

Pathology of Death from Severe Head Injuries in Rivers State: A Study of Sixty Eight Consecutive Cases in Five Years

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ABSTRACT

BACKGROUND: Traumatic head injury and subsequent death is a public health problem in Nigeria. There is an urgent need to study the various factors leading to this problem.

OBJECTIVE: To study the cause and characteristic of fatal head injuries.

DESIGN/SETTING: A five year (1998-2003) autopsy study in Rivers State, Nigeria.

RESULT: A total of 68 deaths from severe head injuries were studied. Traumatic head injury occurred in every age of both sexes. The youngest was a day old female while the oldest was a 72 year old male. The age group 20-29 years was most affected 26(30.9%). Males were 55(82.4%) and females 13(17.6%) giving a ratio of 4.7:1. Road traffic accident 25(36.8%) and gunshot 16(23.5%) were the most common cause of head injury and death. Fractures of the vault of the skull 37(54.4%) were the most common type of head injury and death. Others include fracture of the base of skull 15(22.1%), combined fracture of the base of skull and vault 4(5.9%), intracranial hemorrhage 9(13.2%), cerebral laceration 2(2.9%) and cerebral contusion 1(1.5%). There were associated injuries in 36(52.9%) cases.

CONCLUSION: Head injury is most common cause of death especially in road traffic accidents, gun shot and assault in this environment. There is an urgent need to address the frequency of RTA and gun handling to drastically reduce these fatalities.

KEY WORDS: Head injury, RTA, Gunshot, Assault, Rivers State, Nigeria.

INTRODUCTION

Head injuries are universal and constitute major public health problem in terms of morbidity and mortality.¹ They are caused by the traumatic effect of physical forces on the skull and the brain tissue due to blunt blow, penetrating injuries from gunshot and heavy pointed objects or acceleration/deceleration forces occurring commonly in road traffic accidents (RTA).¹

The effects of blunt or penetrating injuries to the head are complex and depend not only on the mechanism of the injury and the severity of the applied force but also on the site of application of the force on the skull and the presence or absence of injury to other parts of the body.² Injuries to the head may damage the scalp, skull bone as well as intra cranial and extracranial blood vessels and the brain tissue either singly or in varying combinations.

Traumatic epilepsy and infections are complications associated with long term survival.³ Head injury is a common cause of death in young adults and males in particular.^{4,5}

Being unaware of any previous focusing study exclusively on death resulting from severe head injury in River state, the authors intend to document the age and sex distribution, causes of head injuries, anatomical sites and other associated injuries recorded in different parts of Rivers State and to include our findings in the literature.

MATERIALS AND METHOD

This autopsy study was carried out by the authors at different parts of Rivers State on people that died of severe head injuries and/or complications arising from it during the period under review (1st January 1998-31st Dec. 2003).

These autopsies were requested by the coroner, medical practitioners or the deceased relations for death certification and confirmation of diagnosis. In all cases, thorough autopsies following standard procedure was performed and reports given to the police.

Variables considered for the study were age, sex, causes and frequency of head injuries, and other associated injuries apart from head injury. These data were collated, analyzed and tabulated in multi-way frequency tables.

RESULTS

A total of 68 consecutive autopsies were studied during the period under review (1st January 1998-December 31st 2003). The youngest was a day old female while the oldest was a 72 year old male. Adults between the ages 20-29 years were most affected 26(38.2%) followed by the age group 30-39 years 15(22.1%). Fifty five (81.0%) cases were males and 13(19.0%) females, giving a ratio of 4.2:1. (Table 1)

The most common cause of severe head injury in this study was road traffic accident 25(36.8%) fig - 1 followed in decreasing order of frequency by gun shot 16(23.5%) fig-2 and assault 12(17.6%). Others were machete cut 5(7.4%), domestic accidents 4(5.9%), fall from heights (4.4%), diving 2(2.9%) and birth trauma 1 (1.5%). Table II).

Table III shows the type of head injuries in this study. **Skull fracture** accounted for 56 cases (82.4%), while **closed intracranial injuries** accounted for 12(17.6%) of cases. Of the 82.4% cases of **skull fractures**, **vault fracture** recorded 37(54.4%) cases made up of parietal bone fracture 10(14.7%), frontal bone fracture 8(11.8%), mixed fracture 7(10.3%), temporal bone fracture 6(8.8%) and occipital bone fracture 6(8.8%). **Fracture of the base of the skull** accounted for 15(22.1%) made up of anterior cranial fossa 6(8.8%), posterior cranial fossa 4(5.9%), middle cranial fossa 3(4.4%), and mixed fractures 2(2.9%). **Combined base and vault fracture** accounted for 4(5.9%) cases.

Out of the 12(17.6%) cases of **closed cranial injuries**, **intracranial hemorrhage** accounted for 9(13.2%) which was made up of subdural 2(2.9%), sub arachnoid one(1.5%), extradural 2(2.9%) and mixed 4(5.9%) cases. **Cerebral laceration** alone accounted for 2(2.9%) while cerebral contusion alone accounted for one(1.5%) case.

Table IV shows 36(52.9%) associated injuries apart from skull fracture. These constituted multiple injuries 14(38.9%), skeletal fracture 11(30.6%), soft tissue injuries 8(22.2%) and visceral injuries 3(8.3%).

Table I: Age and sex distribution of head injury victims.

| Ages in Years | Sex | | Total | Percentage |
|---------------|----------------|----------------|-----------|--------------|
| | Male (%) | Female (%) | | |
| 0-9 | 4(5.9) | 1(1.5) | 5 | 7.4 |
| 10-19 | 5(7.4) | 4(5.9) | 9 | 13.2 |
| 20-29 | 21(30.9) | 5(7.4) | 26 | 38.2 |
| 30-39 | 13(19.1) | 2(2.9) | 15 | 22.1 |
| 40-49 | 8(11.8) | 1(1.5) | 9 | 13.2 |
| 50-59 | 3(4.4) | - | 3 | 4.4 |
| 60 and above | 1(1.5) | - | 1 | 1.5 |
| Total | 55(81%) | 13(19%) | 68 | 100.0 |

Table II: Analysis of causes of head injuries.

| Causes | Number | Percentage |
|------------------------|-----------|--------------|
| Road traffic accidents | 25 | 36.8 |
| Gun shot | 16 | 23.5 |
| Assault | 12 | 17.6 |
| Machete cut | 5 | 7.4 |
| Domestic accidents | 4 | 5.9 |
| Fall from height | 3 | 4.4 |
| Diving | 2 | 2.9 |
| Birth trauma | 1 | 1.5 |
| Total | 68 | 100.0 |

Table III: Analysis of types of severe head injuries.

| Types | Variants | Components (Nos %) | Total | Percentage |
|--|---------------------------------------|----------------------------------|-----------|--------------|
| (A) SKULL FRACTURES | *Vault Fracture | Parietal bone fracture 10 (14.7) | 37 | 54.4 |
| | | Frontal bone fracture 8 (11.8) | | |
| | | Temporal bone fracture 6 (8.8) | | |
| | | Occipital bone fracture 6 (8.8) | | |
| Mixed fractures 7 (10.3) | | | | |
| *Fracture of the base of skull | *Fracture of the base of skull | Anterior cranial fossa 6 (8.8) | 15 | 22.1 |
| | | Posterior cranial fossa 4 (5.9) | | |
| | | Middle cranial fossa 3 (4.4) | | |
| | | Mixed fracture 2 (2.9) | | |
| *Combined fracture of base of skull and vault | | - | | |
| Sub Total | | | 56 | 82.4 |
| (B) CLOSED CRANIAL INJURY | *Intracranial hemorrhage | Subdural 2 (2.9) | 9 | 13.2 |
| | | Extradural 2 (2.9) | | |
| | | Subarachnoid 1 (1.5) | | |
| | | Mixed 4 (5.9) | | |
| *Cerebral laceration | - | 2 | 2.9 | |
| *Cerebral contusion | - | 1 | 1.5 | |
| Sub total | | | 12 | 17.6 |
| GRAND TOTAL | | | 68 | 100.0 |

Table IV: Frequency analysis of the 36 associated injuries found in victims of severe head injuries.

| Associated injuries | Number | Percentage |
|----------------------|-----------|--------------|
| Multiple injuries | 14 | 38.9 |
| Skeletal fractures | 11 | 30.6 |
| Soft tissues | 8 | 22.2 |
| Visceral lacerations | 3 | 8.3 |
| Total | 36 | 100.0 |



Fig 1: Severe head injury of a front seat passenger in a Road traffic accident



Fig 2: Severe head injury of a man beaten with a blunt object, fracturing the skull bone.

DISCUSSION

The head is especially vulnerable to injuries in accidents and target of choice in assaults involving penetrating and/or blunt trauma. The head, being the heaviest part of the body is usually impacted on the ground when the victim is pushed down, falls from a height or is knocked down by a moving vehicle leading to severe scalp and skull injuries^{3,6}. Though the cranium is protecting the brain tissue, transmitted and distributed forces can cause a variety of injuries within the skull, blood vessels and the nerve tissues.⁶

Severe head injuries are notable public health problems culminating in morbidity and mortality in various parts of the world.^{1,5} Head injury occurs in all ages but it was noticed more among adult males and especially of the age group 20-29 years in this study. The vulnerability of this age group to severe head injury is expected because, they are likely to engage in risky adventures as they are physically sound, economically active and emotionally unstable.^{7,8} This age group is however at variance with another local study carried out in Lagos Nigeria where the highest frequency occurred in the age group 31-40 years.¹ The reason may be attributed to the fact that, youths in Rivers State get engaged in gang/cult activities at an earlier age than those recorded in Lagos⁹.

Road traffic accidents (RTAs) constituted the major cause of head injuries and death in this communication; corroborating other studies locally and elsewhere.^{1,10,11} These accidents were caused by various types of motor vehicles of which the motor cycle was the foremost because they are used as commercial vehicles in this environment.⁸ These accidents involved the motorcyclists, pillion riders, motor drivers, passengers, and the pedestrians in variable proportions. The extent of damage depend on the shape of the object causing the injury, the force applied and whether or not, the head is in motion at the time of impact.¹ The bulk of the motor cyclists are reckless and indisciplined and could be best described as "suicide riders" in this setting. This further strengthened the fact that, the pillion rider and the pedestrian involved in such accidents were in most cases innocent but happen to be in the wrong place at the wrong time.^{8,12} Like the pattern of head injuries sustained in motor vehicular accidents, marine traffic accidents (MTA) also contributed 2.9% of cases in this communication. The edges of these wounds were irregular and they are characteristically described as stretch and tear injury caused by the engine propeller.¹³

Another notable cause of death in severe head injury was gunshot. It involved both the hard and soft tissues of the body, resulting in severe bleeding. The entry point of the missile may be small and clean but the exit may be larger, irregular, dirty and may be avulsive.⁶ The avulsion of tissue may be attributed to the fact that, the

fractured bone in motion acts as a secondary missile that may destroy other tissues along its path and especially at the exit; corroborating the report of another study in Nigeria.¹⁴ The sustained injuries varied in pattern and severity relative to the shape, size, velocity of the missile and the angle of impact on the target which is also in keeping with the report in another study elsewhere.¹⁵ Accidental gunshot to the head was recorded in two children at homes where guns were kept by their parents for self defense. These children were killed when assailant was trying to replicate movie scenes; as reported recently in a previous study.¹⁶

Falls are generally known to be the most common cause of head injuries and death in the elderly and unsupervised children¹⁶. The accidents were motivated by alcoholism, illicit drug abuse, severe arthritis, postural instability, poor vision, dizziness, wet and polished floors as previously reported.¹⁶

Traumatic head injuries using machetes was responsible for the death of 5.9% of cases in this study. This was encountered in different kinds of violence and assaults. The scalp and the underlying blood vessel were lacerated, leading to severe hemorrhage and shock. In other cases, the skull may also be fractured, either contusing or lacerating the brain tissue, tilting the diagnosis to fracture and contusion or laceration of brain tissue. These lacerations may be single or multiple. Other types of assaults, falling objects and birth trauma were also notable causes of severe head injuries and deaths in variable proportions; reflecting the report of other studies.^{7,16}

Two mechanisms of severe head injuries are recognized by this study. The first was injuries resulting in **skull fracture** which accounted for 82.4% of cases. In fracture of the skull, the thickness of the affected bone, the level of individual's consciousness at the time of impact and the site of the trauma determines the level of injuries. For instance a fall while the individual was conscious usually results in occipital impact and hence fracturing that bone¹. This mechanism recorded 8.8% of cases in our report. Frontal bone fracture which was responsible for 11.8% of cases resulted from fainting attacks. Similar to the Lagos study¹, majority of the vault fractures occurred in the parietal bone (14.7%). Fracture of the base of the skull was another variant of skull fracture which accounted for 22.1% of cases. This type of skull fracture was noticed to be commoner in falls from height. Majority of the fractures of the base of the skull (8.8%) occurred in the anterior cranial fossa. Falls and blows are usually associated with linear fractures around the base of the skull and affect the middle cranial fossa in 4.4% of cases. The combination of vault and base fractures of the skull were noticed in 5.9% case. These distribution show similarity to other studies

elsewhere.¹

The second mechanism was the **closed cranial injury** which accounted for 17.6% cases in this communication. Intracranial hemorrhage was the foremost variety (13.2%), reflecting the report in an earlier study¹. Subdural and extradural hemorrhage rank the foremost parenchymal hemorrhage which develop rapid neurological deterioration causing epileptiform seizures and death.³ Others in this class were cerebral laceration and contusions in variable proportions. Associated injuries were discovered in 53% of cases. This varies with the 45%, 46% associated injuries recorded elsewhere^{1,10}. The reason for the slight variation is not unconnected with the recent upsurge in youth violence in the state⁹. Scalp injuries, visceral lacerations and multiple injuries with profuse bleeding caused the death of many.

Finally, severe head injuries are recognized cause of morbidity and mortality in this environment. Therefore there is need to activate and stringently enforce the laws regulating road traffic accident, gun licensing and handling as well as controlling youth restiveness in Rivers State.

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