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Pattern of fatal head injuries in road traffic accidents in Varanasi district: An autopsy finding

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Abstract

Among all types of accidents, those caused by motor vehicle responsible for loss of large number of life and head injury tend to be most serious. The present prospective study was undertaken in the Department of Forensic Medicine, Institute of Medical sciences, Banaras Hindu University from 1st August 2015 to 31st July 2016 on 150 cases of road traffic accidents who died due to injuries sustained to head and brain. Most of accidents had taken place during evening hours (16:00-20:00Hrs). Male predominated over female in the ratio of about 5:1. Majority of deceased of fatal head injury was from Hindu (89%) community. The most vulnerable age group was found to be 21-30 years. Two wheeler occupants were most commonly involved followed by pedestrian. Most of the road traffic accidents happened to occur in rural areas i.e. 81.3% on national highways. Skull fractures present in 62% of cases. Most of the victims of fatal head injury were survived for more than 24 Hrs to one week. In most of the cases linear fracture was observed (22.7). Among intracranial hemorrhage subdural hemorrhage was seen in 43% and combination of subdural and subarachnoid hemorrhage in 20% of cases.

Keywords. national highways, intracranial haemorrhage, pedestrian

Introduction

Of all the regional injuries, those of head and neck are the most common and most important in Forensic practice. Adelson L (1974) gives these sound reasons for this dominance of head injuries:

- The head is the target of choice in the great majority of assault involving blunt trauma.
- When the victim is pushed or knocked down to the ground, he often strikes his head.
- Brain and its coverings are vulnerable to degrees of blunt trauma that would rarely be lethal if applied to other areas.

Head injury has been defined by the national advisory Neurological diseases and stroke council as “a morbid state resulting from gross and subtle structural changes in the scalp, skull and/or the content of skull produced by mechanical forces”^[1].

Every day around the world more than 3000 people die from road traffic injury. Low and middle income countries (LMIC) account for about 85% deaths and for 90% of the annual disability adjusted life years lost because of road traffic injury^[2].

India has one of the highest road accident rates in the world- one out of every 42 vehicles in the country met with an accident in 1986. In US and Europe, the average is one in every 100 vehicle (India Today-May15, 1987, pp.143-18). The peak mortality and morbidity from road accidents are seen in the 15-24 years age group of males. A large proportion of vehicles involved in accidents were two wheelers. Compared to cars they are unstable and provide little protection for their riders in accidents^[8].

Over 1.2 million people die each year on the world's roads and between 20 and 50 million suffer non fatal injuries. Over 90% of world's fatalities on the roads occur in low income and middle income countries, which have only 48% of world's registered vehicle. The most of such deaths are among “vulnerable road users” such as pedestrians, pedal cyclists and motorcyclists^[2].

Material and Methods

This present prospective study was conducted in Department of Forensic Medicine, IMS, BHU, Varanasi from 1st August 2015 to 31st July 2016. During that period 150 cases of road traffic accidents were selected for the present study. The relative of the victims of the road traffic accidents and accompanying police personnel were interviewed to obtain the information

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about the circumstances which led to their death.

A Performa specially designed for this purpose was used at the time of postmortem examination. The details about the victim regarding name, age, sex, address, date, time and place of death, type of vehicle involved and cause of sustaining such injury were noted from the inquest report prepared by police. Postmortem examination (both external and internal) findings were noted down in the Performa and analyzed accordingly.

Observations and Results

During the study period (1st August 2015 to 31st July 2016) a total of 150 cases of fatal head injury were recorded. Males predominated females in the ratio of 5.25:1. Maximum number of victims belonged to age group 21-30years i.e.23.3% followed by age group31-40 years (18.7%), next in frequency lies 41-50 years of age group with 17.3%. Extremes of ages are least involved as compared to adult age group. Table 1 & 2

Table 1: Sex, Religion and Place of occurrence of accident wise incidence

Sex	Frequency	%	Religion	Frequency	%	Accident Place	Frequency	%
Male	126	84	Hindu	134	89	Rural	122	81.3
Female	24	16	Muslim	16	11	Urban	28	18.7
Total	150	100	Total	150	100	Total	150	

Table 2: Age wise incidence of Victims

Age Group	Frequency	%
0-10	5	3.3
11-20	16	10.7
21-30	35	23.3
31-40	28	18.7
41-50	26	17.3
51-60	21	14.0
>60	19	12.7
Total	150	100

In the study majority of deceased of fatal head injury were Hindu i.e. 89% remaining were Muslims. Involvement of other religion was nil. Most of the road traffic accidents happened to occur in rural areas i.e. 81.3% while only 28

(18.7%) cases took place in urban areas. Table 1 The present study showed that maximum victims were from two wheelers (46.0%) next in frequency pedestrian (37.3%) and bicyclists (10.7%). Table 3

Table 3: Types of road users

Types of Road users	Frequency	%
Pedestrian	56	37.3
Bicyclists	16	10.7
Two wheelers	69	46.0
Three/ Four wheeler	9	6.0
Total	150	100

Most of the accident took place at national highways (68%) followed by state road two lane i.e. 20%. Table 4. Maximum number of accidents i.e. 31.3% was observed during evening hours (16 to 20 hours). It was also observed that afternoon (12 to 16 hours) also showed a high incidence i.e. 24.7%. More or less equal number of cases were observed during night hours i.e. 20 to 24 hrs and 0 to 4 hrs in fatal head injury among road traffic accidents. Table 5

27% of victims died on spot remaining 73% victims survived for variable period of time after the incidence. Among those who survived for less than 24 hours are 32% and who survived for more than 24 hours to one week are maximum in number i.e. 35%. Only 6% victims survived for more than one week. Table 6

Table 4: Different types of Road used by victims

Road used	Frequency	%
Highway	102	68
Two lane	30	20
Single lane	18	12
Total	150	100

Table 5: Time of accident

Time of accident	Frequency	%
0-4 Hours	8	5.3
4-8 Hours	22	14.7
8-12 Hours	27	18.0
12-16 Hours	37	24.7
16-20 Hours	47	31.3
20-24 Hours	9	6.0
Total	150	100

Table 6: Victims Survival Time in fatal head injury cases

Survival period	Frequency	%
Died on the spot	40	27
Less than 24 hours	48	32
24 hours to one Week	53	35
More than one Week	9	6
Total	150	100

No fracture of any skull bone was observed in maximum number of cases i.e. 38%. Fracture of frontal, parietal, temporal and occipital in one victim were seen in 19.3% of cases. Fracture of Parietal and temporal in combination were noted in 11.3% of cases. Temporal bone was the single bone which is most commonly fractured in 8.7% of cases. Commonest type of fracture was linear fracture seen in 22.7% cases. Crush fracture of whole skull bone with facial bone observed in 19.3% next in frequency lies comminuted fracture

of skull with 6.7% of cases. Other type of skull fracture was least in frequency i.e. less than 3%. Table 7

Table 7. Site of skull bone Fracture and Type of Skull Fracture

Skull Bone Fracture	Frequency	%	Type of Skull Fracture	Frequency	%
No Fracture	57	38.0	No Fracture	57	38.0
Frontal	6	4.0	Fissured/ Linear	34	22.7
Parietal	7	4.7	Crush	29	19.3
Temporal	13	8.7	Comminuted	10	6.7
Occipital	2	1.3	Depressed	4	2.7
Frontal + Parietal	7	4.7	Sutural	4	2.7
Frontal + Temporal	1	0.7	Perforating	2	1.3
Parietal + Temporal	17	11.3	Depressed Comminuted	4	2.7
Temporal + Occipital	3	2.0	Fissured+ Comminuted	3	2.0
Frontal+Parietal+Occipital	1	0.7	Fissured+ Depressed	3	2.0
Frontal+Parietal+Temporal	2	1.3	Total	150	100
Temporal+Parietal+Occipital	5	3.3			
F+P+T+O (All)	29	19.3			
Total	150	100			

Regarding type of intracranial hemorrhage in 17% of cases no hemorrhage seen in fatal head injury victims. Subdural hemorrhage was the most common type of intracranial hemorrhage was observed in 43% cases next in frequency lies subdural hemorrhage in combination with subarachnoid hemorrhage with 20%. Subarachnoid hemorrhage was the second most common single intracranial hemorrhage recorded in 8% of cases.

Table 8. Various Type of Intracranial Hemorrhage

Hemorrhage	Frequency	%
No Hemorrhage	26	17
Extradural	5	3
Subdural	64	43
Subarachnoid	12	8
Extradural+Subdural	5	3
Subdural+Subarachnoid	30	20
Subdural+ Intracerebral	5	3
Subdural+Subarachnoid+ Intracerebral	3	2
Total	150	100

Discussion

According to the latest data released by National Crime Record Bureau (NCRB), speeding and dangerous driving were the biggest reasons for the road fatalities. Accidents involving two-wheelers and trucks \$ lorries accounted for nearly half of the lives lost in road crashes. The problem of head injury in road traffic accidents is compounded by the fact that, the age group primarily involved in road traffic accidents belongs to the most productive age group of 15-40 years. Males predominated over females in the ratio of 5.25:1. Probably due to the fact that males lead a more active role in life and keep themselves active outdoors most of the time to earn bread and butter for their families. They are more involved in activities such as driving and travelling. Our findings are consistent with those of Shivendra Jha *et al* (2011) [18], Rajeev K. B. *et al.* (2015) [15], Dr Dhaval j. *et al.* (2009). Hindu dominated Muslims 89.3% Vs 10.7%. Preponderance of Hindu is due to larger share of Hindu population in our country. A similar result was noted by Rajeev K. B. *et al.* (2015) and Awdhesh K. *et al.* (2012) [15, 4]. Maximum incidence i.e. 81.3% are recorded from rural areas, this is due to fact that most of national highways are passing through rural areas, our findings are contradictory to those of Ravi Kumar (2014) and Anand R. *et al.* (2016) [7, 3] who

recorded maximum incidence in urban areas. We have recorded the highest percentage of fatal head injury in road traffic accident in the age group of 21-30 years (23.3%) followed by age group 31-40 years (18.7%). Other workers in the field Suresh K. *et al.* (2015) S. V. Kuchewar *et al.* (2012), Deepak Sharma *et al.* (2011), Aggarwal K. K. *et al* (2009) [19, 16, 5, 1], reported observations consistent with those of our studies. There are only 5 cases up to 10 years of age. A higher incidence of fatalities in the adult age group (21-40years) may be explained by the fact that the people from these age groups are more often required to move outdoors in pursuit of their works and studies. This age group is the most active phase of life during which there is tendency to take risk. They generally have a craze for speed while driving and disregard for the general traffic rules. In the study done by Shivendra Jha *et al.* (2011) [18] they found involvement of age group 21-40 years was 68% which is much more than what is reported in the present study. Vulnerability of two wheelers i.e. motorcyclist as RTA victim is a common phenomenon in the present study and other study done in this field in country. The findings of Anand R *et al* (2016), Ramakant V *et al.* (2014) S.V. Kuchewar *et al.* (2012) [3, 14, 16] are consistent with the findings noted by us where two wheeler occupants are most common victims (46%) followed by pedestrian (37.3%). Our study was in contrast with the observation made by Shivendra Jha *et al.* (2011) [18], Kaul A *et al.* (2005), Sanjay K, R K P Singh (2014) [9, 17] where pedestrian were the most common victim involved in the road traffic accident. Lack of awareness and ignorance of traffic rules, careless and speed driving, overtaking, not wearing helmets for safety and many times unfit roads condition are important contributory factors responsible for higher number of victims being two wheelers. Unqualified and unfit drivers, long route and hours of journey, pressure of reaching to the destination on time, driving under influence of alcohol are no lesser responsible factors. As for as the type of road used by victims are concerned in fatal head injury among road traffic accidents, national highways are the commonest road where maximum cases of road traffic accidents were recorded i.e.68% followed by two lane road 20%.Our study consistent with the study done by Suresh K *et al.* (2015) [19], Ravindra SH *et al.* (2011) and Kaul A *et al.* (2005) [15, 9]. This can be explained on the basis that highways are most busy roads with heavy traffic loads especially by heavy vehicles. High number of road traffic accidents on highways in Varanasi district could be attributed

to high speed, rash driving and more number of heavy vehicles like trucks and fast running light weight four wheeler vehicles.

In the present study maximum number of fatal road traffic accident incidence (31.3%) was observed during evening hours (16:00 to 20:00 hours). Afternoon (12:00 to 16:00 hours) also showed a high incidence with 24% of cases. Our study is in consistent with the study done by Suresh K *et al.* (2015) and Ramakant V *et al.* (2014). Kyada H C *et al.* (2012) observed that most of accidents occurred during afternoon followed by in the morning. Maximum number of accidents in evening hours may be due to high rush hour traffic (people returning home from work) tiredness after day work, hurry to reach home, poor visibility and dazzling of vision due to light coming from opposite side vehicle and ignorance of traffic rules.

Present study showed that in 27% of cases victims died at spot without getting any treatment remaining 73% of victims survived for variable period of time after the incidence took place. Among 73% of victims who survived for variable period of time, 35% of victims survived for 24 hours to one week and the victims survived for less than 24 hours are 32% and only 6% of victims survived for more than one week. Our findings with respect to period of survival of victim are consistent with those of Dhaval J *et al.* (2009) and contradictory to Ramakant V *et al.* (2014)^[14]. Thus it can be easily inferred that inspite of treatment most of the victims ultimately die if they have received significant amount of injury.

Out of different types of fractures of the skull encountered in cases of cranio-cerebral injuries due to vehicular accidents, fissured fracture have been most frequently seen (22.7%) in present series. In quite good percent (38%) of cases no fracture of skull bone was observed. Comminuted fracture observed in 6.7% of cases. In 19.3% of cases whole skull bone is crushed along with facial bones which are similar to study done by Sanjay K, RKP Singh (2014), Dr. Dhawal J *et al.* (2009) and Menon A *et al.* (2005) where %age of fissure fracture is much more in comparison to our study. Regarding the part of skull bone fractured, temporal bone was the most commonly involved single skull bone in 8.7% of cases next in frequency lies parietal, frontal and occipital with 4.7%, 4.0%, 1.3% respectively. All the bones of skull (frontal+ parietal+ temporal+ occipital) most commonly involved combination with 19.3%.

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