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The Epidemiology of Hospital-referred Head Injury in Northern Nigeria

U. S. Jasper[1*], M. C. Opara[1], E. B. Pyiki[1] and O. Akinrolie[2]

[1]Department of Physiotherapy, Jos University Teaching Hospital, Jos, Nigeria.
[2]Department of physiotherapy, National Hospital, Abuja, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Authors USJ, MCO and EBP designed the study and wrote the first draft of the manuscript. Author EBP managed the literature searches, while authors USJ and OA carried out data analyses of the study. Author OA interpreted the data and contributed to writing the manuscript. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Aims: This study was aimed at defining the peculiar demographic and associated risk factors of head injury.
Study Design: This was a retrospective study
Place and Duration of Study: We conducted this study at an Accident and Emergency unit of a tertiary hospital between February 2012 and January 2013.
Methodology: All head injury patients who were admitted in the Accident and Emergency Department of a tertiary health institution were studied. Data were collected from the emergency records and case notes, collated and analyzed using the descriptive statistics and chi square test to test for significance of associations between the predictor and outcome variables in the categorical variables.
Results: Out of 3282 patients attended to during the study period, 428 (13.0%) of them had head injury. Majority were males (342, 79.9%). The peak age prevalence was in the 21- 30 years age group (n=145, 33.8%). Road traffic accidents (RTAs) were the most common cause of injury (307, 71.7%), with a majority being vehicular accident (n=215, 70.0%). The mortality rate was 1.6% (7). Many (57.0%) had associated injuries, of which fractures were the majority (n=93, 21.7%) and with skull fracture being the most common (n=27, 26.5%). Pedestrians knocked down by motor vehicles was the most common mechanism of injury (n=77, 23.3%). A few (22, 11.6%) had taken alcohol prior to the

**Corresponding author: E-mail: jaspersnd64@gmail.com;*

accident. Most of patients (64.7%) sustained mild head injury.
Conclusions: The incidence rate was much higher than in the developed countries. In our environment, male gender, driving a motor vehicle, being in the 1-10 years and 21- 30 years age group respectively, pedestrian and ethnic/communal clashes and violence were the major risk factors of head injury. Road safety officials should be more conscientious in tackling avoidable traffic accidents by increasing awareness and emphasizing the importance of avoidance of alcohol, speed limits, seatbelts and crash helmets.

Keywords: Head Injury; epidemiology; etiology; accident; prevention; risk factors; Nigeria.

1. INTRODUCTION

Globally, head injury is recognized as a major public health problem and is associated with high morbidity and mortality both in developed and developing countries [1-5]. The causes and pattern of head injuries reported in literature vary from one part of the world to another partly because of variations in infrastructure, civil violence, wars and crime [6]. In developing countries, injuries such as head injury are due to increase in urbanization, civil violence, criminal activities, ethnic and communal clashes and a surge in terrorism.

Road traffic accidents (RTAs) are the commonest cause of blunt head injuries and are especially common in teenagers and young adults in developed and developing countries [5,7-9] even though falls have been reported as the major etiological factor in some developed countries [1,10]. While some have reported falls to be responsible for the next largest group of injuries [4,11,12] assaults have been reported as the second most common etiology of head injury after RTAs by others [5,13,14]. Furthermore, in developed countries, falls are more common at the extremes of age [1,15] but in developing countries there is a preponderance of falls among children in the first decade of life [9]. Alcohol has been shown to be a contributing factor in approximately 40% of all severe head injuries [8,12].

In the United States (US), the incidence of head injury at an Emergency Department was reported to be 394 per 100,000 people, male: female ratio was 1.8:1 and mortality rate 19.3 per 100,000 people [1]. The leading causes of traumatic brain injury (TBI) were reported as fall (28%), motor vehicular traffic crash (20%), assault (11%) and others (41%). The attendance rate of head injury in another study carried out at an Emergency Department in a United Kingdom (UK) constituted 3.4% of the total attendance and the incidence was 453 per 100,000, with males having a higher risk for moderate to severe head injury than females [15]. In Nigeria, an incidence rate of 2,710 per 100,000 each year has been reported by Emejulu et al. [9]. Adeolu et al. [16] showed that motor vehicular accident (MVA) - both passenger and pedestrian, and fall were the leading etiological factors, accounting for 73.4% and 16.4%, respectively. Also a higher incidence of head injury in the 21 - 30 and 1 - 10 year groups respectively has been reported in Nigeria [9,17], Malawi [18], Kenya [13] and Tanzania [5]. The prevalence of fall as the dominant etiological factor in the first decade of life in regional studies [9,18] raises concerns about surveillance and supervision of this age group.

The effectiveness and efficiency of any accident prevention programme depends on an adequate and up-to-date epidemiological database. At the moment, Nigeria does not have a comprehensive epidemiological database on head injury [9], thus making it difficult to appreciate the depth of the problem in terms of the scale, distribution, determinants and socioeconomic bottlenecks associated with it. This impedes development of evidence based

strategies for prevention of this injury and assessment of the success of any injury reduction strategy put in place [9]. It is therefore necessary to carry out researches such as this in various centres with the aim of pooling it together in a meta-analysis to generate representative national figures and provide the country with a comprehensive national epidemiological data base on the various aspects of head injury.

The aim of this study was to define the risk factors associated with head injury among trauma patients presenting at our Accident and Emergency Department in Jos over 12 months.

2. METHODS

This is a retrospective study of some demographic variables in all the patients that presented at the Accident and Emergency unit of the Jos University Teaching Hospital (JUTH), Jos, Nigeria with traumatic brain injury from February 2012 to January 2013. Jos, a commercial and administrative capital of Plateau State in North central Nigeria is also a major transit route linking other cities in the South and the North.

Jos University Teaching Hospital (JUTH) is a tertiary health institution that caters for neurosurgical conditions for most states in the North-central zone of Nigeria. Demographic data on age, gender, Glasgow Coma Scale (GCS) at presentation, aetiology of injury, type of head injury, mode of presentation, duration of loss of consciousness, associated injuries and bleeding from the craniofacial orifices were collected from the case notes with a structured proforma completed for each patient. The collated data was then analyzed.

The ages were grouped into 9, each spanning a decade. The aetiological factors were broadly classified into motorcycle accident, motor vehicle accident, falls, assault, terrorism related (gunshots and bombings), home and industrial accidents. Motor vehicle accident was further categorized into: restrained, unrestrained and unknown to check for those who were wearing seatbelts at the time of the accident. The data was analyzed with SPSS version 17 using descriptive statistics, while chi square test was used to test for significance of associations between the predictor and outcome variables in the categorical variables.

In this study, head injury was defined as both blunt and penetrating injuries affecting the cranium and its contents. The severity of head injury was assessed using Glasgow Coma scale (GCS) taken on admission and patients were classified as GCS of 13-15, 9-12 and 3-8 for mild, moderate and severe head injuries respectively. Furthermore, depending on the time elapsed before admission at the Accident and Emergency unit, head injury was also classified as acute (less than 72 hours) or chronic (greater than 72 hours) and whether they were open or closed.

3. RESULTS

A total of 3282 patients were admitted during the study period of whom 428 (13.0%) had head injuries. There were 342 (79.9%) males and 86 (20.9%) females with males out-numbering females by a ratio of 3.9:1. Their ages ranged from 1 to 77 years with a mean of 29.75 (SD=15.52) years, with those in the 21- 30 years age group being the majority (n=145, 33.8%), while the least were those between 71-80 years (n=3, 0.7%) as shown in Fig. 1. Road traffic accidents (RTAs) were the most common cause of injury accounting for 307 (71.7%) patients, with an overwhelming majority being vehicular accident (n=215, 70.0%)

(Table 1). Eighty-eight (28.7%) of RTAs were related to motorcycle injuries affecting motorcyclists (55; 62.5%), passengers (13; 14.8%) and pedestrians (20; 22.7%) (Table 2). A majority (n=120, 93.0%) of those involved in vehicular accident as drivers or passengers were not wearing seatbelts at the time of the accident (not shown in table), while none of those involved in motorcycle injuries were wearing helmets as usual. Pedestrians knocked down by motor vehicles while walking on the road or crossing it was the most common mechanism of head injury (n=98, 32.1%) as shown in Table 3.

Table 1. Aetiology of head injury

Aetiology of Injury	Frequency	Percentage
Road Traffic Accidents	307	71.7
Assaults	46	10.7
Falls	37	8.6
Gunshots/Bombings	20	4.7
Unknown	11	2.6
Industrial accidents	4	0.9
Home accidents	3	0.7

Table 2. Etiology of RTA's

Etiology of RTA's	Frequency	Percentage
Motorcycle		
Rider	55	62.5
Pedestrian	20	22.7
Passenger	13	14.8
Motor Vehicle		
Rider	79	36.6
Pedestrian	77	35.7
Passenger	59	27.7
Bicycle		
Rider	4	100

Table 3. Mechanism of RTA's

Mechanism	Frequency	Percentage
Pedestrian knocked by MVH or MC	98	32.1
MC or MVH who lost control	52	16.9
MC knocked by car	40	13.0
Car-to-car head on collision	34	11.1
Burst or removed tire	21	6.8
MVH or MC colliding with a stationary object/vehicle/animal	20	6.5
Car-to-bike or bike-to-bike head on collision	15	4.9
Drove into a ditch	15	4.9
Somersaulted after losing control	9	2.9
Unspecified mechanism	3	0.9

Table 4. Types of fracture

Type of fracture	Frequency	Percent
Skull	27	26.5
Multiple	22	21.6
Tibio-fibular	20	19.6
Femoral	12	11.8
Mandibular	6	5.9
Radial	5	4.9
Humeral	5	4.9
Pelvic	4	3.9
Clavicular	1	1.0

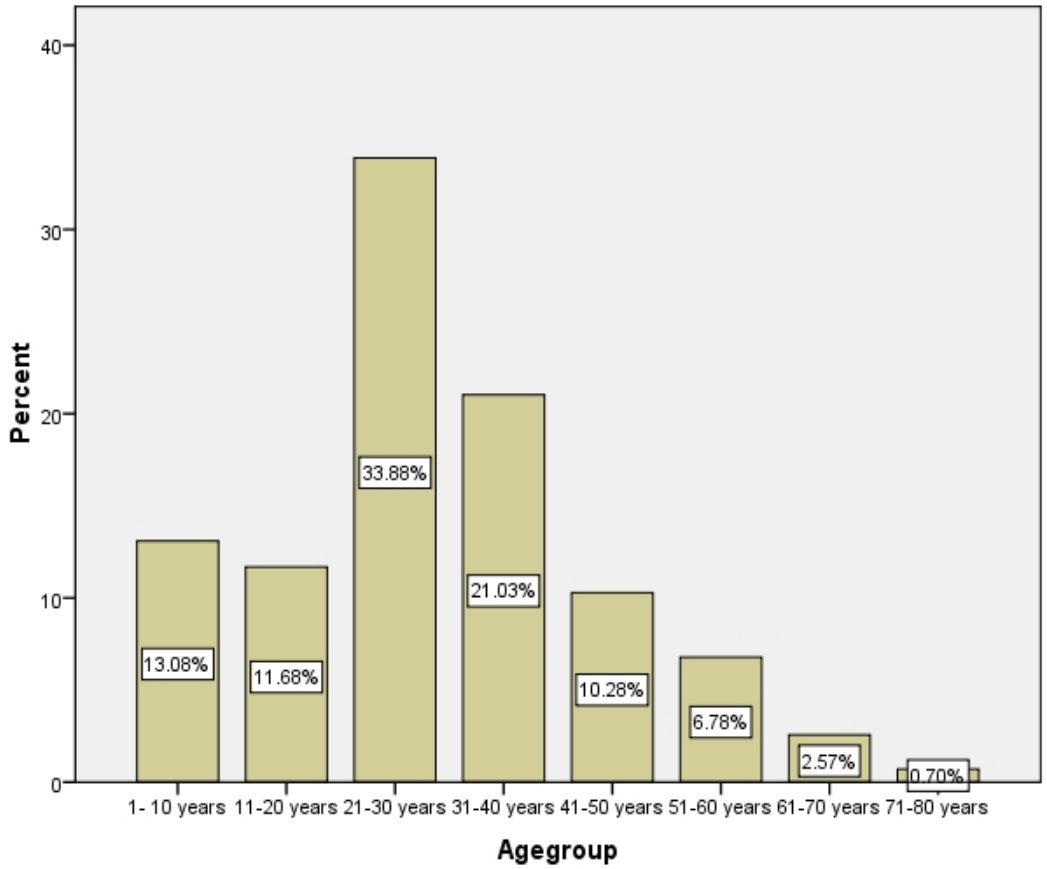

Fig. 1. Affectation of head injury according to age group

Two-hundred and forty four (57.0%) had associated injuries along with head injury, of which fractures were the majority (n=93, 21.7%) and with skull fracture being the most common (n=27, 26.5%) as shown in Table 4. Lacerations, abrasions and other blunt injuries also made up a significant portion of injuries (n=52, 12.1%), followed by intracerebral/subdural hemorrhages (n=13, 3.0%) and neurological deficits such as hemiplegia and convulsions (n=13, 3.0%). Thirteen (3.0%) sustained spinal cord injury (SCI), respiratory system diseases was reported in few (n=6, 1.4%) while number of deaths recorded was seven

(1.6%). Bleeding from the craniofacial orifices was observed in 26 (6.5%) of patients. Ninety-Six of the patients suffered poly-trauma (22.4%). Prior to the accident, a few (n=22, 5.1%) had taken alcohol.

The Glasgow coma scale indicated that majority of the patients suffered mild head injury (277, 64.7%), 58 (13.6%) suffered moderate head injury, while 93 (21.7%) sustained severe head injury as shown in Fig. 2. When the duration was taken into consideration, many (181, 42.3%) sustained acute mild closed head injury, 55 (12.9%) patients sustained acute moderate closed head injury and 57 (13.3%) patients had acute severe closed head injury. Out of the 7 that lost their lives, 4 resulted from acute severe open head injury (57.1%), while 3 (42.9%) suffered acute severe close head injury. A total of 194 (45.3%) patients presented with history of loss of consciousness (LOC). The duration of loss of consciousness was < 1 hour in 46 (23.6%) patients, 1 hour to 24 hours in 62 (31.8%) patients and > 24 hours in 87 (44.6%).

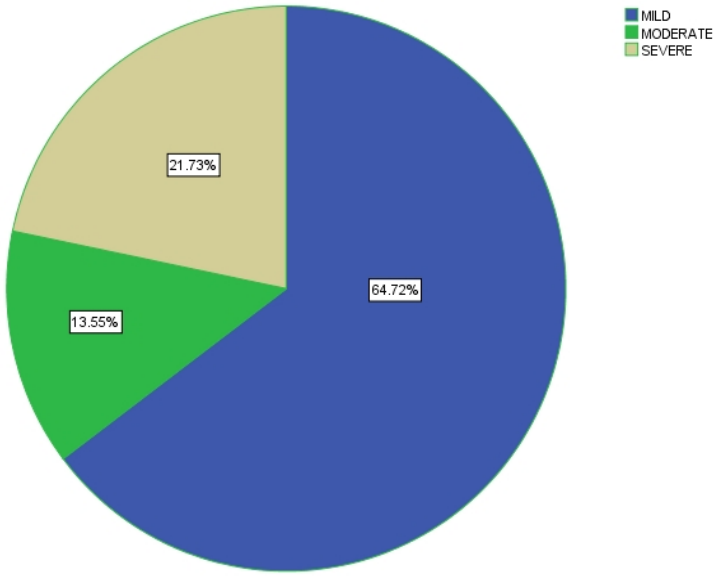

Fig. 2. Types of head injury

Pedestrian motor vehicle and motorcycle injury was more likely to cause head injury in the first 10 decades of life compared to other age groups ($p<0.001$). Also, fall was more likely to cause head injury in the first decade of life compared to other age groups ($p<0.001$). Assaults were also more common among those in the mid-age group (21-30 years) than in other age groups ($p <0.001$). Females involved in RTA were most likely to be passengers than riders or pedestrians ($p<0.001$). An overwhelming majority (16, 72.7%) of those who had abused substances had lost control of their vehicle than any other mechanism of RTA ($p<0001$).

4. DISCUSSION

Globally, head injury has become a public health concern and should rightly be treated as an emerging epidemic. The devastating consequences of head Injury to the victims and their families are manifold and multifaceted. This ranges from residual disabilities, handicap and

poor quality of life on the part of the victim to emotional and psychological trauma on the part of the caregivers. Furthermore, in cases where the bread winner is involved, the socioeconomic effects are burdensome especially in developing countries where social support is scarce or non-existent.

The majority of patients in our study were young adults with males outnumbering females. These findings are comparable with previous studies which reported high male to female ratio [4,5,8,12,19] and a preponderance of head injuries in the young adult age group [4,5,7]. Interestingly, the peak age incidence was lower in the US (15 - 19 years) where majority resulted from vehicular crashes [1]. In Nigeria as in other African settings, males are the bread winners, while young adulthood represents the economically active age group. They thus exhibit high activity levels and participate in high-risk activities such as taxi driving and commercial motorcycle riding (Popularly called okada in Nigeria). Furthermore, in the past few years terrorist activities and ethnic conflicts have been on the rise, with males and young adults being the major players. An urgent public policy response is therefore required, considering that the economically productive age-group was mostly involved due to its attendant economic loss to the family and the nation.

RTA's have been reported to be the commonest cause of head injuries in most studies as supported by the present study [4,5,6,8,12,19]. It is however at variance with other studies which reported fall as the commonest cause of head injury [1,10]. This is plausibly due to differences in geography, availability of good road network, teaching and maintaining proper road safety standards etc. Also majority of those involved do not observe the use of protective devices such as seat belts (93%) and crash helmets (none). In Nigeria, the peculiar scenario is for drivers to wear seatbelts on sighting road safety officials, while it is impossible for passengers to wear them because majority of taxis are overloaded (carrying two passengers in the front seat and four at the back for the taxis). Adequate and conscientious education from road safety officials on the importance of donning seatbelts while driving will go a long way to improve driver's attitude towards wearing seatbelts.

In our study as in others both internationally [15] and regionally [5,16] motor vehicle accident were the leading cause of RTAs. This finding is at variance with a local study by Emejulu et al. [9] which reported motorcycle accident as the commonest cause of RTAs. A ban was placed on commercial motorcycle activities seven months prior to the completion of this study within the metropolis and probably accounts for this discrepancy. We found assault to be the second common cause of head injury, a finding which agrees with those of Muyembe and Suleman [13], Thornhill et al. [14] and Chalya et al. [5] This is contrary to other studies which have reported falls, tending to affect extremes of age as the second common cause of head injury [4,11,12]. High incidence of head injuries due to assault in this study is not surprising with the upsurge in interpersonal, ethnic and terrorism related violence within and around the study area. Moreover, majority of the incidence of head injury among those in the first decade of life was pedestrian related and falls, a finding which agrees with Emejulu et al. [9] and Sharma et al. [16]. This is worrisome and shows a lack of conscientiousness, negligence and poor supervision from responsible adults to young ones who are likely to make poor and irrational judgements.

Pedestrians knocked down by motor vehicles were the most common mechanism of RTAs in this study, with children (1-10 years) and young adults (21-30 years) being the majority. Whereas Durkin et al. [20] has shown that children between 6-10 years had the peak incidence of involvement in pedestrian road traffic accidents, the preponderance of young adults in this study is thought provoking. Several reasons ranging from low socioeconomic

status [21]; street hawking and trekking to school [22]; walking/playing at roadside and working in road side shops; risky behaviour and apparent lack of inhibition probably related to immaturity of cognitive function, inaccurate sensory and physical coordination in children [23,24] have been adduced for the involvement of children in pedestrian RTAs.

For the young adults, over confidence, lack of patience, poor judgements and road side hawking may be plausible reasons for their involvement in pedestrian related RTAs. It should be noted that fifty-two (16.9%) of vehicular accidents was due to loss of control of which several victims could have been young adults going about their daily activities. It may also be that with the increase development of the rural areas, leading to widespread road construction several of them including the young adults are not conversant with how to negotiate and cross the roads. While most studies both locally and internationally did not lay much emphasis on mechanism of RTA, it is imperative to bring these to limelight in studies focusing on aetiologies of head injury. This will provide substantial evidence on which area of road safety education and accident prevention to focus on for relevant government and non governmental agencies.

While putting blame on parents, children, socioeconomic, motorists and cognition for pedestrians' accident, a social dimension should also be laid bare. Majority of the roads in our country are constructed without shoulders or pedestrian walk way and functioning street lights; and even where available, most pedestrians do not observe street lights thus exposing them to the dangers associated with sharing the road with vehicles and motorcycles. In Nigeria, road safety officials rarely or never check the level of alcohol in the blood of those who exceed the legal speed limit or violate other traffic rules. It is therefore not surprising that a majority of victims who were intoxicated with alcohol before the accident (16 out of 22), had lost control while driving. Alcohol has been shown to be a contributing factor in approximately 40% of all severe head injuries [8,12]. Regular and prompt assessment of traffic offenders' cognitive function and toxicity level should be evaluated as part of traffic monitoring and accident prevention by relevant bodies.

Surprisingly, the mortality rate in our study was very low as compared to figures both locally and regionally. While Emejulu and Malomo [4] and Emejulu et al. [9] have reported a mortality rate of 19.8% and 5.5% respectively in Nigeria, a figure of 11.2% and 56.2% has been reported in Kenya and Tanzania respectively [5,25]. Wherefore some of the other studies were cross sectional, while others followed up on patient to the point of discharge, ours was retrospective and did not take into account of the mortality rate of those who were transferred to the ward. Furthermore, other factors that could lead to high mortality rate such as severity of head injury (majority had mild closed head injury), extreme of age and associated extra-cranial injuries were low in this study.

5. LIMITATION

This study was carried out in a single referral centre in Nigeria, and therefore limits the generalization of its findings. However, considering that this referral centre is one of the few tertiary hospitals and serves more than six states within the region the findings of this study is representative of the risk factors for head injury in North-Central Nigeria. Furthermore, there were several confounders which were not controlled for e.g. whether the driver were within their speed limit as at the time of the accident, whether there are appropriate pedestrian road signs where pedestrian accident occurred, if the accidents occurred on bad roads and whether children were under proper supervision at the time of the accident etc. This probably affected the results, inferences and conclusions that would have been drawn

from the study. Future prospective studies that will be able to include these confounders are necessary to conclusively identify risk factors for head injury in our environment.

6. CONCLUSION

In summary, the risk factors for head injury in our environment were the male gender, driving a motor vehicle, being in the 1-10 years and 21- 30 years age group respectively, pedestrian and ethnic/communal clashes and violence. Road traffic accidents remain the major etiology factor for head injury, with young adult males in the productive age group being more susceptible. While the morbidity from head injury in our environment was much higher than those in developed countries, mortality rate was almost at par with those but lower than reports from ours and other developing countries. The impact of head injury to the productive age group calls for concerted public health efforts to prevent economic loss to the nation. This study also exposes poor attitude to wearing seatbelts and helmets, poor supervision from adults on children, ineffectiveness and inefficiency of relevant road safety parastatals and poor cum bad road construction by the government which adds to the burden of head injury in our environment.

Also, in addition to proper road construction to include pedestrian walkways, public education on various road signs and streetlights will go a long way to preventing pedestrian accidents. These is a need for better trauma centers and optimally equipped health facilities to offer prompt care to victims after the injury has occurred so as to reduce mortality rates.

ETHICAL APPROVAL

We hereby declare that the study protocol have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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