POSTMORTEM STUDY OF HEAD INJURY IN FATAL ROAD TRAFFIC ACCIDENTS

Ahmad M1, Rahman FN2, Chowdhury MI3, Islam AKMS4, Hakim MA5

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 subarachnoid 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. 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. Studies in Scotland have shown that 10% of all new patients at the emergency OPD came with head injuries due to RTA. 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. RTA represents 45-50% of the causes of head injuries and young adults were the most common victims. 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. 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.

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 the most common victims. 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. 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.

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

<table>
<thead>
<tr>
<th>Age group in years</th>
<th>Number of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>11-20</td>
<td>09</td>
<td>09</td>
</tr>
<tr>
<td>21-30</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>31-40</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>41-50</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>51-60</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>&gt;60</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Collision type</th>
<th>Number of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head on</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Rear end</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Right angle</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>Side swipe</td>
<td>06</td>
<td>06</td>
</tr>
<tr>
<td>Overturned vehicle</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>Hit object on road</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>Hit pedestrian</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Hit parked vehicle</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>Hit animal</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Other</td>
<td>06</td>
<td>06</td>
</tr>
</tbody>
</table>

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).

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

(Same victim presented with multiple types of injuries.)

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

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Number of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear or Fissured fracture</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Depressed fracture</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Comminuted fracture</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Pond or indented fracture</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>Gutter fracture</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>Perforating fracture</td>
<td>02</td>
<td>02</td>
</tr>
<tr>
<td>Sutural or diastatic fracture</td>
<td>03</td>
<td>03</td>
</tr>
<tr>
<td>Ring/foramen fracture</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>No fracture</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Bones involved</th>
<th>Number of victims</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture to temporal bone</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Parietal bone</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Occipital Bone</td>
<td>07</td>
<td>07</td>
</tr>
<tr>
<td>Frontal bone</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Anterior cranial fossa</td>
<td>07</td>
<td>07</td>
</tr>
<tr>
<td>Middle cranial fossa</td>
<td>08</td>
<td>08</td>
</tr>
<tr>
<td>Posterior cranial fossa</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>Crushed skull</td>
<td>04</td>
<td>04</td>
</tr>
<tr>
<td>Intact skull with no fracture</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

Fig-1: Frequency of different types of Haemorrhage.

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
effects involved in RTA’s include the person, the machine
and the road10.

In this study male and female ratio observed among the
victims was 64 : 36. This ratio is in conformity with
previous studies in other countries11-13. 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 bus14-16. Road conditions are
important aetiological factors in RTA world-wide17-18. 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 roads19-21. Most
accidents in this country take place in the highways and
causely by buses. Aggressive driving, impatience, lack of
attention and drinking alcohol (in case of drivers) prior to
driving are responsible for this12-23.

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 years24. Similar age distribution of
RTA victims has also been reported in other studies from
developing countries25-27. 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
care28.

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 risk29. In Delhi pedestrians and bi-
cyclists amount for around 55 per cent of the total traffic
deaths, and the pattern is also similar in Colombo30. 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
occupants31.

Persons involved vehicular accidents sustain a large
variety 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 patients32. 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 before33-34.

In case of head injury, various patterns of skull fracture
were found. Linear/lissured 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
roads35. 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 impact36.

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 haemorrhages
are most common pattern of intra cranial haemorrhage in
RTA37-39.

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 deaths40-43. 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. 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. 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. 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. 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.

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. However extradural haemorrhage is rare in older population probably because dura matter becomes more adherent to inner table of the skull with increasing age. 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 fractures 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. During post mortem examinations it has been observed that head injury is the commonest cause of death among RTA victims.

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.

References


