

# PATTERN OF FATAL HEAD INJURIES DUE TO VEHICULAR ACCIDENTS IN MANIPAL

**Dr. Anand Menon**, Assistant Professor,

**Dr. Nagesh K. R.**, Assistant Professor,

Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, Karnataka, India.  
E-mail: anandski@rediffmail.com

## ABSTRACT

Head injury is an important cause of mortality worldwide as head is the most vulnerable part of the body involved in fatal road traffic accidents. The present study was undertaken on 100 victims of Road Traffic Accident who died due to injuries sustained to the head, which were autopsied at Kasturba Medical College, Manipal over a period of 3 years between January 1995 and December 1997.

Most of the accidents had taken place in the afternoon hours (12.01 - 18.00 hrs). There was a marked male preponderance (89 %). The most vulnerable age group to accidents was found to be 21 to 30 years. Both pedestrians and occupants were equally involved. Two-wheeler occupants were most commonly involved.

Head injury was present in 82 % of cases with skull fracture in 62 %. Fracture of the vault was found in 38 %, base of the skull in 34 % and both in 28 % of cases. In most of the cases, fissured fracture was found (57 %). Among intra-cranial haemorrhages, subdural haemorrhage was found in 77 % and subarachnoid haemorrhage in 55 % of cases. Contusions and lacerations of brain were found equally in 35 % of cases.

**Key words:** Road traffic injury, vehicular accident, head injury.

## INTRODUCTION

WHO defined accident as an unexpected, unplanned occurrence that may involve injury[1]. During 1990's Road Traffic Accidents ranked 9th among the leading causes of death in the World. It was projected that, if the same trend continued it would become the 2nd leading cause by the year 2020[2]. Each year road traffic injuries take the lives of 1.2 million people around the world[3]. In 2002, the Global rate of deaths from road traffic injuries was about 19 per 100,000 people with adults aged between 15 - 44 years accounting for more than 50 % of deaths[4].

In developing countries, pedestrians were more frequently involved in road accidents than others and two-wheelers more commonly than other vehicles. In South-East Asian countries, 60-80 % of road traffic injuries occurs in urban and semi-urban regions[5]. In India, one accident occurs every 2 minutes with the accident rate corresponding to 45 per 100,000 population. In 1999, India had road traffic accidents at a rate of

7.5 accidents per 1000 vehicles with injuries and deaths correspond to 7.9 and 2.0 per 1000 vehicles respectively[6].

## MATERIALS AND METHODS

The present study includes the retrospective analysis of 100 fatal head injury cases due to Road Traffic Accident, which were autopsied at Kasturba Medical College, Manipal over a period of 3 years from January 1995 to December 1997. Data were collected from police, relatives, hospital and post mortem records. The age & sex wise distribution, time of occurrence of accident, mean survival time of victims, profile of victims, type of vehicles involved and the pattern of cranio-cerebral trauma were studied.

## RESULTS AND OBSERVATIONS

### Sex and Age distribution:

Males comprised 89 % and females 11 % of the total victims. The age groups of the victim were grouped into 10 year intervals ranging from 0-80

years. The youngest victim was a male child aged 4 months and the oldest was a 77 years old male. The age distribution of study sample is shown in Figure 1. Highest numbers of victims were found in the 21 - 30 years group (24 %) and least in the 71 - 80 years group (1 %).

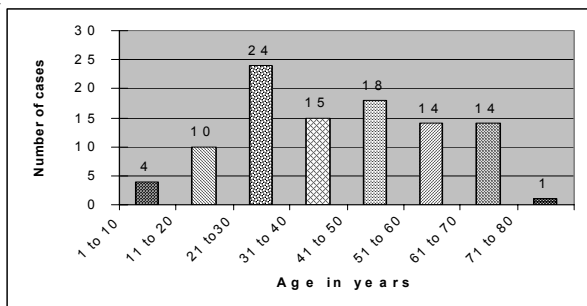


Figure -1

**Time of occurrence of accident**

The time was divided into 4 periods of 6 hours interval i.e. 0.01 - 6.00 hrs, 6.01 - 12.00 hrs, 12.01 - 18.00 hrs and 18.01 - 24.00 hrs as shown in table 1. Most of the accidents have occurred during 12.01 - 18.00 hrs (39 %) followed by 18.01 - 24.00 hrs (27 %) and least during 0.01 - 6.00 hrs (19 %).

**Table 1**  
**Time of occurrence of accident.**

Time interval (hrs)	% of cases
0.01 - 6.00	19
6.01 - 12.00	25
12.01 - 18.00	39
18.01 - 24.00	27

**Profile of victims**

Pedestrians & vehicular occupants were equally involved in the present study (48 % each), while 4 % were due to fall from moving vehicle, which is shown in Figure 2. The types of vehicular

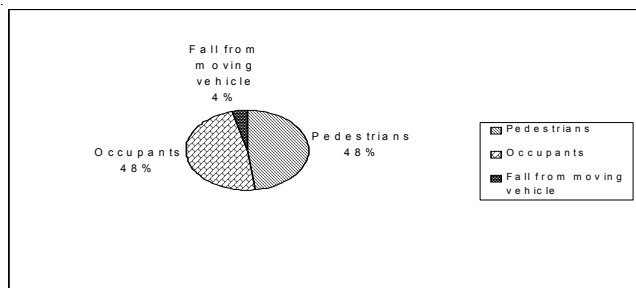


Figure -2

occupants involved in accidents are shown in table 2. Most of the occupants belonged to two wheelers (43 %) and occupants of light motor vehicles and heavy motor vehicles were almost equally involved, which corresponds to 29 % and 28 % respectively.

**Table 2**  
**Type of Vehicular Occupants.**

Occupants	% of cases
Two-wheelers	43
Light Motor Vehicles	29
Heavy Motor Vehicles	28

**Duration of survival and Surgical intervention**

Of the total cases, 17 % of victims died on the spot, while 26 % of the victims were treated surgically. Burr holes were observed in 22 % of cases with craniotomy done in 4 %. Dura was sutured in 8 % and lobectomy was done in 6 % of cases. The mean survival period of victims was 3 days.

**Pattern of cranio - cerebral trauma**

External injury to the face & scalp were found in 82 % of the victims. In 62 % of cases, fracture of skull was found. The types of skull fractures are shown in the Figure 3. Fissured fracture was the most commonly observed fracture (57 %). Whereas, comminuted fracture, diastic fracture and depressed fracture were seen in 18 %, 16 % and 9 % respectively. Cranial vault was involved in 38 %, base of skull in 34 %, and both vault and base in 28 % of cases. The sites of skull fractures are shown in table 3. Middle cranial fossa, parietal bone and temporal bone were the commonly involved areas in fracture, which corresponds to 26 %, 22 % and 20 % respectively. Least involved area in fracture was the occipital bone (12 %).

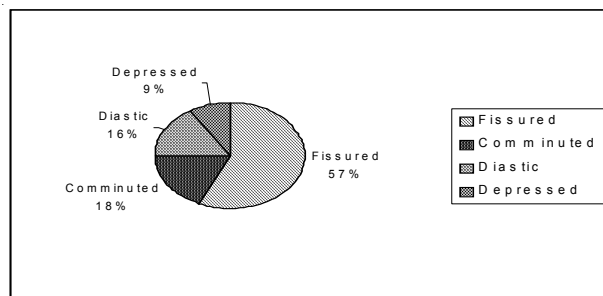


Figure-3

Contusions and lacerations of brain were found in equal number of cases (35 %). Table 4 explains the type of intracranial haemorrhages seen. Subdural haemorrhage (77 %) was observed most commonly, followed by subarachnoid haemorrhage (55 %). Whereas extradural, intracerebral and intraventricular haemorrhages were found in comparatively less number of cases viz., 26 %, 23 % and 22 % respectively. Combination of all haemorrhages was seen only in 5 % of cases.

**Table 3**  
**Site of Skull fractures.**

Site of fracture	% of cases
Frontal bone	17
Temporal bone	20
Parietal bone	22
Occipital bone	12
Anterior Cranial Fossa	15
Middle Cranial Fossa	26
Posterior Cranial Fossa	17

**Table 4**  
**Type of Intracranial haemorrhages.**

Haemorrhages	% of cases
Extradural	26
Subdural	77
Subarachnoid	55
Intracerebral	23
Intraventricular	22
Combination of all	5

**DISCUSSION**

Current trends in population growth, industrialization and urbanization are putting heavy pressure on transport networks particularly on the road systems in the developing world. Because of this, deaths due to Road Traffic Accidents are steadily increasing in the developing countries[7].

In the present study, males are largely involved in the accidents with male to female ratio 9:1. This is in concurrence with other studies8-12. This shows the male dominance in the moving population especially on the roads and in vehicles.

In our study, 21 - 30 years was the most common and those above 70 years was the least common age group involved in accidents. This corresponds with other studies[8-12]. The young and middle aged groups largely consist of students and working people in various jobs, who usually travel by either own vehicles, buses or walk. This results in the involvement of young adults more commonly in road traffic accidents.

Pedestrians & vehicular occupants were equally involved in the present study. In some studies, pedestrians were more involved than vehicular occupants [8,9,11]. Whereas, few studies showed more involvement of vehicular occupants than pedestrians[10,12]. This shows the erratic pedestrian behaviour and reckless driving of vehicles on the roads. Majority of the occupants belonged to two wheelers in our study, which is consistent with other studies[9,11,12]. The increasing trend of driving two-wheelers by college students, who have tendency to drive fast, is probably the reason for increased two-wheeler accidents.

Most of the accidents in our study have occurred in the afternoon (12.01 - 18.00 hrs) followed by evening hours (18.01 - 24.00 hrs), which is in concurrence with study of Nilamber Jha et al[12]. Whereas, findings of some studies have showed that accidents were more between 18.01 - 24.00 hrs followed by 12.01 - 18.00 hrs8,11. That means accidents are common in the afternoon and evening hours. Working people usually get strained physically and mentally by end of the day. This results in decreased reflex action of the person due to fatigue, which may lead to accidents.

In the present study, head injury was present in 82 % cases. This is comparable to studies done by Akang et al[10] (83.8 %) and Chandra et al [9](72 %). Whereas, studies of Gautam Biswas et al11 and Patel8 found it in 56.4 % and 47 % respectively. From the above facts, it appears that head is the most vulnerable part of the body involved in road traffic accidents, which alone accounts for most of the fatalities.

Skull fractures were found in 62 % of our cases, which involved vault and base equally. In the studies done by Chandra et al [9] and Akang et al[10] skull fractures were found in 79.87 % and 38.2 % respectively. This shows that fatalities are

more common in head injuries associated with skull fractures than those without fractures.

In the present study, the most common type of intracranial haemorrhage found was subdural haemorrhage (77 %), which is consistent with the study of Akang et al[10] (62.4 %). This is followed by subarachnoid haemorrhage, which was found in 55 % cases of our study and 24.6 % in Akang et al[10] study. Whereas, study done by Chandra et al[9] showed subarachnoid haemorrhage as most common type (66.9 %), followed by subdural haemorrhage (58.2 %). Extradural, intracerebral and intraventricular haemorrhages were found in significantly less number of our cases, which is in concurrence with other studies[9,10]. Contusions and lacerations of brain were found equally in our study (35 %), which is consistent with study of Chandra et al[9] (24 %). Therefore, it is difficult to predict the type and extent of injury, which would be compatible with life.

Road traffic policies such as pedestrian-friendly paths, separate lanes for light motor vehicles and heavy motor vehicles, and strict implementation of traffic rules and regulations may decrease the incidence of road traffic accidents and its fatalities.

## CONCLUSION

From the present study, following conclusions were derived regarding road traffic accidents:

-Males are more commonly involved in accidents.

-Young adults between 21 - 30 years are more vulnerable to accidents.

-Accidents are more during afternoon hours (12.01 - 18.00 hours) and evening hours (18.01 - 24.00 hrs).

-Fatalities are more in two-wheeler occupants than other vehicles.

-Fatal head injuries are commonly associated with skull fractures.

-Subdural haemorrhage is the commonest

intracranial haemorrhage seen in accidents, followed by subarachnoid haemorrhage.

## References

1. Hogarth J. Glossary of Health care terminology, WHO, Copenhagen.1978.
2. WHO, 1995. The World Health Report 1995, Report of the Director General WHO.
3. World Health Day 2004: Road Safety No Accident.
4. Health Action, Road Safety, A Collective Responsibility, April 2004.
5. WHO (2002), Injuries in South-East Asia Region, Priorities for Policy and Action, SEA / Injuries / A1.
6. The Government of India, Ministry of Home Affairs, National Crime Record Bureau, Accidental deaths and Suicides in India, 1999.
7. WHO. Road Traffic Accidents in developing countries. Technical Report Series No. 703, World Health Organisation, Geneva, 1984.
8. Patel NS. Traffic fatalities in Lusaka, Zambia. Med. Sci. Law 1979; 19 (1): 61-65.
9. Chandra J, Dogra TD, Dikshit PC. Pattern of Cranio-intracranial injuries in fatal vehicular accidents in Delhi 1966-76. Med. Sci. Law 1979; 19 (3): 186-194.
10. Akang EEU, Kuti MAO, Osunkoya AO et al. Pattern of fatal head injuries in Ibadan - A 10 year review. Med. Sci. and Law 2002; 42 (2): 160-166.
11. Gautam Biswas, Verma SK, Jag Jiv Sharma, Aggarwal NK. Pattern of Road Traffic Accidents in North-East Delhi. Journal of Forensic Medicine and Toxicology 2003; 20 (1): 27-32.
12. Nilambar Jha, Srinivasa DK, Gautam Roy, Jagdish S. Epidemiological study of Road traffic accident cases: A study from South India. Indian Journal of Community Medicine 2004; 29 (1): 20-24.