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Aetiology of Traumatic Brain Injury in Bauchi, North East Nigeria

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Abstract

Background: Trauma is the leading cause of death among teens and youth in the developing countries. Head injury accounts for nearly one-third of all trauma deaths and is the leading cause of disability and economic loss. The aim was to study the aetiological pattern of head injury and to highlight the burden of the aetiological factors in our setting.

Materials and method: A prospective study on patients admitted with traumatic brain injury at Abubakar Tafawa Balewa University Teaching Hospital, Bauchi, a tertiary hospital located in North-eastern Nigeria with neurosurgical services being rendered to her primary and referred patients. Data were collected using structured proforma and were analysed using SPSS version 20 software. Descriptive statistics expressed in mean, frequency and percentages.

Results: Five hundred and thirty-seven patients were recruited into the study. The mean age of the patients was 37.02 ± 17.21. Most of the study population were below 50 years of age (80%) with male preponderance of 5:1. Road traffic accident-related head injury and gunshot related head injury accounted for 85% and 2% respectively. Fifty percent of the study population were car occupants while pedestrians constituted 11%.

Conclusion: Road traffic accident is the leading cause of the head injury in our environment with motor-vehicular related accidents being the most common. The productive age group are severely affected with economic tolls on the family and the nation. Concerted public health efforts are required to prevent/reduce the incidence of head injury.

Keywords: Brain injury, Trauma, Road traffic accident

Introduction

Head injury has been defined as a physical damage to the brain or skull caused by external forces or agents (1, 2). Among all traumas, head injury is one of the leading causes of death in people below 25years accounting for one-third of all trauma deaths. The rate of death caused by head injury in developed and developing countries in the first month of injury rises to 21% and 50% respectively (3). Trauma generally is the leading cause of death among teens and youth in the developing countries, likewise the leading cause of disability and economic loss (4).

Brain damage following traumatic brain injury (TBI) can be primary or secondary brain injury. Primary injury is the injury sustained at the time of trauma; laceration, contusion, concussion etc., while secondary brain injury ensues within few hours to several days after the primary injury which includes; brain swelling and hematoma (5). Since the cranium is an unyielding structure, compensatory expansion of the cranium is not possible wherever there is increase in any of its components. Therefore, any increase in the components in an unyielding cranium leads to raised intracranial pressure and this pressure decreases the cerebral blood flow and oxygen level with accumulation of cerebral waste metabolites (6). The consequences of the above includes: feature of raised intracranial pressure, altered/loss of consciousness and death (7).

Several aetiological factors have been identified in head injury globally, the most common causes include road traffic accidents, falls and assaults (8,9). Other recognized causes are violence, sports and recreational related injuries (8). There is a dearth of data on epidemiology and aetiology of head injury in Nigeria, most especially in the North-East geopolitical zone of the country. Elucidation and descriptive data on aetiology of head injury in this environment will provide critical perspectives into the preventive measures that could be adopted.

The aim of this study was to determine the various causes of head injury in our environment with the goal of highlighting the burden the etiological factors possess.

Materials and methods

This was a prospective study on patients admitted with traumatic brain injury who met the inclusion criteria. Abubakar Tafawa Balewa University Teaching Hospital, Bauchi is a tertiary hospital located in the North-eastern part of Nigeria with neurosurgical services being rendered to her primary and referred patients from within and neighbouring states. The study was approved by the ethics committee of our institution (ATBUTH REC-0024/2019), and the principles of the Helsinki declaration were observed during data collection.

The study included all patients admitted with head injuries managed between September 2018–August 2019. Data was acquired from patients, parents/ caregivers using structured questionnaire. The variables collected for the study included patients' age, gender, aetiology, time of presentation, the severity of injury (based on Glasgow coma scale, GCS), radiological findings, treatment offered and the outcome using Extended Glasgow Outcome Score (GOSE). The severity category was based on the assessment of GCS. A GCS Score of 13 - 15 was regarded as mild TBI, GCS 9 - 12 as moderate TBI, and GCS ≤8 as severe TBI.

Data were analysed using SPSS Version 20 software and expressed as Mean SD, frequencies, percentages.

Results

A total of five hundred and thirty-seven patients were recruited into the study. The mean age of the patients was 37.02 ± 17.21 years. The demographic data of the patients is shown in Table 1. Majority of the patients (80%) were below 50 years. Patients between 21-30years of age were the majority among the study groups (20%). The study had male preponderance with male-female ratio of 5:1.

Table 1: Demography of the patients

Variables	N (%)
Age range	
0-10yrs	64 (12)
11-20yrs	68 (12.7)
21-30yrs	108 (20)
30-40yrs	101 (18.8)
41-50yrs	91 (17)
51-60yrs	49 (9)
61-70yrs	56 (10.5)
Gender	
Male	451 (84)
Female	86 (16)
Time of presentation	
<12hrs	401 (75)
>12-24hrs	80 (15)
>24hrs	56 (10)
Mode of transportation	
Tricycle	54 (10)
Bus	21 (4)
Car	411 (76.5)
Ambulance	51 (9.5)
Mode of presentation	
Referral	87 (16)
Primary	450 (84)

Majority of the patients (84%) were referred primarily to the facility while 75% of all the patients presented within 12hrs of their injuries. The commonest mode of transportation of the patients to our facility was via commercial bus (76%) while ambulance accounted for 9.5% (Table 1).

The severity of head injury across the age groups is shown in Table 2. The age group with the highest number of mild head injury was 41-50 years (24%), moderate head injury was 21-30yrs (33.5%) while severe head injury was 51-60years (13.5%).

Table 2: Cross tabulation between Age range and Glasgow Coma Score of patients with head injury

Age range	Glasgow coma score		
	Severe (3-8) N=134 (%)	Moderate (9 12) N=223 (%)	Mild (13-15) =180 (%)
0-10yrs	6 (4.5)	26 (12)	32 (18)
11-20yrs	26 (19)	21 (9.5)	21 (11.5)
21-30yrs	17 (13)	75 (33.5)	16 (9)
31-40yrs	16 (12)	43 (20)	42 (23)
41-50yrs	16 (12)	32 (14)	43 (24)
51-60yrs	18 (13.5)	10 (4.5)	21 (11.5)
61-70yrs	35 (26)	16 (7)	5 (3)
Total	134(25)	223(41.5)	180(33.5)

Figure 1 shows the distribution of the severity of the head injury among the patients. Mild head injured patients were 34%, Moderate head injured were 41% and severe head injured patents were 25%.

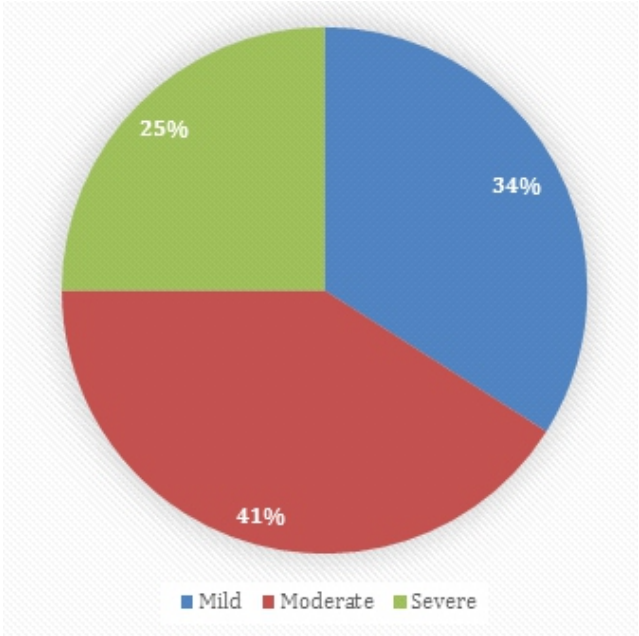

Figure 1: Severity of the head injury based on Glasgow Coma Scale

Road traffic accident-related head injury accounted for 85% of all cases in this study while assault accounted for 6%. Majority of the road traffic accident head injury patients were vehicular passengers (40%) while pedestrians represented 11% (Table 3).

Table 3: Pattern of Aetiology of traumatic brain injury

Variables	RTA	Fall from height	Fall into depth	Assault	Gun shot
N (%)	456 (85)	21 (4)	16 (3)	33 (6)	11 (2)

Categorization of Road Traffic Accident among the Patients

Variables	Pedestrian	Motorcycle rider	Motorcycle passenger	Car driver	Car passenger
N (%)	50 (11)	88 (19.3)	85 (18.6)	49 (10.8)	184 (40.4)

Figure 2 shows the incidence of the different aetiological factors of TBI across sex. Males constituted the majority in each group.

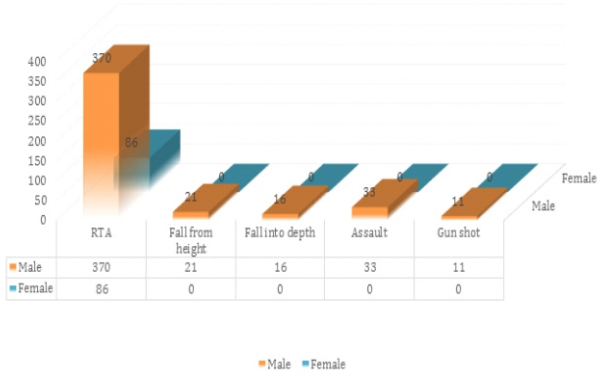

Figure 2: Aetiological pattern across gender

Figure 3 depict the incidences of various causes of head injury across all age groups; road traffic accident-related brain injury was seen across all age groups while fall from height related brain injury was seen between 11- 40 years of age.

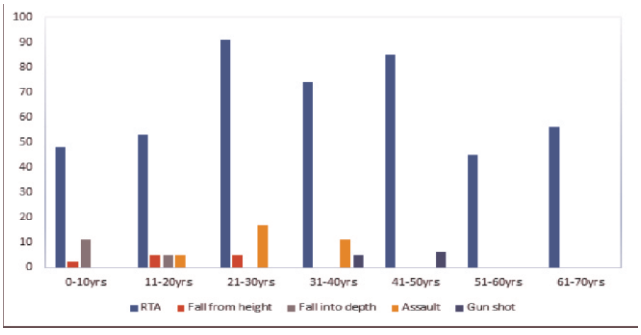

Figure 3: Incidence of Aetiology across Age-ranges

The relationships between severity of head injury and various aetiological factors is shown in Table 4.

Road traffic accident was the commonest cause of head injury across the various severity of head injury.

Table 4: Cross tabulation between Aetiology and Glasgow Coma Score

VARIABLES	Glasgow Coma Scale (GCS)		
	Mild TBI (13-15)	Moderate TBI (9-12)	Severe TBI (3-8)
Aetiology			
RTA	159	186	111
Fall from height	16	5	0
Fall into depth	0	10	6
Assault	5	22	6
Gun shot	0	0	11
Total N (%)	180 (33.5)	223 (41.5)	134 (25)

The outcomes of the head injury with regards to the various aetiological factors involved in our study populations are presented by Table 5. Over 90% of the death had road traffic accident as the underlying cause. Similarly, across all the outcomes observed, road traffic accident still remained the leading underlying cause of head injury.

Discussion

One of the leading causes of disability and death in young people is head trauma, a major problem in the society. However, it is a preventable scourge in the health system (10). Brain damage is equally the leading cause of death in over 50 to 70% of trauma cases (11). Head injury has been documented to be most prevalent among males, expectedly so in our study. The high number of males is in conformity with studies conducted elsewhere (12-14). The ratio of men to women is 5:1 in this study while similar ratio has been reported in different studies from other climes (15, 16). These findings may be attributed to more adventurous nature of men and their participation in daily living activities outside their environment.

The young adults were the most affected with brain injury. This is in agreement with previous studies (12-14).

Table 5: Aetiological patterns and outcomes among the TBI patients

VARIABLES	Glasgow Outcome Score - Extended (GOSE) at Discharge							
	Death	Vegetative	LSD	USD	LMD	UMD	LGR	UGR
Aetiology								
RTA	50	-	-	6	59	31	85	225
Fall from height	-	-	-	0	0	0	0	21
Fall into depth	-	-	-	0	0	5	0	11
Assault	-	-	-	0	16	0	0	17
Gun shot	5	-	-	0	6	0	0	0
Total N (%)	**55(10)**	**0(0)**	**0(0)**	**6(1)**	**81(15)**	**36(6.7)**	**85(15.8)**	**274(51)**

VARIABLES	Glasgow Outcome Score - Extended (GOSE) at Discharge							
	Death	Vegetative	LSD	USD	LMD	UMD	LGR	UGR
Aetiology								
RTA	-	-	-	-	6	74	11	315
Fall from height	-	-	-	-	-	-	-	21
Fall into depth	-	-	-	-	-	-	-	16
Assault	-	-	-	-	-	11	-	22
Gun shot	-	-	-	-	-	6	-	-
Total N (%)	**0(0)**	**0(0)**	**0(0)**	**0(0)**	**6(1.3)**	**91(18.8)**	**11(2.3)**	**374(77.6)**

This is because they constitute majority of the work force and engage more in adventurous activities. Most of the cases of head injury documented in this study were due to road traffic accidents (85%). This finding is consistent with the rising incidence of road traffic accidents in our country and other parts of Africa (13, 14,17, 18) and other findings outside Africa (19, 20). Road transport remains the major mode of transportation in Nigeria but it is still associated with limitations such as bad roads, poor vehicle's maintenance culture, poor adherence to safety road use. Few reports from developed nations showed fall as the leading cause of head injury which were at variance with findings in our locality and region. This disparity could be due to lower road traffic accident rates, good road networks, well-coordinated transport system and strict adherence and enforcement of traffic rules in the developed countries as against what is obtainable in our environment.

The main carrier of people and goods within and outside Nigerian states are buses, cars, motorcycle and tricycles. This study demonstrated that over 50% of TBI were due to motor-vehicular related injury, about 40% were motorcycle related injury and 11% were pedestrian related. These findings were similar to reported by Chandra and colleagues in a study where about two-third of road traffic related injuries were motor-vehicular related and one-third were pedestrians related (21). These should give critical insight into the burden and preventive measures and interventions to mitigate this problem in our setting. Policies should be put forward to reduce the risks of road traffic incidents most especially for the vulnerable population in our society. Among the policies should include; enforcement of traffic rules, construction of overhead bridges across major roads, raising the legal age of driving, enforcement of safety measure on all imported vehicles including airbags and anti-lock braking system. It should be noted that the above measures have worked well in developed nations. However, the applicability of such and enforcement of the preventive measures remain a herculean task for the government. Notwithstanding, governments of the low-middle income economies must devote their resources maximally to reduce the burden of road traffic related morbidity and mortality.

It is not enough to blame children, parents, care givers, motorists and illiteracy for the high rate of RTA. Most of the roads in our country were constructed without shoulders or walk way for pedestrians and with no street lights. All these factors contribute to the high incidence of road traffic accidents in our environment.

Fall from heights was the second leading cause of head injury in our study. This is in keeping with many previous studies in our country and outside the country (13, 14, 17, 18). However, this finding is at variance with some studies reported in developed countries that have shown fall as the leading cause of head injury (22, 23). This difference could be explained by lack of enforcement of traffic rules and poor road network that had worsened the incidences of road traffic accidents, thus relegating head injury due to fall to second place in developing countries (24). It should be emphasized that some studies have reported assault as the second most common cause of head injury (25-27). Although assault is the third most common aetiology in this study and constituted only 6%, the incidence tends to rise in our environment because of upsurge in inter-personal conflicts, banditry and terrorism.

The fall into depth in this study were majorly fall into dug-wells and this finding was only seen in patients that were within the first and second decades of their lives. While the first decade of life accounted for about 70% of all cases, patients in the second decade of life constituted the remaining 30 %. Adeolu et al. (24) and Emejulu et al. (28) reported similar findings with our study. These findings are worrisome and usually due to negligence and poor parental care.

The mortality rate in this study was 10%, this is within the range reported in previous studies from another region in our country where 5.5% was reported by Emejulu et al. (13) and 19.8% was reported by Emejulu and Malomo (29). Similar and higher mortality rate have also been reported in studies outside our country but within Africa. A mortality rate of 11.2% and 56.2% have been

reported in Tanzania and Kenya respectively (27, 30).

Conclusion

Road traffic accident is the leading cause of the head injury in our environment as seen in this study. The productive age group are severely affected with economic tolls on the family and on the nation. There need to be some concerted public health efforts to prevent or reduce the incidence of head injury and in turn prevent the economic loss to the nation. The key to achieving above will require; provision of social infrastructure, well organized public transport system, effective/enforcement of traffic safety rules and constant public health awareness.

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