Original Paper

POSTMORTEM STUDY OF HEAD INJURY IN FATAL ROAD TRAFFIC ACCIDENTS

Ahmad M[1], Rahman FN[2], Chowdhury MH[3], Islam AKMS[4], Hakim MA[5]

Abstract

This study was conducted at the Dhaka Medical College (DMC) morgue among 100 postmortem cases of Road Traffic Accident (RTA) victims over a period of one year. The objective of this study was to find out incidences of head injury among the RTA victims along with other injuries and also to overview the present situation of RTA in the country. Out of 100 cases, 64% were male and 36% female. The highest incidence of RTA (28%) was observed among the age group 31 to 40 years. The highest number of victims were pedestrians (68%). Considering recorded causality by type of collision, hit pedestrian was the most common (39%), followed by head on collision (20%). Regarding injury pattern in different parts of body, all the victims had multiple abrasion and bruise, 90% had laceration, 78% had injury to brain and 77% victims had injury to abdominal organs like liver and spleen. In the skull, Linear/fissured fracture was the commonest type of fracture (36%), followed by comminuted fracture (18%). Temporal bone was observed most prone to be fractured (23%), followed by parietal bone (17%). Most of the victims had subdural haemorrhage (43%), followed by sub arachnoid haemorrhage (36%).

Key words: Road traffic accident, head injury, postmortem.

Introduction

Most of the injuries and fatalities world wide are caused by Road Traffic Accidents (RTA). An estimated 1.2 million people are killed each year and around 50 million are injured due to RTA occupying 30-70% of orthopedic beds in hospitals of developing countries[1]. Developing countries bear a large share of the burden, accounting for 85 percent of annual deaths and 90 percent of the disability-adjusted life years (DALYs) lost because of road traffic injury[2]. Studies in Scotland have shown that 10% of all new patients at the emergency OPD came with head injuries due to RTA[3,4]. In developed countries, RTAs are the commonest cause of death below the age 50 years and predicted to be the third leading contributor to global burden of disease, just behind clinical depression and heart disease by 2020[5]. RTA represents 45-50% of the causes of head injuries and young adults were the most common victims[6,7]. In Bangladesh road collisions are the fourth leading cause of permanent disability for children, accounting for about 1360 children being permanently disabled each year. Out of 30,000 children (aged 0-17 years) killed each year from injury and 3400 children (aged 01-17 years) are killed in road accidents, the majority of whom are from poor families and cause of death is head injury[8]. World Bank report estimates that road traffic injuries cost 1-2% of the gross national product (GNP) of developing countries, which is twice the total amount of development aid received annually[9].

Materials and Methods

This study was conducted at the Dhaka Medical College (DMC) morgue among victims of Road Traffic Accident (RTA) during the period July 2002 - July 2003. Various identification data of the victims, like, age, religion and sex, along with places of incidence, time, vehicles involved were noted from the inquest report accompanying the dead bodies. Other information regarding accidents were gathered from the victims attendants. Points regarding injury like pathological features, pattern of skull fractures, intracranial haemorrhages and their distributions were noted during post mortem examinations.

Results

A total of 100 post mortem cases were studied. Among them 64% were male and 36% female (table-I). Highest incidence of RTA was observed among the age group 31 to 40 yrs (28 %). Highest number of victims were pedestrians (68%); followed by passenger (27%) of public and personal transports and driver (5%). Regarding recorded causality by type of collision, hit pedestrian was

Table-I: Age distribution of RTA victims (n =100).

Age group in years	Number of victims	Percentage
< 10	14	14
11- 20	09	09
21- 30	13	13
31- 40	28	28
41- 50	15	15
51- 60	11	11
>60	10	10

1. Maj Mushtaq Ahmad MBBS, MCPS, DFM, Head of the Dept, Forensic Medicine, AFMC; 2. Dr Farial Naima Rahman MBBS, DMU, Practicing Physician; 3. Dr Md Habibuzzaman Chowdhury MBBS, MCPS, DFM, Assoc Prof of Forensic Medicine, Sir Salimullah Medical College, Dhaka; 4. Prof Dr AKM Shamsul Islam MBBS, DTCD, Head of the Dept, Forensic Medicine, Shahabuddin Medical College, Dhaka; 5. Col Md Abdul Hakim MBBS, MCPS, M.Phil, Dept of Radiology, CMH, Dhaka.

Table-II: Recorded causality by type of collision (n=100).

Collision type	Number of victims	Percentage
Head on	20	20
Rear end	16	16
Right angle	04	04
Side swipe	06	06
Overturned vehicle	03	03
Hit object on road	01	01
Hit object off road	02	02
Hit pedestrian	39	39
Hit parked vehicle	02	02
Hit animal	01	01
Other	06	06

the most common form, among dozen of causes observed (table-II)

All the victims had multiple abrasion and bruises all over the body. Laceration was present in 90% cases. Various types of injuries observed are shown in table-III. About half of the cases showed fracture of femur. Among skull fracture, linear/fissured fracture was the commonest type (36%). Frequency of different types of skull bones fracture are shown in table-IV and other locations are

Table-III: Distribution of injury pattern on the body of the victim (n=100).

Type of injury	Number of victims	Percentage
Multiple abrasion	100	100
Multiple bruise	100	100
Avulsion (flaying)	28	28
Laceration	90	90
Fracture skull bone	82	82
Various injury to brain	78	78
Injury to spinal cord	16	16
Fracture of rib cage bones	47	47
Injury to heart, lungs	41	41
Fracture of radius , ulna	26	26
Fracture of pelvic bones	36	36
Fracture of femur	49	49
Fracture of tibia fibula	41	41
Injury to liver, spleen	77	77
Injury to kidneys	41	41
Injury to other abdominal viscera	79	79
Decapitation	01	01
Amputation of limbs	09	09

(Same victim presented with multiple types of injuries.)

Table-IV: Distribution of specific type of fracture of skull bones (n=100).

Type of injury	Number of victims	Percentage
Linear or Fissured fracture	36	36
Depressed fracture	11	11
Comminuted fracture	18	18
Pond or indented fracture	03	03
Gutter fracture	05	05
Perforating fracture	02	02
Sutural or diastatic fracture	03	03
Ring/foramen fracture	04	04
No fracture	18	18

Table-V: Location of fractures in different cranial bones (n=100).

Bones involved	Number of victims	Percentage
Fracture to temporal bone	23	23
Parietal bone	17	17
Occipital Bone	07	07
Frontal bone	12	12
Anterior cranial fossa	07	07
Middle cranial fossa	08	08
Posterior cranial fossa	04	04
Crushed skull	04	4
Intact skull with no fracture	18	18

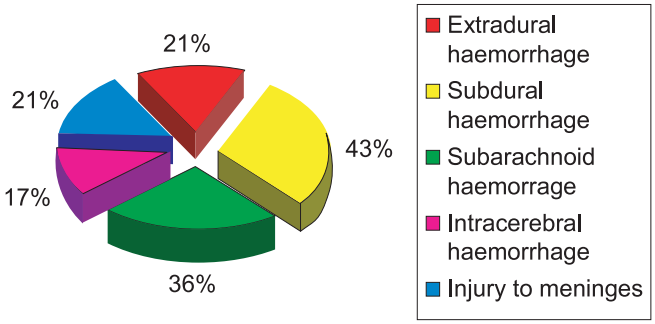

Fig-1: Frequency of different types of Haemorrage.

shown in table-V. Temporal bone was most prone to be fractured (23%). Most of the victims (43%) had subdural haemorrhage(Fig-1).

Discussion

Bangladesh is a South Asian developing country. Here poverty and unemployment push the people towards urban areas. This rapid and unplanned urbanization associated with incompetent traffic system, unplanned

roads and highways, violation of traffic laws by the drivers and pedestrians, over crowding, unlicensed rickshaws, reckless driving etc are responsible for this highest figure of road traffic accidents. The essential factors involved in RTA's include the person, the machine and the road[10].

In this study male and female ratio observed among the victims was 64 : 36. This ratio is in conformity with previous studies in other countries[11-13]. In this country, males are predominantly the earning member of the family. More over they are at higher risk of injuries than women because of their greater exposure to traffic and more risky behavior like hanging on the side of bus or rush to get in a running bus[14-16]. Road conditions are important aetiologic factors in RTA world-wide[17-18]. Rural roads tend to pose special and additional hazards. Many roads have become death traps with potholes are dotted along the length and breadth of the roads[19-21]. Most accidents in this country take place in the highways and caused by buses. Aggressive driving, impatience, lack of attention and drinking alcohol (in case of drivers) prior to driving are responsible for this[22-23].

Highest incidence of RTA was observed among the age group 31 to 40 (28 %), followed by 41-50 years (15%), less than 10 years (14%) and 21-30 years (13%). This coincides with other study reports, which explain that more than one-half of all road traffic deaths globally occur among people ages 15 to 44 years; their most productive earning years[24]. Similar age distribution of RTA victims has also been reported in other studies from developing countries[25-27]. Comparatively lower proportion of age group below 10 years and above 60 years could be explained by the fact that children are usually taken care of by elders during travel and lesser mobility of geriatric people. But the effect of head injury is disproportionately severe in elderly and they require more neurosurgical care[28].

Pedestrians were the commonest victim (68%), followed by passenger (27%) and driver (5%). Considering recorded causality by type of collision, hit pedestrian were the most (39%), followed by head on collision (20%). Pedestrians suffer most, though the proportion varies greatly according to the traffic patterns of different countries. Bangladesh and India has a high rate of pedestrian accidents, whilst countries like Germany and USA with a higher vehicular density, produce relatively more car occupant injuries. Studies in Brazil, Mexico and Uganda have found that pedestrians would rather cross a dangerous road than go out of their way to take a pedestrian bridge, even though such preferences increased their exposure to injury risk[29]. In Delhi pedestrians and bi-cyclists amount for around 55 per cent of the total traffic deaths, and the pattern is also similar in Colombo[30]. In Dhaka city, a large number of pedestrians are garments employees. Due to their lack of knowledge regarding traffic rules and also shortage of space in side walks, they often become victims of RTA. Kraus et al showed that in San Deigo, USA 62% head injuries occurred to car occupants[31].

Persons involved vehicular accidents sustain a large varieties of injury , which often assume definite pattern in the case of a pedestrian, a driver or a passenger.. According to the dynamics of pedestrian accidents, legs were involved in 85%, head between 50-80%, followed by arms, pelvis, chest and abdomen. Injuries of neck and spine are relatively infrequent in overall time. Motorcycle and pedestrian accidents occur in vulnerable individuals lacking the relative physical protection afforded by cars and buses. These accidents result in major multiple injuries in the patients[32]. Various types of injury pattern in different parts of body are seen in RTA victims. All the victims in this study had multiple abrasion and bruises all over the body .Laceration were present in (90%) cases. Seventy eight percent victims had injury to brain, 82% had fracture of different skull bones, 77% had injury to liver and spleen. Thirty six percent cases had fracture of pelvic bones, 49% had fracture femur, 41% had rupture of kidneys. These pattern of injuries coincides with other studies done before[33-34].

In case of head injury, various patterns of skull fracture were found. Linear/fissured fracture was the commonest type (36%), followed by comminuted fracture (18%), depressed fracture (11%). Linear fracture is the commonest one because during RTA head strikes by forcible contact with broad resisting surface like the roads[35]. Regarding fracture of individual bones, temporal bone was most prone to fracture (23%) followed by parietal bone (17%). This coincides with other studies done before. The thinnest area in outer skull is temporal bone (4 mm), followed by frontal bone(6 mm), parietal bone (10 mm) and occipital bone (15 mm). A force of 400- 600 pound per square inch is required to fracture a skull covered by cushion of hair and scalp. However a fall from 3 foot height will produce impact energy of 35 foot pound , causing two linear or mosaic fracture. This indicates the predominance of fracture in RTAs, where passengers or pedestrian are thrown with great impact[36].

About intra cranial lesions, most of the victims had subdural haemorrhage (43%), followed by sub arachnoid haemorrhage (36%). Extradural haemorrhages are more common in 20-40 years of age and occurred mostly due to RTA or hit by other objects. Subdural haemorrhages mostly occur in old ages and children due to fall on ground by accidents, whereas subarachnoid haemorhages are most common pattern of intra cranial haemorrhage in RTA[37-39].

The distribution of causes of head injury in children varies greatly according to severity, with falls predominantly for RTA and is the major cause for neurosurgical unit transfers and deaths[40-43]. The

distribution of victims of RTA with head injuries is different for children, with fewer car occupants and more pedestrians and cyclists. Among fatal RTAs concerning children, pedestrians are even more common, 69% in the Newcastle series[44]. Most bicycle injuries in children are sustained during play off the road and do not involve collision with another vehicle. In some reports these are classified as recreational rather than road accidents. The high incidence of unsafe behaviour by children as a cause of both pedestrian injuries and those caused by bicycle collisions was noted by the Newcastle team. Most child occupants in cars who were fatally injured were not wearing seat belts and a few of bicycle fatalities had been reported to wear helmets. The value of bicycle helmets for children has been studied in Australia[45]. There use of helmet is now mandatory in several states. It has been suggested that built-in safety features for restraints in cars should become the rule[46]. However, most of the recent reduction in child death rates from road accidents in England and Wales appears to be because there are fewer child pedestrians and cyclists as more children travel by car[47]. Neuropathologists in Glasgow have compared detailed necropsy findings in 87 children aged 2-15 years with those for 360 adults. The frequency of contusions, diffuse axonal injury, ischaemic brain damage, and intracranial haematoma was similar in adults and children. However, in children, bilateral cerebral swelling was three to four times more common[48].

Incidence of traumatic intra cranial haemorrhage after head injury is more in adult than young. In elderly person subdural haemorrhage is 4 times more than young population[49]. However extradural haemorrhage is rare in older population probably because dura matter becomes more adherent to inner table of the skull with increasing age[50-52]. The cause of death in car occupants following an accident is most commonly related to head, neck or chest injury. In a case study of 100 consecutive deaths of car drivers, 42% had fractured skull, 30% had neck bone injury, 69% had bony chest injury, 53% had brain damage, 37% ruptured aorta, 16% traumatic rupture of the heart and 50% had some form of abnormal injuries[53]. During post mortem examinations it has been observed that head injury is the commonest cause of death among RTA victims[54-57].

Conclusion

Road traffic accident is an unfortunate economical burden for a third world country like Bangladesh. Head injury due to RTA is a recognized major public health problem causing death and disability among the populations of this country. It is the high time for concerned authority to take appropriate and immediate measures for reducing the incidences of head injury associated with RTA and thereby protecting this vulnerable group of people.

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