

# A Study on Pattern of Intracranial Injuries in Cases of Fatal Head Injury

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## Abstract

Head injuries are the most common cause of death in trauma patients throughout the world. These injuries occur due to many causes most common of them being road traffic accidents, followed by fall, assault, etc. The dissection technique of scalp, skull and dura was in accordance with the procedures suggested by Gresham GA and Turner AF and the brain dissection as suggested by Ludwig J. Among the 42 cases, highest number of cases was between the age of 51-60 years with 12 cases (28.6%) and the lowest < 20 years with 4 cases (9.5%). The highest number of cases were seen among the upper middle class with 19(45.2%). There were 30 (71.4%) cases of road traffic accidents and the remaining 12 (28.6%) were case of fall (fall from height, fall of objects etc). Among the cases with skull fracture 23.8% (10) had linear fractures, 11.9% (5) had comminuted fracture, 2.4% (1) had diastatic fracture and others (61.9%) had no fractures. Among the cases with skull fracture 23.8% (10) had linear fractures, 11.9% (5) had comminuted fracture, 2.4% (1) had diastatic fracture and others (61.9%) had no fractures. Subdural hemorrhage was the commonest (n=34) intracranial injury observed. Highest number of fractures were present in the middle cranial fossa (n=16) among them 11 was linear fractures and 5 were comminuted fractures.

**Key Words:** head injury, road traffic accident, fall, fractures, parenchymal injuries.

## Introduction

Among all regional injuries, injuries to the head and neck are the most common and important in Forensic Medicine. [1] Head injuries are the most common cause of death in trauma patients throughout the world. As the head accommodates the most vital organ of our body 'brain', so such injuries cause death of victim in most of cases due to brain damage. [2] These injuries occur due to many causes most common of them being road traffic accidents, followed by fall, assault, etc. Road traffic injuries are the leading cause (60%) of fatal head injuries followed by fall from height (20%-25%) and violence (10%). Road traffic accidents are a human tragedy. Road traffic accidents take major portion of magnitude of

mortality in developing and developed countries, also the major concern of disability and pose itself as a major epidemiological and legal problem universally. However the other causes viz. fall from height, assault etc. also adds up to the toll. The extent of injuries sustained vary depending on the falling height, the composition of the impact surface, rate of deceleration, intermediate objects encountered during the process of fall, the position of the body when landing and individual factors such as age, body weight, pre-existing disease, and type of the person (child, adult, elderly). In India, fall from height is one of the common causes of severe blunt trauma. Fall from high places are frequently encountered in accidents, suicides & sometimes rarely in homicides. [2]

## Aims and Objectives

To ascertain pattern of head injury due to varying etiology

## Materials and Method

This cross-sectional study was conducted at the

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Department of Forensic Medicine and Toxicology of Sri Ramachandra Medical College and Research Institute, Porur, Chennai between June 2017 and May 2018. The sample size was 42 that were found eligible and taken up however the cases with advanced stage of decomposition where interpretation of injuries were not possible were excluded from the study.

The dissection of scalp, skull and dura matter was done after which the brain dissection was done. The brain was subjected for 1cm thick coronal sections. Each slice was examined before the new slice was made. The brain-stem and cerebellum were sectioned in a horizontal plane.

The demographic data as regards to age, sex, socio economic status (based on modified Kuppusamy classification), manner of injury, and Post mortem findings with respect to Skull fractures types and sites, brain parenchymal injuries.

Data collected were analyzed using Statistical Package for Social Sciences version 15.0 software. The output of the Data was in frequencies and percentage. Then Charts and Tables were prepared based on the output data.

## Results

Among the 42 cases, highest number of cases was between the age of 51-60 years with 12 cases (28.6%) and the lowest < 20 years with 4 cases (9.5%). The youngest victim was 18yrs old and the oldest was 80 years of age. On adding up total of 19 cases (45.3%) were present in the productive age group between 20yrs-50yrs (Ref Table 1). Mean age is 45.45years. In the study there were 39 (92.9%) male cases enlisted and female were 3 (7.1%) (Chart – 1).

The socio-economic status of the total cases were classified based on modified Kuppusamy classification with data collected on education, occupation and monthly income of a person. Based on this the highest number of cases were seen among the upper middle class with 19(45.2%) and the least was among the upper 1 (2.4%) and lower 1 (2.4%) economic category. Two cases were left behind as, one was a student and the other was a old female with no necessary credentials required (Chart – 2).

As per the history obtained from the relatives and through the Police Inquest, out of the total 42 cases,

there were 30 (71.4%) cases of road traffic accidents and the remaining 12 (28.6%) were case of fall (fall from height, fall of objects etc) ( Table – 2).

Among the cases with skull fracture 23.8% (10) had linear fractures, 11.9% (5) had comminuted fracture, 2.4% (1) had diastatic fracture and others (61.9%) had no fractures (Chart – 3). Subdural hemorrhage was the commonest (n=34) intracranial injury observed among the total 42 cases of fatal head injuries next with subarachnoid hemorrhage in 28 cases closely followed by subscalpal hematoma in 28 cases, Ventricular hemorrhages were present in 9 cases, contusions present in 7 cases and epidural hemorrhage was elicited in 6 cases (Table – 3). Highest number of fractures were present in the middle cranial fossa (n=16) among them 11 was linear fractures and 5 were comminuted fractures, Posterior cranial fossa had 10 fractures of which linear and comminuted fractures were equally observed and 6 fractures were present in the anterior cranial fossa were linear and comminuted fractures are equal in number (Chart – 4).

**Table 1: Age Distribution**

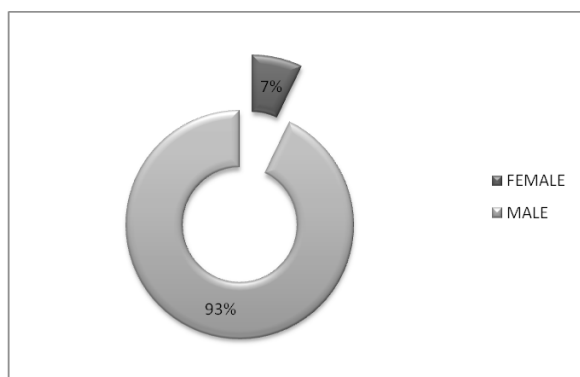
Age (range)	Frequency (n)	Percent (%)
<20yrs	4	9.5
21-30yrs	6	14.3
31-40yrs	6	14.3
41-50yrs	7	16.7
51-60yrs	12	28.6
>60yrs	7	16.7
Total	42	100.0

**Table 2 : Incidence**

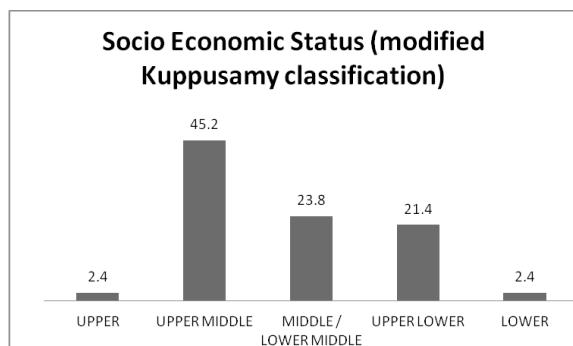
Type	Frequency (n)	Percent (%)
RTA	30	71.4
FALL	12	28.6
<b>Total</b>	42	100.0

**Table 3: Types of Injury / hemorrhage in head injury**

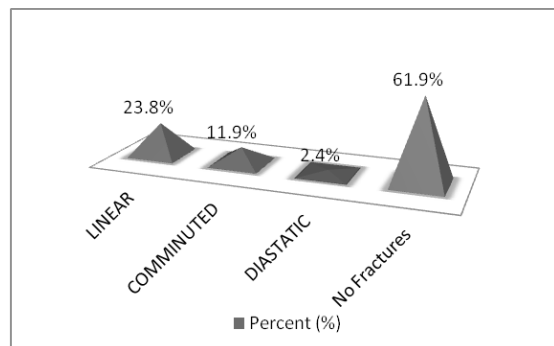
Types of Injury / Hemorrhage	No.of cases
Sub-Scalpal Hematoma	28
Epidural Hemorrhage	6
Sub-Dural Hemorrhage	34
Sub-Arachnoid Hemorrhage	29
Ventricular Hemorrhage	9
Contusion	7



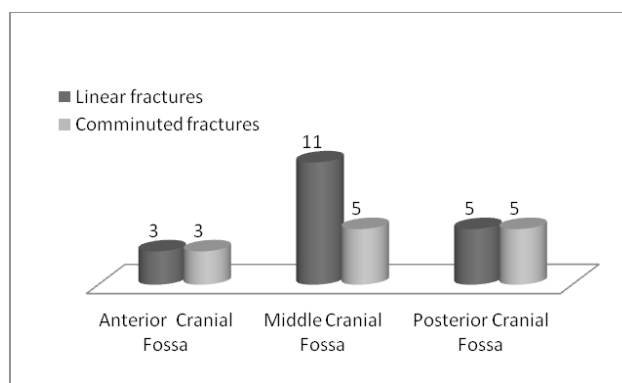
**Chart 1 : Gender Distribution**



**Chart 2: Socio Economic Status (modified Kuppusamy classification)**



**Chart 3 : Incidence of skull fractures**



**Chart 4 : Pattern of Base of Skull Fractures**

### Discussion

A total of 42 cases were taken up, for the study in which the highest incidence of fatal head injury cases was observed in the age groups 51-60years followed by the group between 41-50years and the mean age of the subjects was 45.45years. Dr. Priyadarshi et al’s study on pattern of fatal RTA found the vulnerable age group of fatal head injuries were among those in 40-59 yrs (54.3%) [3] which is the most productive age group in the community.

The data show male victims were more common than the female is in coherence to study by Selvaraj.T et al, in the southern city of Madurai in Tamilnadu with 84.9% of male and 15.1% of female victims of road traffic accidents. [4] Arvind Kumar et.al study was with highest male victims (88.22%) in his study on relating the fatal road traffic accidents and head injury. [5] The finding of the study that majority of victims of head injury fell in the category of upper middle class as per Modified Kupussamy classification of Socio-Economic Status, is almost referring the study by Dr. Priyadarshi et.al where the middle category (20%) was the highest involved group in fatal road traffic accidents followed by the upper middle category. [3]

The incidence of road traffic accident (71.4%) followed with fall (28.6) were found in study is similar to the observation of Prasanthi Puvanachandra in Asia in which majority of cases of traumatic brain injuries were of road traffic accidents (60%) followed by fall (20-30%) and the least violence (10%) [6], another study by Dr. Mukesh Kr Goyal et.al also shows similarity with cases of road traffic accidents (62.1%) followed by fall (30.7%) [7].

Linear fracture composed of 23.8% of the skull

fractures and next was the comminuted fracture. In a study on head injury by blunt force by Raja Rupani et al, fissure/diastatic fracture was seen in 50% followed by 30% of depressed fracture and 20% comminuted fracture<sup>[10]</sup> showing a wide difference in the results. Manish K et al observes that a linear fracture (38.8%) was the commonest among the victims of road traffic accidents.<sup>[9]</sup>

As found in the study it was the subdural hemorrhage predominating among all types of intracranial injuries followed by subarachnoid hemorrhage. These results were in coherence with the 5 years (2008-2012) retrospective study by Shivaramu MG et al; states that subdural hemorrhage (130) was the commonest intracranial injury, followed by Sub-Arachnoid hemorrhage (126) among a total of 310 fatal cases of road traffic accidents.<sup>[10]</sup> Yet another similar study by Anand Menon et al also state that Sub-Dural hemorrhage was present among 52.63% of cases, followed by 27.27% cases with subarachnoid hemorrhage.<sup>[11]</sup> Study of Arvind Kumar et al also gives subdural hemorrhage (89.11 %) as the commonest of the intracranial hemorrhages.<sup>[7]</sup>

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