



## THE PATTERN OF INJURIES ON THE BASIS OF AUTOPSY FINDINGS IN FATAL ROAD TRAFFIC ACCIDENTS

### Forensic Medicine

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### ABSTRACT

**Background-**A Road traffic accident (RTA) is defined as any vehicular accident occurring on a public road or highways and includes vehicular accidents where the place of occurrence is unspecified. RTA is one of the major preventable public health problems.

**Aim & objective-**To study the patterns of injuries due to RTA, causes, mechanism of injury & also CT imaging evaluation whenever it is available.

**Material & method-**Total 57 cases of RTA were selected for retrospective study which had definite history of RTA. The detailed analysis of these cases was based on the inquest report and evaluation of autopsy reports.

**Result-**RTA is more common among 20 to 40 year age group & males are more commonly affected. Two wheeler users and pedestrians have the highest rates of fatal injuries. Peak time of occurrence of RTA is reported at 9: am to 12; 30 pm. National highway (55%) most vulnerable place for RTA. **Comminuted fracture (42%) & intracranial hemorrhage SDH type (84%)** are most common type. The head injury was responsible for most of the deaths.

**Conclusion-** The incidence is about 25.12%. The commonest affected age group is 31-40 yrs and most of victims (82%) were males. Most affected group belongs to urban area, winter & marriage season. The commonest crash pattern was 2WH to LMV. Commonest types of skull fracture was comminuted & intracranial hemorrhage was SDH type

### KEYWORDS

RTA, Road users, SDH, Fatal injuries, NCCT

### BACKGROUND

A Road traffic accident is defined as any vehicular accident occurring on a public road or highways and includes vehicular accidents where the place of occurrence is unspecified. RTA is one of the major preventable public health problems and is on the rise which can be attributed to increase in number of vehicle, life style changes, and risky attitude. Accidents occur not only due to ignorance but also due to carelessness, thoughtlessness and over confidence. Human, vehicular and environmental factors play a role before, during and after RTA[1]The problem is so severe that by 2020, it is projected that road traffic disability –adjusted life year (DALYs) lost will move from being the 19th leading cause of DALYs lost to the 3rd leading cause in developing countries.[2] RTA kill an estimated 1.3 million people and injure 50 million people per year globally. The magnitude of RTAs and fatalities in India is alarming. The National Crime Records Bureau (NCRB) 2016 report states there were 496,762 roads, railways and railway crossing-related traffic collisions in 2015. Of these, road collisions accounted for 464,674 collisions which caused 148,707 traffic-related deaths in India[3]. These numbers translate into one road accident a minute and one road accident death every four minutes. This study is to ascertain the incidence of fatal vehicular accidents and patterns of injuries with emphasis on traumatic brain injuries amongst RTA victims and their preventive measures.

### AIMS AND OBJECTIVES

To know the incidence, profile of victims. Preventive measures of factors contributing to causation of accidents. To study the patterns of injuries due to RTA, causes, mechanism of injury. CT imaging finding evaluation of those cases for which CT plate was available.

### MATERIAL AND METHODS

The present retrospective study was carried out at Dept. of Forensic Medicine of Patna Medical College. All the deaths due to RTA to PMCH Patna during the period July 2018 to June 2019 were retrospectively analyzed. The detailed analysis of these cases was based on the inquest report and evaluation of autopsy reports. 2531 Autopsy conducted in the PMCH Mortuary during July 2018 to June 2019. Out of 226 medico legal autopsies were taken into consideration and among them 57 cases were of vehicular accident fatalities. Only those cases were selected which had a definite history of RTA. A detailed analysis of the pattern and incidence of various injuries sustained by RTA victims carried out. Beside, features pertaining to

hosts (road users), crash pattern, severity of injuries of victims, types of skull fractures, types of intracranial hemorrhages are studied.

### RESULTS AND DISCUSSIONS

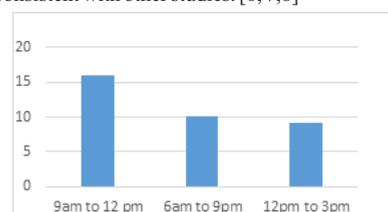
The accidents contributed for most of the deaths due to RTA, two wheeler users and pedestrians have the highest rates of fatal injuries. Commonest age group was 30-40 yrs.

Statistical analysis-Analysis of data was done using data summarization in which calculation of appropriate statics & display of information was done in form of tables & graphs.

**Table1- Age & sex distribution of RTA**

Vulnerable age	30-40 years	20-30 years	11-20 years	41-50 years	>50 years
%	21(37%)	16(28%)	10(17.5%)	8(14%)	2(3.5%)
Sex	Male	Female	Urban/Rural	Urban	Rural
%	47(82%)	10(8%)	No of people	40(70%)	17(30%)

Tendency of this age group of 20-40 years show scarce attention to traffic rules and regulations and no use of safety devices like helmets, seat belts etc. can be a possible explanation for the same. RTA involved most productive age group, result into a serious economic loss to the community. This is also supported by author.[3-6] In the present study, the peak time of occurrence of RTA was reported at 9:00am to 12; 30 pm(Fig-1). This is due to heavy rush on road at these working hours which are consistent with other studies. [6, 7,8]



**Fig1-Peak time of RTA**

We observed that highest no of RTA case took place on national highway. Possible explanation for this is narrow & busy road, no strict enforcement of safety rules & no traffic signal. Other studies are also support this.[7, 8]

**Table2-RTA cases distribution on highway**

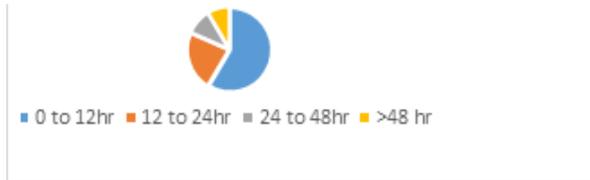
National highways	State highway	City road
31(55%)	10(16.67%)	5(9.25%)

In this study, we observed that the highest no of cases were occurring during winter season (30[52.63%]) followed by summer season (16[28%]) and least (11[19.3%]) cases occurred in rainy season. During marriage season like May, June, July, November. the no of cases were high (30(56%)), than non marriage season (27(44%)), this occurs because of high busy schedule and loss of care. These are consistent with other author.[6, 9]

\*Types of road users involved in accidents in this study maximum no of accidents were two wheeler type given in form of following -Table3

Vehicles/ pedestrians	Two wheeler	Two pedestrians	LMV	SWH
No of accident/%	34(61%)	13(24%)	5(8.5%)	4(7.4%)

\*there are different types of crash pattern between vehicles. Like number of crash pattern b/n two wheelers to LMV-20 cases, LMV to LMV-18 cases, two wheeler to two wheeler-10 cases, pediatrician to LMV- 9 cases were found. Likely explanations are two wheeler are more affordable & much more in number. In two wheeler accident, we noticed that the most of the victims who died because of fatal head injury were non users of helmet, which shows that the safety helmet can be lifesaving during the accident involving two wheelers.[6, 8, 9, 10] In our study, we found that most of the victims death during within 0-12hrs.(Fig.2) Which is supported by other studies.[8]



**Figure2-Survival period pie chart**

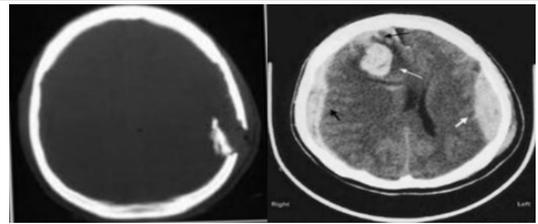
There are different types of skull fractures found during our study in which comminuted fracture is most common.

**Table4-Percentage of different types of Fracture**

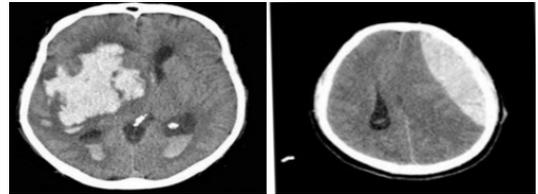
Comminuted fracture	Linear fracture	Depressed fracture	Basilar fracture	Suture fracture	No fracture
24(42%)	11(19.3%)	7(12.2%)	2(3.5%)	4(7%)	10(17.54%)

There are different types of skull fractures found during our study in which comminuted fracture is most common. These are consistent with studies by other authors.[12-13] The most frequent bone fractured was temporal bone followed by parietal bone and frontal bone. The commonest variety of intra cranial hemorrhages found was subdural hemorrhage(SDH) [48(84%)] followed by subarachnoid hemorrhage(SAH) then intra cerebral hemorrhage (10[17%]) and least is extramural hemorrhage [EDH](6[10%]). which is supported by other studies also.[12] our result is also supported by imaging finding in cases for which NCCT brain was done when patient admitted to hospital emergency. With regard to pattern of injuries, musculoskeletal injuries topped the list of injuries of RTA in all age groups of victim, while injuries of head, chest, and abdomen injuries in motorcyclist were more frequent than other victims due to severe trauma to unprotected bodies. These were consistent with other studies[11,13]

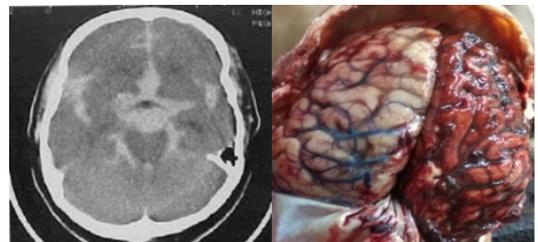
In cases of RTA in which spot death don't occurred, get hospitalized and died in few hours or days. In all cases NCCT brain was suggested by surgeon immediately to rule out intracranial hemorrhage in form of EDH, SDH, SAH, Intraparenchymal hemorrhage(IPH), Intraventricular hemorrhage(IVH) or mixed pattern and fracture of skull[Figure3a,b 4a,b 5a(NCCT Image) 6a,b(PM Image)]. Depending upon degree of impact, amount and type of intracranial hemorrhage, result into brain edema, mass effect & midline shift. In case of traumatic brain injury(TAI) [also known as diffuse axonal injury (DAI)] is due to shearing forces. It is difficult to diagnose on imaging especially CT as finding can be subtle. In TAI clinical deterioration is disproportionate to his or her imaging finding. Depending upon severity & distribution of injuries patient can vary from minimally affected, persistent vegetative static or death.



**Fig3a**  
**Figure3a-Depressed comminuted fracture of skull left temporo-parietal region Figure3b-Mixed pattern of ICH (SDH, EDH & IPH) with midline shift to left**



**Fig-4a**  
**Figure4a-Large intraparenchymal hemorrhage region right basal ganglia & insular cortex with IVH, Effacement of right lateral Ventricle & marked midline shift to left Figure4b- Large EDH left fronto-parietal region with midline shift to right**



**Fig-5a**  
**Figure5a- marked subarachnoid hemorrhage bilateral lateral fissure, tentorium cerebelli & interhemispheric fissure , suprasellar cistern Figure6a-SDH after RTA in left cerebral hemisphere**



**Fig6b-EDH after RTA involving cerebral hemisphere**

**CONCLUSIONS**

- The incidence is 25.12%.
- The commonest affected age group is 31-40 yrs.
- Most affected age group belongs to urban area.
- Male subjects were predominant.
- High no of cases occurred during winter season
- High no of cases also seen during marriage season
- Highest no of cases occurred during day time, on the national highways.
- The commonest crash pattern was 2WH to LMV.
- The commonest road users are two wheelers riders followed by pedestrians.
- We found multiple injuries of soft tissue and bony injuries among different types of road users.
- Most of the victims were non-helmet users at the time of incident.
- Commonest types of skull fractures is comminuted fractures.
- Commonest type of hemorrhage is SDH.
- Most of the death takes place either on the spot or within 24 hrs. of injury.
- Human error is the most common cause of RTA.

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