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ORIGINAL RESEARCH

Profile and outcome of traumatic brain injury patients in a tertiary care centre in north Karnataka: An observational descriptive study

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ABSTRACT

Background: Traumatic Brian injury (TBI) has been one among the significant Public Health problems. It remains one of the leading causes of Mortality, morbidity, disability in developed and developing nations. It was estimated that TBI would be the third main cause of death and disability by 2020 according to World Health organization[1]. It is a leading cause of disability and death among young adults in the world, with devastating impact on patients and their families. **Objective:** The objective of study is to assess the profile and outcome of patients with Traumatic brain injury attending tertiary care hospital in North Karnataka. **Methods:** Over a course of three months, 172cases of Traumatic Brain Injury at Shri B.M. Patil Medical College, Hospital & Research Centre, Vijayapura, were studied as a part of an observational study. The TBI cases with or without Loss of consciousness and/or CT scan findings of Traumatic Brain Injury were selected. The data collection has been done in different formats, which included initial assessment and care, details of hospital stay and outcome at discharge. **Results:** The study revealed, male preponderance(87.8%), the distribution was more in early middle adulthood (age group 26-45 years)(50.58%) for TBI than other age group. The area distribution was Rural (71%), semi urban (12%) and Urban (17%). RTA(85%) was cause of most TBI cases followed by fall from height (10%) and Assault (5%). 37.9% of the cases presented within first hour and 41%within 1-6 hours of time since injury. The presentation symptoms were LOC (94%), Vomiting (66%), Seizures (1%). 11 were brought dead cases, and rest presented as Mild TBI (55.3%), Moderate TBI (24.3%), Severe TBI (20.5%). On CT Scan, Skull fractures (63.4%), Traumatic SAH (36.6%), Epidural Hematoma (15.7%), Subdural Hematoma (30.8%), Contusions (44.2%), Diffuse axonal Injury (9.3%) were found. Out of 172 cases, 126 cases were admitted and treated conservatively (71.4%), Underwent neurosurgery (19.1%), other surgical procedures (7.9%) and observation (1.6%), during admission 5.6% of cases suffered non-neurological complications. 8.1% of cases treated at the hospital on OPD and IPD basis, succumbed to death, and 85.8% had upper good recovery on GOS-E score. Out of 24 cases that underwent neurosurgery, only 4 cases succumbed to death. **Conclusion:** TBI is a major health problem with RTA being the most common cause. The occurrence is highest and prognosis is better for Mild TBI, though those suffering from Moderate and severe TBI suffer disabilities of various degree and/or death.

Key words: Traumatic brain injury, Glasgow coma scale, Glasgow outcome scale-Extended

INTRODUCTION

Traumatic Brian injury (TBI) has been one among the significant Public Health problems. It remains one of the leading causes of Mortality, morbidity, disability in developed and developing nations. It was estimated that TBI would be the third main cause of death and

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disability by 2020 according to World Health organization[1]. Nearly worldwide, Sixty-nine millions people per year are estimated to sustain a TBI[2].It is a leading cause of disability and death among young adults in the world, with devastating impact on patients and their families.

There appears lack of data and evidence in India on TBI, with data being published only 20,000 patients with TBI over 27 years. This accounts to only less than 1,000 TBI cases studied/year. This hardly would represent 0.1% of the population with TBI[3].

An increasing incidence of Traumatic Brain Injury in the productive age group is of major concern. Both the extremes of age group are more susceptible to severe injury and poor outcome. Quantitative analysis of injuries and outcomes of TBI patients shows a better impact on health in the economically productive population and in patients in the extreme age group[4].

There has to be stress on the development of high quality, standardized epidemiological data in India that would help reduce the growing economic and social burden due to TBI. There is necessity of designing Trauma systems which link rural and next level centres for trauma. These mid-systems should have guidelines to help the local doctors in immediate management and referral to the nearest Trauma Centre[5].

MATERIALS & METHODS

Present study wasa Hospital-based prospective descriptive study, whichaimed at studying the profile, Pattern and outcome of patients with Traumatic brain injury, attending a tertiary care hospital in North Karnataka.Data from 172 patients attending the casualty at BLDE(DU) Shri B M Patil Casualty Medical College Hospital and Research centre, Vijayapur, State Karnataka, India, were collected, from October 2022 to January 2023. All the Cases with age more than 18 years, which were medicolegally registered at the hospital, with history of trauma with Loss of Consciousness and/or CT findings of Traumatic Brain injury of any degree were selected.Cases with brain haemorrhage due to any natural diseases like Hypertension/ Stroke were keenly segregated from the traumatic haemorrhages. Consent of Patient and/or Consent from the patient attenders, in case of unconscious patients and deceased, was taken.

The data collection has been done in 3 different Google formats, namelyInitial assessment and care, Hospital care, Autopsy findings, in case of death. Age, gender of each patient was noted. Type of trauma (Fall from height, Road traffic accident, Assault etc), Place of trauma (rural, semi urban or urban areas), Time since injury at presentation, Whether the cases were referred from outside or directly attended the hospital, Treatment done at referral hospital including intubation, History of Loss of consciousness, Vomiting and seizures were all noted in history. Further, on examination, Patients vitals, GCS score at presentation, involvement of other parts of the body, CT brain findings were recorded. Patients were further categorised on the basis of GCS score, as having mild, moderate and severe TBI with GCS score of <8, 9-13, 14-15 respectively. Treatment advised in the form of IPD or OPD basis, choice of the patient towards such advice was noted. In the "Details of Hospital stay" format, reason for admission, mode of treatment at hospital such as, Conservative, Observational, Neurosurgical, Non-neurological or mixed, and their details, Complications during hospital stay were all noted meticulously. The Glasgow Outcome Scale-Extended was used to measure the outcome at discharge, which included eight scores from 1-8 indicatingdeath, vegetative state, lower severe disability, upper severe disability,lower moderate disability, upper moderate disability,lower good recovery and upper good recovery respectively[6].

Statistical analysis included Characteristics of participants, expressed descriptively, with Mean and SD for continuous variables and counts and proportions for categorical variables. The variables measured were the proportion of TBI with different Ages, Sex, Type of injury, Causes of Injury, and Proportion of Patients presenting with different degrees of severity of the disease. Categorical variables like type of injury, the pattern of TBI, and grade of TBI were presented in proportions.Statistical analysis of the collected Data has been done using JNP-SAS Software.

RESULTS

Table 01. Profile of patients presenting with TBI

Parameter	Results (Total N=172)
Gender	
Male	87.8 (n=151)
Female	12.2% (n=21)
Age (years)	
18-25	31.40% (n=54)
26-45	50.58% (n=87)
46-60	12.21% (n=21)
>60	5.81% (n=10)
Place of trauma	
Rural area	70.9% (n=121)

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Semi urban area	12.2% (n=21)
Urban area	16.9% (n=29)
Type of trauma	
Road traffic accidents	84.9% (n=146)
Assault	10.5% (n=18)
Fall from height	4.7% (n=8)
Duration at presentation	
<1 hour	37.9% (n=61)
1-6 hours	41.0% (n=66)
6-12 hours	5.0% (n=8)
12-24 hours	8.7%(n=14)
24-48 hours	3.7% (n=6)
>48 hours	3.7% (n=6)
Referral type	
Direct without referral	58.4% (n=94)
With referral	41.6 (n=67)
Brought dead cases	6.4% (n=11)

Table 02. Clinical features of TBI

History of	(Total N=172)
Loss of Consciousness	93.6% (n=161)
Vomiting	29.7% (n=51)
Seizures	1.2% (n=2)
GCS Score	(total N=161 live cases)
<= 8 (Severe TBI)	20.5% (n=33)
9 – 13 (Moderate TBI)	24.2% (n=39)
14-15 (Mild TBI)	55.3 (n=89)
CT Scan- Brain, Findings	(Total N=172)
Skull fractures	63.4% (n=109)
Traumatic Subarachnoid haemorrhage	36.6% (n=63)
Subdural hematoma	30.8% (n=53)
Epidural hematoma	15.7% (n=27)
Contusion within Brain parenchyma	44.2% (n=76)
Diffuse Axonal Injury	9.3% (n=15)
Prior intubation done	3.1% (n=5)
Agreed to Doctors advice	78.3% (n=126) (total N=161 live cases)
Went against Medical advice	21.7% (n=35)

Initial assessment and immediate care

The present study was done in a tertiary care center, and the sample size taken was 172. 87.8% of the total 172 cases were males and 12.2% were females. Maximum number of TBI cases belong to the early middle adulthood, i.e. age group of 26-45 years (50.58%). 31.40% of cases belong to the Young adults, i.e. age group of 18-25 years, 12.21% were late middle aged adults (46-60 years) and only 5.8% of cases belong to the older age group (more than 60 years old).

Among the total TBI cases that presented to our tertiary care center, the place of trauma was rural, semi urban and urban areas in 70.9%, 12.2%, and 16.9% of cases respectively.

Among the Total 172 TBI Cases, 84.9% were due to Road traffic accident, 10.5%due to Assault, 4.7% due to fall from height.

Among 172 total TBI cases, 161 cases presented to the casualty in the living condition. Among the 161 cases, 37.9% cases presented within one hour of the TBI event, 41% within 1 to 6 hours, 5% within 6 to 12 hours, 8.7% within 12-24 hours, 3.7% presented within 24-48 hours, 3.7% after 2 days. This concludes that 4 out 5 patients presented within 6 hours of Head injury.

Among 172 total cases, 6.4% cases were brought dead, and 93.6% cases were in living condition.Among the 161 total live cases that presented at casualty, 58.4% of cases attended the casualty directly, without referral. 41.6% of total live cases were referred from various other health centres.

History of Loss of consciousness after the trauma was present in 94% of total TBI cases. The duration of loss of consciousness was very much varied from few minutes to few hours.History of Vomiting was present in 66% of total TBI cases. History of seizures was present in only 1% of total TBI cases

Among all the total 161 TBI cases that were brought live to the casualty, 55.3% of cases were having GCS score between 14-15 (Mild TBI), 24.3% of cases presented with a GCS score between 9-13 (Moderate TBI) and 20.5% of patients presented with a GCS score less than 8 (Severe TBI)

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Skull fractures were present in 63.4% of total TBI cases, Subarachnoid hemorrhage was present in 36.6%, Epidural hemorrhage was present in 15.7%, Subdural hematoma was present in 30.8% of total TBI cases. 44.2% of total TBI cases suffered with contusions in various parts of brain parenchyma. Diffuse axonal injury couldn't be elicited during the autopsy of the brought dead cases. Among the total 161 live cases, 9.3% of cases were diagnosed with diffuse axonal injury.

Among total 172 cases that presented to the casualty of the tertiary care centre, 48.8% of patients were adviced admission for medical management, 24.4% for surgical intervention and 20.3% for only a 24 hours observation for any untoward event following a TBI. Those who were adviced admission for medical management, included all such cases which could be managed conservatively, and those severe cases, which were not operable immediately after admission. 6.4% among the total cases were brought dead and could not receive any treatment.

Among total 161 cases of TBI, which presented to casualty in living condition, 78.3% of patients agreed to the doctors' advice and 21.7% went against medical advice.

Table 03. Hospital care and outcome(IPD cases only, N=126)

Mode of treatment	
Conservative	71.4% (n=90)
Neurosurgical	19.1% (n=24)
Observation	1.6% (n=2)
Other surgical	7.9% (n=10)
Non neurological Complications during hospital stay	5.6% (n=7)
Status at Discharge	
Against medical advice	15.9% (n=20)
Death	10.3% (n=13)
Improved	73.8% (n= 93)

Among all the 126 admitted cases, 71.4% of patients were managed conservatively, 19.1% of cases underwent Neurosurgery, 7.9% of cases underwent other surgical procedures, and only 1.6% of patients were admitted for observation. Among 126 admitted cases, 5.6% of cases suffered non neurological complications during the hospital stay

Among all the 161 treated cases, both IPD and OPD basis, at their discharge, 8.1% had a GOS-E score of 1, i.e. Death. 4.3% of cases were discharged in vegetative state (GOS-E score 2), 2.5% of cases were in lower severe disability (GOS-E score 3), 1.9% in upper sever disability (GOS-E score 4), 0.6% in lower Moderate disability(GOS-E score 5), 14.9% in upper Moderate disability (GOS-E score 6) and 1.9% of cases in Lower Good recovery(GOS-E score 7). Most of the cases, i.e. 85.8% of cases were having upper Good recovery, with a GOS-E score of 8.

Table 04- Glasgow outcome scale-Extended, among the treated cases (N=161)

Glasgow Outcome scale extended	No. of patients	Percentage
1	13	8.1
2	7	4.3
3	4	2.5
4	3	1.9
5	1	.6
6	24	14.9
7	3	1.9
8	106	65.8
Total	161	100.0

Table 05- Glasgow outcome scale-Extended, among those who underwent Neurosurgery (N=24)

Glasgow Outcome scale	No. of patients	Percentage
1	4	16.67
2	1	4.17
3	3	12.50
4	1	4.17
5	1	4.17
6	9	37.50
7	0	0.00
8	5	20.83
Total	24	100.00

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Among all the 24 cases, who underwent Neurosurgery, treated cases, both IPD and OPD basis, 4 cases succumbed to death (GOS-E score 1), 1 case was discharged in vegetative state (GOS-E score 2), 3 cases were in lower severe disability (GOS-E score 3), 1 case in upper sever disability (GOS-E score 4), 1 cases in lower Moderate disability(GOS-E score 5), 9 cases in upper Moderate disability (GOS-E score 6), no cases in Lower Good recovery(GOS-E score 7), and 5 cases were having upper Good recovery, with a GOS-E score of 8.

DISCUSSION

Traumatic brain injuries are significant due to the high morbidity, mortality, disability associated with it. It has a significant socioeconomic impact in a developing country like India[7], according to Gururaj et al.It is estimated by observation only, that the incidence of TBI is 1.6 million per year, mortality being nearly 2 lakhs per year and nearly one million among them would need rehabilitation.

In our study, there is male preponderance among the total TBI cases, 87.8% of the total 172 cases were males and 12.2% were females, as seen in most of the TBI. These figures are in consistent with most of the studies on TBI[7,8,10,11]including Gururaj G et al., Newall N et al.

Maximum number of TBI cases, belongs to the productive age group, the early middle adulthood, 26-45 years (50.58%) and Young adults, 18-25 years (31.40%), and the mean age being 35.22+/- 13.8 years, as in other studies[8,12] such as Gururaj G et al. and Khan KA et al. This shows the burden of TBI on the socioeconomic condition of the families, as the bread winners are affected more. The elderly are at special risk of falls, and an age more than 75 years is a bad prognostic indicator for TBI[13].

In our study maximum number of TBI, were due to Road traffic accidents, comprising almost 84.9%, followed by assault in 10.5% and fall from height 4.7%, which is in consistent with most studies[7,8,10,14], Gururaj G et al, Newall N et al. The increase in the incidence of traumatic brain injuries may continue due to the increased usage of motor vehicles, and the population density[12]. This appears to be due to the rampant increase in the usage of motor vehicles in India and parallel lesser usage of safety precautions like helmets, in case of two wheelers and safety belts, in case of four wheelers. The productive age group not following simple rules of road safety such as limiting their speed, avoiding triple riding etc may also be one among the various reasons for traffic accidents being the most common cause of TBI. Since profile of TBI among two- and four-wheeler vehicular accident is different, a better supply of helmets of proper quality, strict usage of seatbelts and strict legislation for road safety is a must as preventive measure[15].

Among all the TBI cases, 70.9% of the cases were results of incidents mostly at rural areas followed by urban (16.9%) and semi urban (12.2%) areas. This may be due to better road facilities and regular maintenance of the road quality at urban and semi urban areas, than the rural areas[11].

In our study, 6.4% of cases were brought dead cases,among the rest 93.6% cases presented to the casualty in the living condition, with most of them reaching the tertiary care centre within one hour of the TBI event (37.9%), or within 1 to 6 hours (41.0%). This concludes that 4 out 5 patients presented within 6 hours of Head injury. This is a very positive sign to indicate better reachability to the tertiary care centres, and awareness among the public to reach better facilities within a short period of time[14].

Among the symptomatology, History of Loss of consciousness was most common (93.6%). The duration of loss of consciousness was very much varied from few minutes to few hours. This was in contrast with most of the studies[16], where loss of consciousness was found to be in only 12-15% of TBI cases. This huge contrast may be because, the cases with mild TBI, without loss of consciousness, do not necessarily present themselves to the tertiary care hospital, due to the trivial symptoms and they may reach out to primary care centres instead. History of loss of consciousness is a trigger to visit a tertiary care center for its fearful consequences, among the public. History of Vomiting was present in 29.7% of cases and seizures in 1.7% of cases.

Assessing a patient's eye, verbal and motor response at presentation and calculating the GCS score is the most important protocol at all the trauma centres. The TBI cases are further divided into Mild, moderate and severe TBI, according to the Glasgow coma scale score, being 14-15, 9-13 and <8 respectively. In our study, 55.3% presented with Mild TBI, 24.3% with Moderate TBI and 20.5% with Severe TBI. This is in accordance with the most other studies[7,9,10] Gururaj G et al, Khan KA et al. Such segregation is necessary because, in most studies, GCS score is an outcome predictor for TBIs[14,17], including those in elderly[13].

In our study, CT scan features included Skull fractures in 63.4%, Subarachnoid hemorrhage in 36.6%, Epidural hemorrhage in 15.7%, Subdural hematoma in 30.8% of total TBI cases. 44.2% of total TBI cases suffered with contusions in various parts of brain parenchyma, which varied from pin point hemorrhages to subcentimetric hematomas to massive hemorrhages at different parts of brain parenchyma, 9.3% of cases were diagnosed with diffuse axonal injury. In a similar study by Khan N et al., a similar result was observed with skull fractures (42%) being the most common CT scan finding[9].

At the casualty, Among total 172 cases, 48.8% of patients were adviced admission for medical management for subtle to mild subarachmoid or subdural hemorrhages with cerebral edema. It also included the other extremes of the disease, which included, those cases which couldn't be operated neurosurgically due to hemodynamic instability,

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cardiorespiratory failure or due to very severe or critical TBI. 24.4% were admitted forneurosurgical intervention and 20.3% for only a 24 hours observation for any untoward event following a TBI, since they were having mild TBI. 6.4% among the total cases were brought dead and could not receive any treatment.

Among total 161 cases of TBI, which presented to casualty in living condition, 78.3% of patients agreed to the doctors' advice and 21.7% went against medical advice at casualty itself, and most of the cases that went against medical advice were those with mild TBI.

During the hospital stay, among all the 126 Inpatient cases, 71.4% of patients were actually managed conservatively, 19.1% of cases underwent Neurosurgery such as decompressive craniectomy procedures, 7.9% of cases underwent other surgical proceduressuch as, fractures in limbs, repair of lacerations, or crush injuries, and only 1.6% of patients were admitted for observation. Among these cases, 5.6% of cases suffered non neurological complications during the hospital stay.

The outcome of TBI is measured by battery of tests, like GOS, GOS-E, GODS. GOSE-E is considered to be satisfying most of the criteria for a good outcome scale for the assessment of outcome of TBI[18].It is also included along with ten other outcome measures in the common data elements in the AUS-TBI data dictionary[19]. The GOS-E is appropriate for broader social and behavioural measures[20].Hence the GOS-E score on discharge was used to measure the outcome of patients with TBI.

Among all the 161 treated cases, both IPD and OPD basis, at their discharge, 8.1% had a GOS-E score of 1, i.e. Death. 4.3% of cases were discharged in vegetative state (GOS-E score 2), 2.5% of cases were in lower severe disability (GOS-E score 3), 1.9% in upper severe disability (GOS-E score 4), 0.6% in lower Moderate disability(GOS-E score 5), 14.9% in upper Moderate disability (GOS-E score 6) and 1.9% of cases in Lower Good recovery(GOS-E score 7). Most of the cases, i.e. 85.8% of cases were having upper Good recovery, with a GOS-E score of 8. Most of the cases which had upper good recovery had mild to moderate TBI. This indicates a very good outcome of patients with mild to moderate TBI

Among all the 24 cases, who underwent Neurosurgery, 4 cases succumbed to death (GOS-E score 1), 1 case was discharged in vegetative state (GOS-E score 2), 3 cases were in lower severe disability (GOS-E score 3), 1 case in upper severe disability (GOS-E score 4), 1 cases in lower Moderate disability(GOS-E score 5), 9 cases in upper Moderate disability (GOS-E score 6), no cases in Lower Good recovery(GOS-E score 7), and 5 cases were having upper Good recovery, with a GOS-E score of 8. This indicates better outcome by neurosurgery since only four died out of twenty four who underwent neurosurgery. In other similar studies, it was found that, Patients who undergo neurosurgery have lower mortality and better cognitive outcomes[21] and the presence of neurosurgeons was associated with increase in survival among casualties with moderate to severe TBI[22].

Among 126 admitted cases, 73.8% of cases were in an improved condition at discharge, 15.9% of cases went against medical advice and 10.3% of cases succumbed to death. Among those who went against medical advice, were those, who couldn't withstand prolonged admission due to their poor socioeconomic status, or those with whom, the treatment seemed futile by the patient attenders.

CONCLUSION

TBI is a major health problem with RTA being the most common cause of TBI, with male preponderance. The occurrence is highest and prognosis is better of Mild TBI, though those suffering from Moderate and severe TBI suffer disabilities of various degree and/or death. Skull fractures are the most common CT findings. Neurosurgery has better outcome. Most of the traumas are accidental, but the severity can be reduced by, self-discipline, taking safety measures while riding such as wearing helmet/car seat belts, safety at work places. The precautionary measures also include better road facilities, and strict disciplinary actions by the traffic authorities.

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