

# Profile of CT findings and clinical presentation in traumatic brain injury: A single center experience

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## Abstract

**Objective:** To describe the computed tomography findings of patients with traumatic brain injury and their clinical presentation following admission to a tertiary care teaching hospital in India. **Study Design:** Retrospective, hospital based analysis of 1713 patients of traumatic brain injury [TBI] admitted from the department of emergency in a tertiary health centre in Jaipur from January 2014 to August 2015. **Method:** The computed tomography (CT) scan results of all eligible patients were reviewed and data collected on age, sex, mechanism of injury and clinical characteristics. **Results:** Among the 1713 patients admitted, mean age 21 years, majority of TBI's were reported in the age group 20 – 29 years (34.38%), followed by 30 – 39 years (26.97%), 40 – 49 years (16.70%), p value <0.05. Majority of the patients were male (63.46%), mostly unmarried. The most common mechanism of injury was road traffic accidents (RTA) 1199 (69.99%), followed by assault 251 (14.65%), 15.35% accounted for fall from height and fall of object on head. Clinical examination revealed that 1481 (86.46%) patients experienced loss of consciousness; 788 (46%) had one or more episodes of vomiting; 312 (18.21%) patients presented with bleeding from ear, nose or throat. Seizures were noted in 282 (16.46%) patients and vertigo in 411 (23.99%). Clinical examination also revealed abnormal pupils in 208 (12.14%) patients, abnormal motor response in 211 (12.32%) patients, only 3 – 5% patients showed cranial nerve deficit, racoon eyes or battle's sign. CT scan revealed contusions (42.50%) and fractures (35.14%) were the most common findings followed by sub dural hematoma (32.87%), extra dural hematoma (18.21%). 85% patients were managed conservatively and 27% managed surgically. Mean hospital stay was  $7.6 \pm 9.3$  days (range < 1 day to 87 days)

**Keywords:** Traumatic brain injury, Glasgow outcome score.

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## INTRODUCTION

Traumatic brain injury (TBI) is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or

temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness<sup>1</sup>. In India, it is estimated that about 1.5 to 2 million people are injured and more than a million succumb to death every year. Road traffic accidents are the leading cause (60%) of TBIs followed by falls (20%-25%) and violence (10%). Alcohol involvement is known to be present among 15%-20% of TBIs at the time of injury<sup>2</sup>. Due to rapid surge in urbanization, motorization and economical liberation, many Asian countries have an increased risk for TBI<sup>3</sup>. Motor vehicle accidents, history of fall from height, fall of object on head and road traffic injury associated with substance abuse like alcohol accounts for majority of patients seeking emergency medical care in sub-urban Jaipur and surrounding rural areas, whereas injury due to

assault, firearms and occupational hazards are not common. Historically, imaging of traumatic brain injury relied on skull radiographs, with the advent of new technologies like computed tomography (CT) and magnetic resonance imaging (MRI) the modality of diagnosis has taken a big leap forward and presently CT scan has become the diagnostic procedure of choice to evaluate patients with TBI. In our institution, CT is performed for all patients presenting to the emergency with TBI.

**MATERIALS AND METHODS**

The retrospective study included 1713 patients from less than 1 year of age to 92 years, with clinical evidence of TBI, admitted to the Department of Emergency, Mahatma Gandhi Medical College and Hospital, Jaipur from January 2014 to August 2015. All studies were performed with a single CT scanner (GE) by taking axial sections of 5mm from the base of the skull to the vertex. Brain window (width, 80 HU; level, 40 HU), subdural (width, 350 HU; level, 40 HU), and bone (width, 3500 HU; level, 500HU) windows were scanned in each patient. All CT's were performed without contrast and patient data and reports were recorded in Microsoft word. The patient's age, gender, signs and symptoms, mode of injury and CT findings were duly recorded in the patient database. Data was recorded in Microsoft excel. Statistical analysis of the compiled data was analysed using Microsoft excel and Epi Info™ and presented in proportion and mean values. Proportions were analysed using the Chi Square test, error value set at <5%

**RESULTS**

Among the 1713 patients admitted during January 2014 to August 2015, median age was 21 years (range 1 month to 92 years). The majority of TBI's were in the age group of 20 – 29 years (34.38%), followed by 30 – 39 years (26.97%), followed by 40 – 49 years (16.70%), p value <0.05.

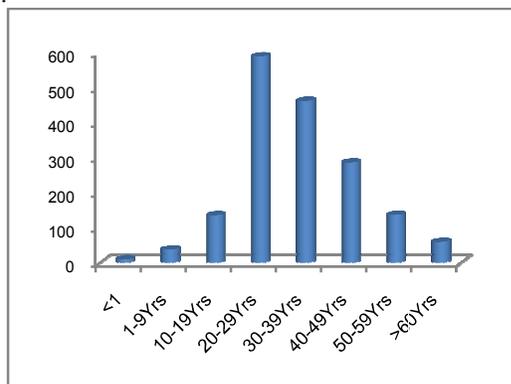


Figure 1: Age Distribution

Most of the patients were male (1087 / 63.46%), females accounted for the rest 36.54%.

Table 1: Mode of Injury

Age Group	Mode of Injury				Total
	Fall from Height	Road Traffic Accident	Assault	Fall of object on head	
<1 year	5	2	0	2	9
1 – 9 years	22	10	3	2	37
10 – 19 years	43	70	13	9	135
20 – 29 years	14	480	72	23	589
30 – 39 years	29	322	78	33	462
40 – 49 years	14	188	58	26	286
50 – 59 years	16	89	23	8	136
60 – 69 years	12	38	4	5	59
<b>Total</b>	<b>155</b>	<b>1199</b>	<b>251</b>	<b>108</b>	<b>1713</b>

The most common mechanism of injury was road traffic accidents (RTA)1199 (69.99%), followed by assault 251 (14.65%). The rest 15.35% accounted for fall from height and fall of object on head. The mean hospital stay was 7.6 ± 9.3 days (range < 1 day to 87 days). Majority of injuries (47%) were two wheeler users.

Table 2: Clinical Details

Symptoms	Number	Percentage
Loss of Consciousness	1481	86.46%
Vomiting	788	46.00%
Ear Nose Throat Bleed	312	18.21%
History of Seizures	282	16.46%
Vertigo	411	23.99%
<b>Signs</b>		
Racoon Eyes	42	2.45%
Battle Signs	78	4.55%
Abnormal Pupillary examination	208	12.14%
Abnormal Motor Response	211	12.32%
Abnormal plantar response	162	9.46%
Cranial Nerve Deficit	61	3.56%

Clinical examination revealed that 1481 (86.46%) patients experienced loss of consciousness; 788 (46%) had one or more episodes of vomiting; 312 (18.21%) patients presented with bleeding from ear, nose or throat. Seizures were noted in 282 (16.46%) patients and vertigo in 411 (23.99%). Clinical examination also revealed abnormal pupils in 208 (12.14%) patients, abnormal motor response in 211 (12.32%) patients, only 3 – 5% patients showed cranial nerve deficit, racoon eyes or battle's sign.

**Table 3: CT scan findings**

CT Scan Outcomes	Number	Percentage
Normal	243	14.19%
Fractures	602	35.14%
Extra Dural hematoma	312	18.21%
Sub Dural hematoma	563	32.87%
Contusion	728	42.50%
Sub Arachnoid Haemorrhage	152	8.87%
Intra Ventricular Haemorrhage	68	3.97%
Diffuse Axonal Injury	221	12.90%
Pneumocephalus	411	23.99%

CT findings revealed no significant findings in 243 (14.19%) patients, contusions in 728 (42.50%) and fracture in 602 patients (35.14%); Sub dural hematomas were noted in 563 patients (32.87%), extradural hematoma in 312 (18.21%), sub arachnoid haemorrhage in 152 (8.87%), intra ventricular haemorrhage in 68 (3.97%), diffuse axonal injury in 221 (12.90%) and pneumocephalus in 411 (23.99%) patients.

## DISCUSSION

The study reveals that traumatic brain injury is more common in the young population (20 – 40 years) since they are the most active group of society. A steady decline was noted after the age of 40 years, patients above the age of 50 years were rather less mobile and unlikely to get involved in road traffic accidents. The present study revealed similar associated symptoms with positive CT findings and included loss of consciousness, dizziness, headaches, nausea, vomiting. The incidence of CT findings was higher in unconscious patients and patients with altered motor function. CT done for headaches; dizziness and vomiting were of less diagnostic

value. Thus, the correlation between the severity of clinical presentations and abnormalities noted at computerized tomography showed a linear relationship<sup>4</sup>.

## CONCLUSION

Traumatic brain injury is a serious challenge to the community. With rapid modernization, growth in the country has been sporadic, boosting only segments of the population. With the high incidence of TBI in our region and the associated CT findings, CT is considered an integral part in the management of patients with TBI and in moderate and severe head injuries it is essential for rapid surgical intervention. Moreover, as a tertiary teaching and referral institution, CT is promoted as an important diagnostic criteria and screening criteria for assessing the condition of patients immediately upon arrival to the department of emergency.

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