

# Fatal Cranio-Cerebral Injuries-Epidemiological Trends in Mortality Rates from Road Traffic Accidents

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## Research Article

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## Abstract

“Head injury” as defined by the National Advisory Neurological Diseases and Stroke council”, as a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, produced by mechanical forces. Cranio-cerebral injuries can be caused by any kind of blow on any sort of head. In this retrospective study, all the fatal cranio-cerebral injuries due to RTA's brought for autopsy at mortuary of Adichunchanagiri Institute of Medical Sciences, Mandya district, Karnataka, India, between January 2013 to December 2017 were analyzed. During this study, several epidemiological observations and their results were considered. In the present study Total number of autopsies done in the last five years was 748. RTA constitutes 51% (383 cases). The majority of victims belonged to the age group 31-40 years. (92 cases; 30%). Females was less involved than men with ratio of 1:4. Drivers of 3 and 4 wheelers were most commonly involved (106 cases; 28%), followed by occupants of 3 and 4 wheeler (86 cases; 22%) and motor-cyclists in fatal RTA's (62 cases;17%). Intracranial Hemorrhages were the most common findings followed by skull fractures. Frontal bone fracture was the commonest injury (96 cases). Fissure and depressed fractures were the most common type of skull fractures. “Prevention is better than cure” is the only method to control the mortality and morbidity from road traffic accident cases. Better road, good driver, safety precautions are the key factors to control the damages. National and state highway authorities should implement a strict plan to reduce the road traffic accidents. However it is the driver duty to ensure safe drive to protect him and pedestrians.

**Keywords:** Cranio-cerebral Injuries; Mortality Rates; Road Traffic Accidents

## Introduction

“Head injury” as defined by the National Advisory Neurological Diseases and Stroke council”, as a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, produced by mechanical forces. Cranio-cerebral injuries can be caused by any kind of blow on any sort of head. The extent and degree of injury to the skull and its contents is not necessarily proportional to the quantum of force applied to the head. No form of cranio-cerebral injury is too trivial to be ignored or so serious as to be despaired of [1].

According to National statistical trends in Road Accidents, injuries and fatalities, A Road traffic accident is an event that occurs on a way or street open to public traffic, resulting in one or more persons being injured or killed, where at least one moving vehicle is involved. Thus RTA comprises of collision between vehicles, between vehicles and pedestrians, between vehicles and animals,

or between vehicles and geographical or architectural obstacles [2].

RTA'S are among the leading causes of death and lifelong disability globally. According to WHO, 1.24 million people die every year on the world's roads, with 20 to 50 million sustaining non fatal injuries. Globally, RTA's are reported as the leading cause of death among young people aged 15-39 years and are among top three causes of mortalities among people aged 15-44 years [3].

## Materials and Methods

In this retrospective study, all the fatal cranio-cerebral injuries due to RTA's brought for autopsy at mortuary of Adichunchanagiri Institute of Medical Sciences, Mandya district, Karnataka, India, between January 2013 to December 2017 were analyzed. During this study, several epidemiological observations and their results were considered.

## Results

Year	Total No. of autopsies.	No. of RTA cases.	% of RTA cases.	Males		Females	
				No.	%	No.	%
2013	140	78	55%	60	77%	18	23%
2014	158	82	52%	70	85%	12	15%
2015	138	63	46%	52	83%	11	17%
2016	148	72	49%	62	86%	10	14%
2017	164	88	54%	74	85%	14	15%
TOTAL	748	383	51%	318	83%	65	17%

Table 1: Year wise distribution of cases.

Age Group(in years)	Males		Females		Total No.
	No.	%	No	%	
<10 years	0	0	0	0	0
11-20 yrs	12	4%	5	6%	17
21-30 yrs	55	18%	20	25%	75
31-40 yrs	92	30%	35	43%	127
41-50 yrs	75	25%	14	17%	89
>51 years	68	23%	7	9%	75
Total	302	100	81	100%	383

Table 2: Age and Sex wise distribution of cases.

Type of Road user No	No.	%
Pedestrians	22	6%
Cyclists	5	1%
Motor-cyclists	62	17%
Pillion Rider	40	10%
Driver of 3 and 4 wheeler	106	28%
Occupants of 3 and 4 wheeler	86	22%
Bus/Mini Bus passengers	62	16%
TOTAL	383	100%

Table 3: Victims of Road Traffic Accident.

Findings	No.
Scalp Injuries(Abrasions, Lacerations, Hematoma)	245
Skull Fractures	294
<b>Intracranial Hemorrhages</b>	
Extradural Hemorrhage	160
Subdural Hemorrhage	142
Subarachnoid Hemorrhage	134
Intracerebral Hemorrhage	118
Cerebral contusion/Laceration	88
Cerebral odema with diffuse axonal injury	24
Brain abscess	58
Associated fracture of Cervical spine.	54

Table 4: Autopsy Findings.

Location of skull fracture.	No.
Frontal	96
Fronto-Parietal	69
Parietal	34
Parieto-Temporal	31
Temporal	28
Parieto-Occipital	36
Occipital	39
Temporo-occipital	22
Base of skull	10

Table 5: Anatomical Location of skull fractures.

Type of skull Fracture	No.
Only Fissure	165
Comminuted	62
Depressed Comminuted	18
Fissure + depressed comminuted	118
Fissure + Sutural diastasis	86

Table 6: Type of skull fracture.

## Discussion

In the present study Total number of autopsies done in the last five years was 748. RTA constitutes 51% (383 cases). The majority of victims belonged to the age group 31-40 years (92 cases; 30%). Females were less involved than men with ratio of 1:4. Drivers of 3 and 4 wheelers were most commonly involved (106 cases; 28%), followed by occupants of 3 and 4 wheeler (86 cases; 22%) and motor-cyclists in fatal RTA's (62 cases; 17%). Intracranial Hemorrhages were the most common findings followed by skull fractures. Frontal bone fracture was the commonest injury (96 cases). Fissure and depressed fractures were the most common type of skull fractures.

According to a study done by Gambhir Singh, These 50 cases of fatal craniocerebral injuries comprised about 2.82% of all medico legal autopsies conducted during the study period [4]. The incidence of brain stem involvement in fatal craniocerebral injury cases was very high, observed in 41 cases (82%). Amongst these 41 cases of brain stem injury, 16 cases (39.02%) were primary brainstem injury and 25 cases (60.98%) were secondary brainstem injury. Majority of the victims were middle aged male though the age range was wide spread from 4-87 years. Road Traffic Accidents (RTA) was the single most common cause of fatal head injury which was seen in 43 cases (86%) as shown in Homicidal head injury was observed only in one case. The most common site for brain stem hematoma was the Pons, seen in 12 case (63.16%).

According to a study done by Sachin Chourasia, Out of 50 cases 40 (80%) were males and 10 (20%) were females with a M:F ratio of 1:0.25. The most common age group involved was 21-40 years (32%) followed by 61-80 years (28%) and 41-60 years (18%) [5,6]. The most common cause of TBI was found to be road traffic accidents (68%) followed by fall from height (16%). Following TBI majority of the patients succumbed to death between 16-24 hours (34%) while spot death was seen in 12% of the cases. 39 (78%) patients were found to be having skull fracture majority of which involved vault alone (48.72%) while in 18 (46.15%) patients the fracture involved both vault and the base of skull. Contusion was present in 28 (56%) patients. Most common type of intracranial hemorrhage was found to be subarachnoid hemorrhage which was found in 41 (82%) patients followed by subdural and intra-cerebral hemorrhages which were seen in 38 (76%) and 22 (44%) patients respectively.

According to a study done by Hareesh SG, Deaths due to vehicular accidents constituted 69% of the total unnatural deaths. Cranio-cerebral injuries were present in 68.5% of victims of vehicular accident. Combination of skull fracture, intra-cranial hemorrhages and cerebral injury was seen in maximum number of victims (38.2%). If injuries are considered individually, most commonly observed injury was intracranial hemorrhage (90.7%), followed by skull fracture (78.9%). Subarachnoid hemorrhage was the commonest type of intracranial hemorrhage present (78.3%). In the skull vault, linear fracture was the commonest type (49%) and in the base, middle cranial fossa (68.3%) was the most commonly fractured fossa. Among the cerebral injuries, contusion of the brain tissue was the commonest injury seen. Frontal and temporal lobes were the most commonly injured parts of the cerebrum (65.8%).

### Conclusion

“Prevention is better than cure” is the only method to control the mortality and morbidity from road traffic accident cases. Better road, good driver, safety precautions are the key factors to control the damages. National and state highway authorities should implement a strict plan to reduce the road traffic accidents. However it is the driver duty to ensure safe drive to protect him and pedestrians.

Fatal RTA's are mostly due to human errors and thus are preventable to a very large extent. Strict licensing policy especially for 4 wheelers, a greater awareness of traffic rules and regulations among general public along with cultivation of road traffic sense, curbing drug and alcohol abuse, and proper construction and maintenance of roads will go a long way in curbing the incidence of fatal cranio-cerebral injuries in fatal RTA's. Providing safe crossings and sidewalks or separate paths and lanes for pedestrians and cyclists, providing convenient, affordable and frequent public transportation will reduce the

occurrence of fatal RTA's. Helmets for all riders and pillion riders of motorcycles made compulsory by honorable Supreme Court of India should be strictly enforced by the authorities who go a long way in reducing death or disability of riders and pillion riders. Seat belts are also made compulsory for all drivers and passengers of cars and other four wheelers. Providing appropriate immediate first aid at the scene of accidents, developing a comprehensive highway trauma protocol for timely medical aid to RTA victims shall also reduce the death and disabilities.

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