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Traumatic brain injury from motor vehicular crashes: Drivers versus passengers

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Abstract

Background: During our school age we were told drivers disappear during vehicular crashes. When we became teenagers we saw crashes where drivers sustained injuries and some even died. However, the myth continued when we observed arguments and sometimes exchange of insulting words between drivers and passengers due to reckless driving on our roads. We decided to study the outcome of traumatic brain injuries in these groups of people as majority of crash victims sustain traumatic brain injuries. **Objectives:** To study the outcome of traumatic brain injuries between drivers and passengers from motor vehicular crashes. **Methods:** It was a prospective, observational and comparative studies between drivers and passengers who were managed in our center for traumatic brain injuries from motor vehicular crashes from August 2010 to July 2016. Data were collected using structured proforma which was component of our prospective data bank that was approved by our ethics committee. The data was analyzed with Environmental Performance Index info 7 software. **Results:** There were 102 patients in the study. Drivers were 34 and passengers were 68. Males were 79. The average age was 33.44 years. There was no significant differences between drivers and passengers in terms of age, severity of injuries, treatment outcome and length of hospital stay. **Conclusion:** There was no significant difference in severity of injuries, treatment outcome and length of hospital stay between drivers and passengers who sustained traumatic brain injuries from vehicular crashes. The complacency of the drivers and assumption by people must have led to the notion of drivers disappearing.

Keywords: Drivers, Motor vehicular crashes, Outcome, Passengers, Traumatic brain injuries.

INTRODUCTION

Motor vehicular crash leaves on its trail destruction of properties, injuries and deaths. Traumatic brain injury incidence in Europe was estimated at 500/100,000 population and 200/100,000 hospital admission [1,2]. Motor vehicular accidents remains the most common cause of traumatic brain injuries in many countries [3-6]. Motor vehicular collisions cause traumatic brain injuries in 3-5 million people each year [7]. During our school age we were told that drivers 'disappear' whenever vehicular crash occurred. As we were growing up we saw many drivers sustained injuries and some died during vehicular crashes. However, as we started travelling from one city to another we saw reckless driving from some vehicular drivers. We heard passengers asking drivers 'Do you have photocopy of your life? Have you taken *kaikai* (local gin) this morning? Do you think you are conveying grass somewhere?' Others would advise the drivers: 'Please take it easy driver, we are not in a hurry'. Some drivers reacted negatively and even insulted passengers: 'Are you teaching me my job? I have been driving for over ten years.' 'Do not insult yourself. If you are a big man, why not drive yourself.' 'Do not allow me to insult you here'. We decided to study the outcome of traumatic brain injuries from vehicular crashes among vehicular occupants, comparing drivers and passengers since most victims of road traffic accident sustain traumatic brain injuries [8-10].

MATERIALS AND METHODS

Study design

It was a prospective, observational and comparative study among traumatic brain injuries patients who were occupants of motor vehicles that were involved in crashes comparing drivers and passengers.

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Setting/approval

It was carried out in a young neurosurgical center in a developing country. The study was part of our prospective data bank that was approved by our ethics and research committee.

Inclusion criteria

The study included occupants of motor vehicles who sustained traumatic brain injuries from crashes. Those who were admitted, treated, discharged and followed up to three months post-injury.

Exclusion

All vehicular occupants who were brought in dead were excluded. Others excluded include those who were not admitted, and those involved in crashes but were not vehicular occupants. Patients who discharged themselves against medical advice and those who ran away from the hospital while being treated were excluded. Patients we could not ascertain their states of health three months post-injury due to failure to attend out-patient clinic and we could not reach them or their relatives on phone, and those with traumatic spinal injuries.

Protocol

Patients were resuscitated in accident and emergency using Advanced Trauma Life Support protocols. Intravenous (i.v.) Normal saline 1 liter was given to adults 8 hourly while children were given 4.3% Dextrose/1/5 saline based on their weight. Foley's catheter was passed in unconscious patients for fluid monitoring. Intramuscular (i.m.) Paracetamol 900 mg 8 hourly was given to adults, while children received 15/kg/dose. Those with open wound had i. m. 0.5 ml Tetanus toxoid. They also had i. v. Ceftriaxone 1gm daily for adults and 50-100 mg/kg for children. For dose desaturating in room air, Oxygen was given via face mask, nasal prongs or via endotracheal tube, aiming at ≥95% saturation. Those with posttraumatic seizure were given Phenytoin infusion at 14 mg/kg in 100 ml Normal saline over one hour as loading dose and then 5-10 mg/kg once daily as maintenance dose. Computerized tomography (CT) scan of the brain, full blood count, serum electrolyte/urea/creatinine, urinalysis, and random blood sugar were done. Those with severe head injuries (Glasgow Coma Score ≤8) were admitted in intensive care unit (ICU) while others were admitted in the wards. Those who needed surgical intervention were operated and admitted accordingly. For those who could not feed via oral route, we commenced high energy/high protein diet on third to fifth day post-injury. The diet was constituted with pap 500 ml, two tablespoonful powdered milk, two tablespoonful soya bean powder, one tablespoonful cray fish powder, and one tablespoonful red oil. They were given 5-6 times daily via nasogastric tube. The daily fluid requirement of each patient was calculated and factored into the diet. Intravenous and intramuscular routes were stopped and oral drugs given via the nasogastric route. Treatment continued in the wards until discharged. They were followed up in surgical out-patients clinic. The patients were assessed at three months post-injury. If they failed to attend clinic at three months post-injury, we called the patients or their relatives to ascertain their conditions.

Data were collected using structured proforma which was component of our prospective data bank that was approved by our ethics and research committee. The history, physical findings, including their Glasgow Coma Scale (GCS) scores, CT scan findings (for those who could afford it) and other investigative findings were documented in accident and emergency. The GCS prior to surgery, the procedure, and the surgical findings were documented in the theater. The progress of the patients and length of hospital stay were documented in the wards. Their Glasgow Outcome Scores were documented in the out-patient clinic, three months post-injury.

Data were analyzed using Environmental Performance Index (EPI) info 7 software (Center for Disease Prevention and Control, Atlanta, Georgia, USA). We use the visual dashboard component for the analysis. Mean was used for continuous variables such as age. Frequency/chart were used for frequency of variables such as gender. The MXN/2X2 was used for univariate analysis, while its advanced component was used for multivariate analysis. At 95% confidence interval P <0.05 was considered significant.

RESULTS

One hundred and two patients were studied. There were 68 passengers and 34 drivers. Males were 79 while females were 23. The average age overall was 33.44 years with range of 1-71 years. Patients aged 40 - 50 years had the highest frequency, 34 patients, while the bulk of the patients were between 20 and 50 years, 80 patients, table 1. Among the passengers, the average age was 32 years with a range of 1-71 years, while in drivers, the average was 36.32 years with a range of 18 - 65 years. There was no significant age difference between passengers and drivers, P = 0.4399. Based on severity of injury, there were 65 mild, 20 moderate, and 17 severe traumatic brain injuries. There was no significant difference between the two groups, table 2. Fifty nine of the patients afforded CT scan of the brain, 18 drivers and 41 passengers. Among those who did CT scan, the most common pathology was contusions/intracerebral hematoma, table 3. When we compared CT findings, there was no significant difference between drivers and passengers in terms of CT pathologies, P = 0.7109.

The overall favorable outcome (≥4) was 93.13% with mortality of 4.9%, table 4. The favorable outcome among passengers was 89.70%, while drivers had 100% favorable outcome, table 5. There was no significant difference in outcome between passengers and drivers, P = 0.2051. The overall mean hospital stay was 18.71 days with a range of 1-112 days. Among the passengers, the mean hospital stay was 18.49 days with a range of 1-112 days. For drivers, the mean hospital stay was 19.15 days with a range of 1-74 days. There was no significance difference in hospital stay between drivers and passengers, P = 0.1781.

Table 1: Age group frequency

Age group	Number	Percent (%)
0 - <10	4	3.92
10 - <20	7	6.86
20 - <30	29	28.43
30 - <40	34	33.33
40 - <50	17	16.67
50 - <60	6	5.88
60 - <70	3	2.94
70 - <80	2	1.96
Total	102	100

Table 2: Position VS Severity

Position	Mild (%)	Moderate (%)	Severe (%)	Total (%)
Driver	21 (61.76)	9 (26.47)	4 (11.76)	34 (100)
Passenger	44 (64.71)	11 (16.18)	13 (19.12)	68 (100)
Total	65 (63.73)	20 (19.61)	17 (16.67)	102 (100)
P = 0.3695				

Table 3: CT findings

CT findings	Number	Percent (%)
Cerebral edema	3	5.17
Extradural hematoma	4	6.90
ICH/contusions	10	17.24
Multiple lesions	8	13.79
None	6	10.24
Diffuse axonal injuries	7	12.07
Subdural hematoma	9	15.52
Skull fractures	11	18.97
Total	58	100

Table 4: Severity VS Glasgow Outcome Score

Severity	GOS					
	1 (%)	3 (%)	4 (%)	5 (%)	≥4 (%)	Total (%)
Mild	0 (0)	0 (0)	4 (6.15)	61 (93.85)	65 (100)	65 (100)
Moderate	0 (0)	2 (10)	1 (5)	17 (85)	18 (90)	20 (100)
Severe	5 (29.41)	0 (0)	4 (23.53)	8 (47.06)	12 (70.58)	17 (100)
Total	5 (4.90)	2 (1.96)	9 (8.82)	86 (84.31)	95 (93.13)	102 (100)
P = 0.000						

Table 5: Position VS GOS

Position in vehicle	GOS				
	1(%)	3 (%)	4 (%)	5 (%)	Total (%)
Driver	0 (0)	0 (0)	2 (5.88)	32 (94.12)	34 (100)
Passenger	5 (7.35)	2 (2.94)	7 (10.29)	54 (79.41)	68 (100)
Total	5 (4.90)	2 (1.96)	9 (8.82)	86 (84.31)	102 (100)
P = 0.2051					

DISCUSSION

There were 102 patients with 79 males amongst them and majority were between the age of 20 and 50 years. Traumatic brain injury ravages the young males of the world. In their study of traumatic brain injury in the accident and emergency department of a tertiary hospital in Nigeria, Emejulu *et al* [11] found 79.2% males with 21-40 year old patients constituting over 50%. Jasper *et al* [12] in their study of the epidemiology of hospital-referred head injury in northern Nigeria, found that 79.9% were males and 20 – 40 year age group formed 54.46%. Jaja *et al* [13] in their own evaluation of demographics and etiological factors on intensive care unit mortality after severe head injury in Port Harcourt found males formed 73.2%; road traffic accident formed 84%, mean age was 31.2 years and mortality was 52.8%. The mortality and morbidity among our youths from road traffic accident have been due to active nature of males to provide for their families and high unemployment rate in our country with youths resorting to commercial driving as means of livelihood.

In terms of severity of injuries, treatment outcome and length of hospital stay, there was no significant difference between passengers and drivers. Majdan *et al* [14] in their study of traumatic brain injuries caused by traffic accident in five European countries, Austria, Slovakia, Bosnia, Croatia, and Macedonia, found that the largest subgroup who suffered traumatic brain injuries were drivers, 205 (30%) of 1557 patients with severe traumatic brain injuries. Passengers were 118 (17%). The intensive care unit outcome (percentage of survival) was 73% among drivers and 66% among passengers with lowest, 60% among pedestrian. There was no significant difference between all the groups. The long term favorable outcome among drivers was 55%, while that of passengers was 59%. There was no significant difference between them. If there is no significance difference between these two groupsas seen in our results and five European countries, why the argument and the insults amongst passengers and drivers. Two factors may be involved here. One is manner of communication with the drivers by the passengers or the effect of information overload on the drivers. According to Van K and Donald J [15] drivers are faced with many problem when driving in congested and overcrowded cities, specifically by having the senses overloaded by the vast amount of information that needs to be continuously processed such as traffic signs, traffic signals, information about detour, billboard and advertisement, horns, loud music from passing vehicles, vehicle changing lanes, pedestrian, frustrating traffic hold ups and so on. These could cause rising anger in drivers with resultant nasty response to worried passengers. The second could be the effects of alcohol on the

brain of the drivers. Plato [16] said "He was a wise man who invented beer". Benjamin Franklin [17] said "Beer is proof that God loves us and wants us to be happy". However, Homer [18] noted 'The wine urges me on, the bewitching wine, which sets even a wise man to singing and to laughing gently and rouses him up to dance and brings forth words which better not spoken'. The 'words which better not spoken' was corroborated by Plato [19] when he said "When a man drinks wine he begins to be better pleased with himself, and the more he drinks the more he is filled with full of brave hopes, and conceit of his powers, and at last the string of his tongue is loosened, and fancying himself wise, he is brimming over with lawlessness, and has no fear or respect, and he is ready to do or say anything". This is the likely aspect of alcohol effect on the drivers that triggers the arguments and insults in the vehicle. One of the likely route to accident was from Plautus [20] quote "This is the great evil in wine, it first seizes the feet; it is a cunning wrestler". These were supported by findings of Badanachi et al [21] that alcohol decreased the frequency of current-evoked action potentials in the lateral orbitofrontal cortex cells with accompanied modest hyperpolarization leading to disinhibition, behavioral inflexibility and poor judgement. In their study of the prevalence of alcohol consumption among commercial drivers in Uyo local government area, in Akwa Ibom state, Nigeria, Akpan and Ikorok [22] found that all the 160 drivers they studied were taking alcohol. Ninety of them took alcohol to stay awake while driving, 55 took alcohol to enhance their driving, while 15 took it to feel good. They also found that 20 drivers had been involved in accident 1-3 times, 50 involved in accident 4-6 times, while 90 had accident 7 or more times.One hundred of them were aware of adverse effect of alcohol on health. The complacency of the drivers when driving must have led to the belief of their disappearing when crash occurs. In Ghana, Damsere-Derry et al [23] studied the determinants of drink-driving and association between drink-driving and road traffic fatalities. They used Breath alcohol concentration test for drivers on the roads and converted them to blood alcohol concentration. They studied 2,736 drivers and found that 8.7% had detectable alcohol in their breath. They also found that 5.5% exceeded the country limit of blood alcohol concentration of 0.08%. Ninety seven percent of the drivers knew the law regarding drink-driving, while 96% had never had Breath alcohol test. This calls for serious action by our government and the governments of our sub-region to ensure compliance to alcohol laws among drivers as it had been found that in US that alcohol related fatalities significantly declined from 60% in 1982 to 40% in 2006 due to the effectiveness of countermeasures premised on deterrent laws[24]. The success of enforcement of drink-driving law is premised on deterrence which involved apprehension, swiftness and severity of punishment [25-28].

Why the myth of disappearance? On looking backwards, we realized that the disappearance was from lack of understanding of the nature of accidents seen then. The accidents were mainly by Lorries conveying farmers to and from farm settlements through untarred pothole-laden roads. They carried goods from the farm to villages. The drivers cross planks from one side of the vehicle to the other over the goods. Passengers seat on the planks, raising the center of the gravity of the Lorry. Sometimes they enter potholes and fell on one side. The planks and goods cause the mortality and morbidities. The drivers would run into the bush, to come out when situation calmed down. Those seeing them come out from the bushes likely assumed they disappeared. They did not absorb much energy from the vehicle falls and always appeared unhurt. These fueled the lotion that they disappeared.

CONCLUSION

There was no significant difference in severity and treatment outcome between passengers and drivers who sustained traumatic brain injuries from vehicular crashes. Ignorance of nature of accidents by people must have originated the disappearance of drivers and complacency of the drivers must have sustained it till today.

Recommendations

Government should tar the roads leading to farm settlements and ban Lorries from carrying goods and passengers together.

Drivers and passengers should unite together and work as a team to reduce crashes on our roads. There should be strict enforcement of alcohol rules for drivers. The government should equip the police and the Federal Road Safety Commission with Breathalyzers for testing drivers and ensuring compliance.

Conflicts of interest

We have no conflicts of interest.

Authors' contributions

Mathias O N Nnadi: concept and design, data acquisition, analysis, drafting and final approval. Beleudanyo G Fente: concept and design, revision of the manuscript and final approval.

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