

## Pattern of Skeletal Trauma at Autopsy in the Mortuary of Tertiary Care Teaching Hospital in South India

Thripathi Suvarna<sup>1</sup>, Shankar M Bakkannavar<sup>2</sup>

### Abstract

Any injury caused to the body is trauma. It could be mental or physical. Physical trauma is a serious injury to the body, which causes structural change in any tissue of the body including skeleton in man. The skeletal trauma usually occurs in individuals of all age groups, which effects body parts; and may lead to fracture in bones. The injury may be caused due to road accidents, fall from height, slip, and fall, fires, burns and any crimes against human beings. It is very much essential to examine and find out the cause of skeletal trauma, whether the fracture and skeletal injury is due to blunt, sharp, or ballistic forces. Because it helps in differentiating whether the manner of death was homicide, accident, suicide or natural. The purpose and main objective of this project is to study the pattern of bone fractures in trauma cases while considering features like the types of fracture, injured regions and their location in each patient varying with age and sex. Even the injuries produced show different patterns related to patterns of skeletal trauma in different case.

**Keywords:** Trauma; Skeletal; Bones; Blunt force; ballistic effect

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### Introduction:

Trauma is an insult to the state of well-being; this can be mental or physical. Physical trauma is a serious injury to the body, which causes structural change in man.<sup>1-4</sup> It may be associated with loss of tissue. Two main types of physical trauma are; blunt force trauma – injury caused due to broad or blunt instruments often causing tearing, crushing, shearing or broken bones and sharp force trauma – injury resulted due to sharp edged or pointed object causing cuts, stabs and chops. In forensics, it is quite challenging to determine the cause and interpret skeletal trauma cases. So analysis requires strict approach to provide valid scientific elucidations.

Skeletal trauma usually occurs in individuals of all age groups, which effects body parts; and may lead to fracture in bones. The blunt force trauma is a leading cause of death in trauma cases it is caused when the body gets hit by a heavy object with great force. Skull fracture is a serious type of skeletal trauma, that results in bleeding and swelling in the brain, which is life threatening and may lead to coma.<sup>5-7</sup> Forensic experts play a very important role and are well trained to analyze the death due to major trauma.

Forensic experts are well known to interpret the type of force and number of impacts by reconstructing the fragmented bone and in examining fracture patterns. Blunt force trauma also sometimes results to skeletal fractures, analyzing fracture characteristics<sup>1</sup> and the distribution pattern is very informative for determining the manner of death. Violent deaths resulting from trauma mainly includes road traffic accident and falls from height.<sup>2,3,8,9</sup> Medico

<sup>1</sup>FormerMSc Student, <sup>2</sup>Associate Professor,  
Department of Forensic Medicine & Toxicology,  
Kasturba Medical College Manipal, MAHE, Manipal.

**Correspondence:** Ms ThripathiSuvarna

Email: thripathisuvana73@gmail.com

Contact: +91 9663352941

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legal questions likely to arise in case of RTA and falls are mainly, whether the death caused was suicidal, homicidal or accidental. Thus, analysis of fractures in detail plays an important role in forensic investigations.

### Aims and Objectives

- To study the pattern of bone fractures.
- To analyse the cause of death in major trauma.
- To determine the relation between fractures and causes of death in patients who died due to trauma.
- Compare the results of our study with the other autopsy-based studies in India and abroad.

### Materials & Methods

Materials:

1. Post mortem reports of the last 2 years from January 2018 to December 2019 reported in the mortuary of Department of Forensic Medicine and Toxicology at Kasturba Medical College, Manipal

2. Performa Sheet

Methods: The two years retrospective research was done of all the skeletal trauma cases based on the post-mortem reports from January 2018 to December 2019. A detailed study of the post-mortem report was done. All the data necessary for the study was properly tabulated in the excel Performa sheet. Data pertaining to the age, sex, history, months of incident, time of incident, bone involved, types of fracture, causes of death, survival period and any notable information related to the case. Total of 175 cases have been reported in the mortuary of Department of Forensic Medicine and Toxicology. Information once systematically tabulated was carefully analysed in the form of graphs and reported statistically.

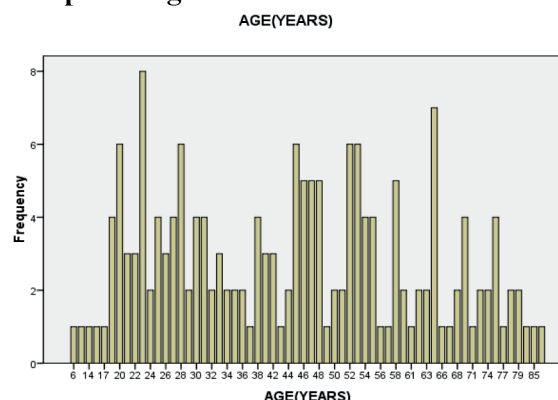
### Results

Total of 175 cases have been reported in the mortuary of Department of Forensic Medicine and Toxicology, at Kasturba Medical College, Manipal in the period of

two years from January 2018 to December 2019.

Age wise distribution of cases: In the overall study, out of total-number of trauma deaths reported while considering the age group in relation to number of deaths it was noted that maximum number of deaths occurred between the age group belonging to 20-30 years and the least number of deaths were reported between the age group of 80-85 years as can be seen in Graph 1.

**Graph 1: Age wise distribution of cases**

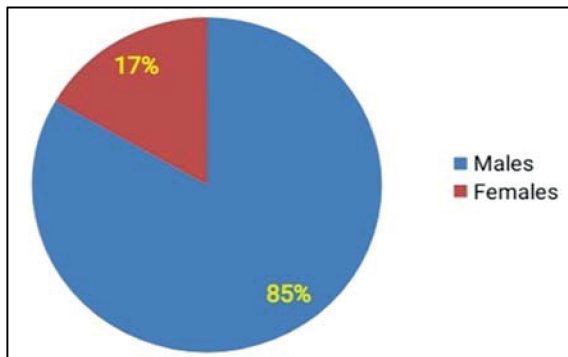


Gender-wise distribution of cases: In the annual death rate of male and female the results showed that out of 175 cases – 145 (83%) were males and 30 (17%) were females. Most of the trauma cases are due to RTA and it is common- cause of death in male population while compared to females. Males are often subjected to work which may cause some sort of stress also they are exposed to outside-environment since they are backbone and earning members of the family. The reason of males outnumbered being the victims of trauma death in predominance may be due to tendency of violating the traffic rules and regulations: also possession of fake driving licenses. (Graph 2).

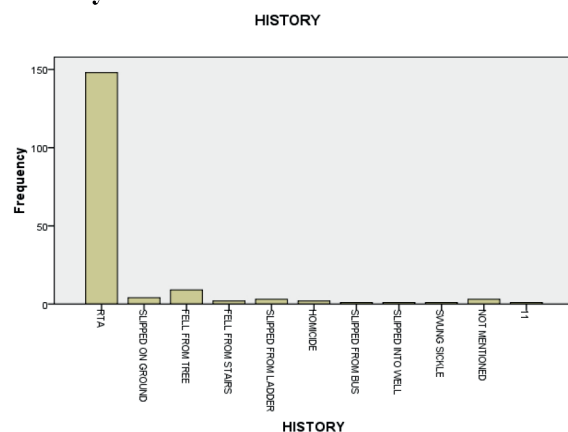
Distribution of cases based on history: The background and history of cases is of vital importance in the following study and was mainly focused, the study showed that major cause of trauma deaths was due to road traffic accidents occurred by collision of vehicles. Slipping from ladders, tree, and

stairs, slipping into well and other falls also led to trauma in few cases (Graph 3)

**Graph 3: Genderwisedistribution of cases**



### Graph 3: Cases distribution based on history

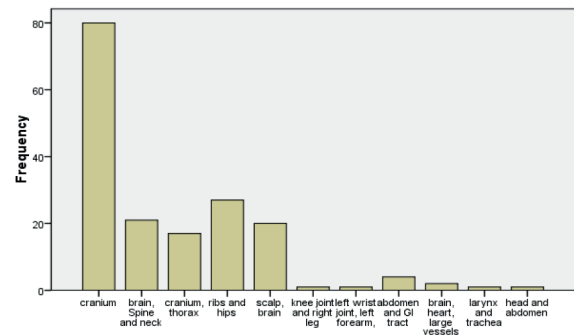


Case distribution based on bone involved: To describe the relation of fracture to the cause of death, it is necessary to study the bone involved in the fracture. It is observed that most of the trauma deaths involved cranium. According to graph 3 it is clear those deaths due to trauma fatal for life of the victim ranks with highest of 160 cases out of the total 175 cases. Brain, heart, larynx, trachea, knee joint was reported only in few cases ranking the lowest in the graph 4.

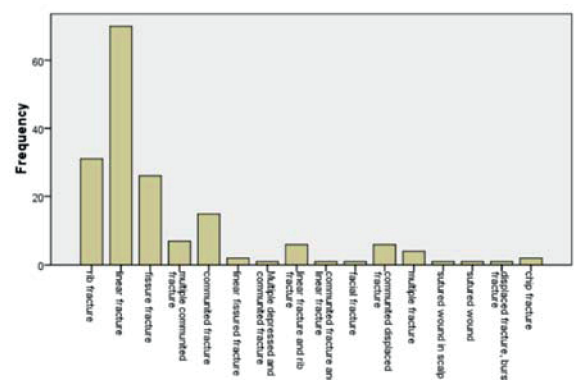
Case distribution based on the type of fracture: In order to analyze the death in cases of major trauma and study the pattern of injuries it is important to study the patterns and location of injuries. The 4 major types of fractures were studied during the study period- linear fracture, rib

fracture, fissure fracture, comminuted fracture. It is noted that most of death resulted linear fracture. Other types of fracture such as chip fracture, facial fracture, multiple depressed comminuted fracture was ranking lowest in the data studied which can be clearly seen in the Graph 5.

**Graph 4: Case distribution based on bone involved**



**Graph 5: Cases distribution based on types of fracture**



**Discussion:**

In 2 years, a total of 175 trauma deaths were reported from January 2018 to December 2019. There were no such irregularities seen in the number of trauma deaths among 2 years. In the study, it was found that there were more male victims with 83% (145) as compared to female victims with 17% (30), a similar pattern was observed in the retrospective study<sup>2</sup> entitled “Pattern of skeletal injuries: in cases of falls from height” where they have estimated that majority of the victims were males belonging to age-group of 20-30

years old. Also this study showed that the highest number of deaths have been occurred between the age group of 20-30 years. Similarly the study<sup>1</sup> conducted at M.S. Ramaiah medical college and hospital located at Bangalore during the study period between October 2005 to May 2007 titled "Study the pattern of injuries in fatal cases of fall from height" they studied that the maximum number of fall from height cases were observed in the age belonging to 21-30 years accounting for 34.61%. The lowest number of fall from height cases were seen in age group of 61-70 years and 81-90 years. The youngest age was 6 years and eldest was 85 years. It is observed that the main reason of trauma death was RTA which accounted for 85% (149 cases). Followed by fall from tree 9% (15 cases), slip and fall 4% (7 cases), other reasons such as swung sickle, suspicious were 2% which resulted in trauma deaths. As this study shows that most of the victims are of age 20-30 years and the main cause of trauma deaths were due to RTA, which clearly indicated that this is due to reckless driving of young people, drunken driving can also be the reason for this. It is also estimated that most of the victims were males in trauma deaths: who died due to 30 slip and fall from tree, building, ladders which tells us that they are working as laborer by occupation. The study has estimated 4 main types of fracture: rib fracture, linear fracture, fissure fracture, comminuted fracture. The other types of fracture were found only in few cases- chip fracture, facial fracture. It was inferred in the study<sup>1</sup> titled "Study of pattern of injuries in fatal cases of fall from height" wherein among all skull fractures, fissured fracture was more frequently found accounting 26.92%, which is then followed by comminuted fracture accounting for 23.07% also subdural, Subarachnoid Haemorrhage were found in 29 cases and Extradural Haemorrhage was observed in two cases along with subdural, Subarachnoid Haemorrhages. Among

injuries to neck, fracture of cervical spine was more frequently noticed accounting for 13.46%. Fracture of facial bones including nasal, maxilla and mandible was seen in three cases (05.76%). The results showed that out of 175 patients – 145 were men (83%), 30 were women (17%). Similar observations were seen in other studies.<sup>10-14</sup> Trauma cases involved males since men are exposed to trauma and falls more often than women, because boys are more active than girls at early ages and more men work as physical laborer compared to women. Out of all cases reported, the cause of death most commonly was blunt force trauma followed up by sharp force trauma was observed in trauma deaths. It is important to study the bone evolved to assess the manner of death. In this study it is estimated that the majority of the bone evolved were cranium, thorax, neck, brain, rib. The mean age of the patients was 44 years, ranging from 6-85 years. 107 patients sustained fractures of cranium, spine and neck. In the overall study, the rib fracture and skull fracture were highest in number. 31 Even though the project has given most of the positive findings we also have to pay attention to the fact that this project was only done for 2 years which cannot be corroborated to come to strong statistics of anything rigid. In addition to this, this study was done only based on the cases that were reported in the mortuary of Department of Forensic Medicine and Toxicology, Kasturba Medical College, Manipal which is another disadvantage of the study because there are many other medical centres in and around Manipal where post mortems take place hence not all these cases are reported here and there is no proper number of how many cases are exactly occurred in 2 years of study period. The probable suggestions that could be given from this study is to make this study purely multicentred so that we get an exact count of actually how many cases have occurred. This study could get more validation and strength if the research is



extended for more than 2 years so that it is easier to understand the pattern of trauma deaths. Further a more rigid security and traffic rules must be followed by the people while moving in vehicles, also patrolling system by police and strict rules must be developed by traffic policeman.

### Conclusion:

For better perspective of the crime rate and to know the pattern of injuries, it is important to include all the cases reported throughout the area of interest. The youngsters, adults must have the proper knowledge of traffic rules, sign boards as they are more vulnerable to RTA etc to prevent fatal skeletal trauma deaths and in order to create a secure and more protected environment. It would also help to understand the vulnerable group of people who get often victimized. This will not only help to recognize the present scenario but also to provide awareness among the people for better tomorrow.

Conflict of interest: None

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Ethical clearance: Obtained

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