specialist teams. Its dramatic impact on the death rates for trauma-related injuries clearly shows the role of deliberate and intervention-focused management policies in reducing mortalities and improving the quality of care.

Traumatic brain injuries are by far the leading cause of trauma related deaths in our ER (82.5%). Amaefule et al. [27] also showed that traumatic brain injuries caused more deaths (66.2%) within the first 72hours in the ER than all other causes combined. Etebu and Ekere [28] in a similar study 2 decades ago in the same institution showed that traumatic brain injury was the leading cause of trauma-related deaths in children. The persistently high impact of head injuries to trauma-related deaths may result from poor adherence to helmet use, terrible condition of roads within the country, the abysmally low ratio of neurosurgeon per population (worsened by health workforce exports) as well as inability of a large fraction of the population to afford brain CT scan [29,30,31].

Hemorrhagic shock accounted for 12% of mortalities within the study period. These deaths were probably from unrecognized concealed bleed coupled with poor assessment of hemodynamic status with inadequate intervention in the ER. Reducing mortalities from hemorrhagic shock will require more attention to clinical details by the ER personnel and a deliberate management policy aimed at prompt and unrestricted access to blood for trauma victims without payment irrespective of health insurance status. Reduction of existing bottlenecks to early surgical intervention will also go a long way to reducing mortality from hemorrhagic shock.

More than 95% of trauma-related deaths took place within the first 72hours of admission. Both Osime et al. [32] in a similar tertiary center in Nigeria and Elachi et al. [4] have reported the same pattern, clearly reflecting the severity of such injuries at presentation and the need for emergency room personnel to optimally utilize this golden period for prompt and adequate resuscitation.

Reducing trauma-related mortality clearly need an ambivalence of coordinated efforts from vehicle manufacturers, drivers/road users, prehospital personnel, the ER physicians, health system managers and the government at all levels. The enforcement of safe driving laws such as helmet use, use of seat belts, government-backed vehicle inspection, speed restrictions, no drink-driving policies, safer vehicle manufacturing ass well as provision of good roads are some primordial and primary preventive measures [33].

Secondary preventive measures will include, prompt evacuation and transport of injured victims to appropriate facilities within an organized trauma system, adequate prehospital resuscitation as well as prompt and optimal in-hospital care by Advance trauma life support trained ER personnel [34,35].

As tertiary measures, early and adequate rehabilitation of injured victims will go a long way to incorporating these victims back to work and social life as early as possible.

Though most of these are stills non-existent in the country, this study will hopefully stimulate the needed change.

## 5. CONCLUSION

Trauma-related deaths occur in 7.1% of all injuries presenting at the study sight. The most common mechanism is RTA while the most affected victim is the young adult male. Traumatic brain injury accounts for more deaths than all others combined with most of the deaths occurring within the first 72hours of presentation. Since these deaths are preventable, all effort should be on deck to prevent or at least reduce them.

## CONSENT

It's not applicable.

## ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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