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## Original Research Article

## Socio-demographic correlation of traumatic brain injury patients at a tertiary care centre of northern India

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## ABSTRACT

**Introduction:** India has a limited and evolving health infrastructure. A vast majority of rural and distant population are unable to access good quality treatment due to limited number of tertiary care centres in the country. Information from National Crime Records Bureau (NCRB) reveals that nearly 500000 deaths occur every year due to injuries and 1/3<sup>rd</sup> of them are due to Road Traffic Injuries (RTI). Trauma in general and traumatic brain injury (TBI) in particular poses a major public health crisis in India and in many developing countries. TBI causes significant number of deaths, disabilities and socio-economic losses.

**Materials and Methods:** Selected 150 head injury patients admitted under the Department of Neurosurgery, Trauma Centre, Institute of Medical Sciences (IMS), Banaras Hindu University (BHU), Varanasi, UP, India.

**Results:** The peak incidence of head injury was observed in the younger population, male deceased outnumbered female, most common cause for TBIs was RTI followed by fall from height, most of the victims had rural background, among victims students were in highest number and most belonged to low to middle income group family.

**Conclusion:** Trauma is not a 100% preventable problem but accidental deaths are preventable and the incidence of RTIs can be minimized by creating due attention in public. Global experience clearly indicates that road traffic injuries are amenable to prevention and require systematic approaches. Burden of disability can also be minimized by increasing rehabilitation services. Government should step in for implementation of traffic safety rules and driving regulations, efficient transport system for accidents victims and instructions for strict governance.

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## 1. Introduction

India has a limited and evolving health infrastructure. Even after successfully overcoming the phase of severe epidemic, country is still struggling to cope up with challenges of day to day trauma cases.<sup>1</sup> Trauma in general and traumatic brain injury (TBI) in particular poses a serious public health challenge in India and in many other developing countries.<sup>2,3</sup> In such a scenario, provision of good quality and affordable treatment to every section of society is

extremely important.<sup>4</sup>

India has an unbalanced distribution of trauma care that is more inclined towards urban areas.<sup>5,6</sup> There is lack of life saving devices, CT scans and crucial equipment like ventilators in many districts. A vast majority of rural and distant population are unable to access good quality treatment due to limited number of tertiary care centres in the country.<sup>5,6</sup> Information from National Crime Records Bureau reveals that nearly 500000 deaths occur every year due to injuries and 1/3 of them are due to a Road Traffic Injury (RTI).

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Among RTIs, TBI are at the forefront resulting in significant number of deaths, hospitalizations, disabilities and socio economic losses.<sup>7</sup> TBI has been defined 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<sup>8</sup> Brain - like other organs - bruises and swells from impact injuries. Such injury can also severely limit blood-flow and deprive tissue of vital oxygen, causing cell death and irreversible brain damage.<sup>9</sup>

The current understanding of pattern of TBI in India is limited due to lack of good quality population based information and inherent limitations of the available data in completing the epidemiological picture and profile of TBI.<sup>10</sup> So, this study tries to highlight the socio-demographic profile of TBI patient receiving treatment at a tertiary care centre of northern India that can be used further to create awareness at mass level and also in strengthening both- policies and policy making authorities towards a safer world.

## 2. Materials and Methods

### 2.1. Study design & setting

The current study is a cross sectional study done on selective 150 head injury patients admitted in the Department of Neurosurgery, Trauma Centre, IMS, BHU, Varanasi, a tertiary care hospital and teaching institute during the study period 1<sup>st</sup> October 2021 to 30<sup>th</sup> September 2022.

### 2.2. Inclusion criteria

All head injuries patients admitted into the Department of Neurosurgery, Trauma Centre, IMS, BHU, Varanasi, UP, India.

### 2.3. Exclusion criteria

1. Head injury patients coming to emergency of Trauma Centre, IMS, BHU, Varanasi, UP, India and getting discharged from there only without getting admitted.
2. Follow up patients of head injury admitted in the department of neurosurgery for repeat operative procedures and rehabilitation.
3. Head injury patients admitted in the Intensive Care Unit (ICU).
4. Poly-trauma cases with head injury admitted in other departments of Trauma Centre.
5. Other neurosurgery patients (like spine injuries patients, tumour patients, meningitis or infective lesion patients) admitted in the department.

## 3. Methodology

A detailed proforma was designed especially for the purpose of this study. Basic information about the deceased like age, gender, background, time, place of accident, type

of accident, and contributing factors etc., were obtained from the OPD/registration slip. These served the basis for epidemiological aspect of the study. Where data on the form was incomplete, additional information was sought verbally from the relatives or witnesses. The medical records and case sheets of the victims were also referred for collecting additional information where necessary for cross-checking.

## 4. Statistical Analysis

A total of 150 cases that satisfied the inclusion and exclusion criteria were included in the study and were administered with the predesigned proforma. The data thus collected from the proforma was recorded in Master-chart (Microsoft Excel Spread Sheet).

All relevant data obtained from each case were transferred to special information register sheet having a standard proforma for case recording. Data thus compiled were studied and analyzed statistically using Statistical package (SPSS20.0). Descriptive statistics employing use of frequency tables were analyzed and the result of these analyses have been presented and discussed in various tables and graph.

## 5. Results and Observations

### 5.1. Age

It was observed that the highest number of injuries occurred in the 16-30 years age group 57(38.0%). This incidence rises to 91(60.7%) if 31-45 years of age group in considered together.

The incidence was lowest in the victims above 75 of years of age group 3(2.0%) followed by below 15 years age of people 8(5.3%).

**Table 1:** Distribution of cases according to the different age groups

Age group	No. of cases	Percent (%)
0-15	8	5.3
16-30	57	38.0
31-45	34	22.7
46-60	24	16.0
61-75	24	16.0
>75	3	2.0

### 5.2. Sex

It was observed that 110(73.3%) of the victims were males and only 40(26.7%) were female. The male to female ratio in this study was 2.75:1

### 5.3. Education

Maximum number of cases were recorded in matric pass 52(34.7%) education level, followed by below matric pass

**Table 2:** Distribution of cases according to the gender of the deceased.

Sex	No. of cases	Percent (%)
Male	110	73.3
Female	40	26.7

39(26.0%) education level then in graduates and illiterates 30(20.0%) and 26(17.3%) respectively.

**Table 3:** Distribution of cases according to the educational status

Education	No. of cases	Percent (%)
Illiterate	26	17.3
Below matric	39	26.0
Matric pass	52	34.7
Graduate	30	20.0
Postgraduate	3	2.0

#### 5.4. Residence

Maximum number 104(69.3%) of head injury cases occurred in rural areas while only 46 cases (30.7%) occurred in urban areas.

**Table 4:** Distribution of cases according to the residence of the victims

Background	No. of cases	Percent (%)
RURAL	104	69.3
URBAN	46	30.7

#### 5.5. Occupational status

It was observed that maximum number of cases occurred in student category 30(20.0%) followed by house wives 29(19.3%) and then in decreasing trend in daily wage workers 25(16.7%), private job holders 22(14.7%) and farmers 16(10.7%).

**Table 5:** Distribution of cases according to the occupational status

Occupation	No. of cases	Percent (%)
Unemployed	11	7.3
Farmer	16	10.7
House-wife	29	19.3
Daily wage worker	25	16.7
Driver/vendor	9	6.0
Private job/business	22	14.7
Government job	8	5.3
Student	30	20.0

## 6. Gross Monthly Income

It was observed that maximum number of cases were recorded in the category of 20,000-30,000 INR earning people 37(24.7%) followed by 30,000 – 40,000 INR category and 10,000 -20,000 INR category equally sharing 35(23.3%) cases each.

It shows that the major chunk of population being admitted and getting treated here belongs to low to middle socio-economic status i.e. 133(88.6%) cases that is up to 40,000 INR earning per month.

**Table 6:** Distribution of the cases according to gross monthly income

Gross monthly income (INR)	No. of cases	Percent (%)
<10,000	26	17.3
10,000-20000	35	23.3
20000-30000	37	24.7
30000-40000	35	23.3
40000-50000	14	9.3
50000-60000	3	2.0

#### 6.1. Time of injury

It was observed that maximum number of incidences 40(26.7%) occurred during evening hours (18 to 22 hours). Afternoon time (14 to 18 hours) also showed high incidence of 35(23.3%). Minimum incidence was observed showed during night 22 - 06 hours 23(15.3%).

In other way at day hours (10:00- 22:00), a total of 107cases were recorded and in night hours (10:00-22:00) only 43 cases were recorded.

**Table 7:** Distribution of the cases according to time of injury

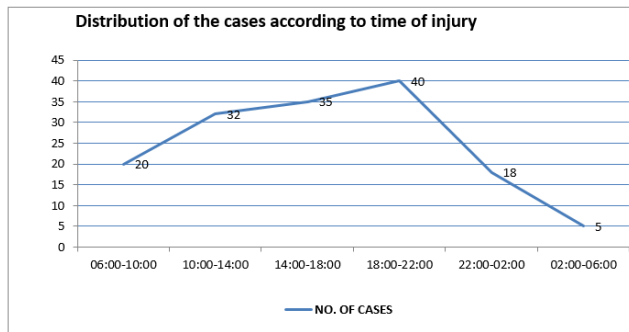
Time of injury	No. of cases	Percent (%)
06:00-10:00	20	13.3
10:00-14:00	32	21.3
14:00-18:00	35	23.3
18:00-22:00	40	26.7
22:00-02:00	18	12.0
02:00-06:00	5	3.3

#### 6.2. Place of injury

It was observed that majority of the cases 126(84.0%) occurred outdoor, among that road side accidents 77(51.3%) were the commonest followed by residential area accidents 26(17.3%) and only 24(16.0%) cases occurred at home.

## 7. Discussion

Injuries are a major public health problem today. TBI has often been referred to as “the silent epidemic” [Langlois, Rutland-Brown and Ward, 2006] especially due to fact that



Graph 1: Distribution of the cases according to time of injury

**Table 8:** Distribution of the cases according to place of injury

Place of injury	No. of cases	Percent (%)
Roadside	77	51.3
At home	24	16.0
Construction site	7	4.7
Residential area (village/colony)	26	17.3
Market area	14	9.3
Railway track	2	1.3

most of its consequences, especially cognitive impairment are not obvious. Visible or not, TBI continues to be a significant public health problem accounting for huge expenses and lost manpower every year.

Detailed analysis of 150 selected cases and multitude of factors associated with these TBI cases is discussed underneath.

### 7.1. Age

More than half (60.7%) of the victims of TBI in this study fall into the most active age group in the society i.e. the economically productive age group of 21-50 years. This age group is in the most active phase of life during which there is tendency to take a risk<sup>11,12</sup> and there is no doubt that these statistics impact negatively on the productivity and economic capacity of the country.

The lower proportion of victims above 75 years age and in children can be due to less mobility of these groups.<sup>11,12</sup>

### 7.2. Sex

1. 73.3% of the victims were males and only 26.7% were female. The male to female ratio in this study is 2.75:1.
2. The preponderance of males over the females in road traffic accident deaths may be explained by the fact that males in our country have more active life and more involved in outdoor activities.<sup>13</sup>

### 7.3. Education

1. Highest numbers of cases were found in matric pass 34.7% and below matric pass 26.0% education level group, then in graduate 20.0% and illiterate 17.3% group.
2. The literate education level group together constituted 124 out of 150 (82.7%) which shows literacy played no major role in causation of accidents or deaths.
3. Even after being literate, lack of road traffic senses and inadequate implementation of road traffic rules may have been a significant contributory factor in causation of accidents in all the groups.<sup>14,15</sup>

### 7.4. Background

In this study, maximum number of head injury patients belonged to rural area 69.3%; while only 30.7% were from urban area. The greater preponderance of rural population i.e.; 2.26:1 (104:46) ratio signifies the requirement of more number of such trauma care centres in the country. It also points towards the non-reliance of urban population towards the government hospital setups and their preference of private tertiary care centres over government ones.<sup>5,6</sup>

### 7.5. Occupation

Maximum numbers of cases were noted in student category 20.0%. The remaining groups like housewives, daily wage workers, private job holders, farmers etc showed equitable distribution means occupation of victims had no significant role to play in case of accidents in my study contradicting the Road Traffic Accidents Report 2021 India.<sup>16</sup>

### 7.6. Income

1. Maximum cases were recorded from low to middle socio-economic status i.e.; 65.3% cases that are up to 30,000 INR earning per month.
2. This can be explained by the fact that people of low socio economic status which forms a greater chunk of our country's population, need more hours of outdoor activities to earn their livelihood.<sup>16,17</sup> Most of the pedestrians also belong to this group.

### 7.7. Time

1. Maximum number of incidence 26.7% occurred during evening hours (18 to 22 hours). Afternoon (14 to 18 hours) also showed high incidence of 23.3%. Minimum incidences were observed during night (22 - 06 hours) i.e. 15.3%.
2. Maximum number of accidents occurring in evening hours can be attributed to high rush of traffic (people returning home from work), tiredness after day work, urgency to reach home, poor visibility due to insufficient street lightning, ignorance of traffic rules

and fast driving, etc. Minimum number of accident in the night can be explained by the fact that it is the quietest period of the day and most of the people remain indoors or go to sleep.<sup>16</sup>

### 7.8. Place of incidence

1. Majority of the cases 84.0% occurred outdoor among which road side 51.3% was the commonest followed by residential area 17.3%. Only 16.0% cases occurred at home.
2. Outdoor places are more common and vulnerable for various accidents like roadside in RTA, construction sites, footpath, etc in case of pedestrians etc.<sup>16</sup> However, the place of incidence was more frequently indoors in case of family related disputes and fall cases.

### 8. Conclusion

According to NCRB, TBI is increasingly being recognized as a public health problem of immense proportion with the substantial burden of disability and death occurring in low and middle income countries (LMICs).<sup>2</sup> Young people are being affected more at their prime periods of life which in turn affects their education, work, marriage, and other aspects of life. Also rural India lacks systematic prevention and trauma care services resulting in delayed care as well as greater number of referrals.<sup>5,6</sup>

Accidental deaths are preventable and the incidence of Road Traffic Accidents can be minimized by creating due attention in public. Global experience clearly indicates that road traffic injuries are amenable to prevention and require systematic approaches.<sup>14,15</sup> Burden of disability can also be minimized by increasing rehabilitation services for people with TBI.

It is therefore an urgent need that steps should be taken for-

Implementation of safety traffic rules, creation of an efficient transport system for accident victims, instructions for strict governance, ensuring preparedness of hospitals, implementing trauma team concept in medical college hospitals and all higher centres, implementation of driving license and regulations by the police and transport authority and implementation of rehabilitation facility centre for the people with TBI so that the mortality rates can be checked and those injured can have the opportunity to return to independent routine lifestyles.

### 9. Author Contributions

Both authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Dr Dhananjay Kumar. The final draft of the manuscript was written by both authors. Both authors have read and approved the final manuscript.

### 10. Ethics Approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Banaras Hindu University (Date: 20-08-2-22/ No Dean/2022/EC/3440).

### 11. Consent to Participate

Written informed consent was obtained from all individual participants included in the study.

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### 13. Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

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