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Demographic and clinical profile of head injury in Western Uttar Pradesh-A study at SVBP hospital Meerut

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ABSTRACT

In India because of increasing modern and high speed vehicles, there is high incidence of road traffic accident and there is high prevalence of head injury in western Uttar Pradesh which is semi urban part of India. Road conditions are in some parts good and in some parts very bed. Road maintenance departments are not up to the mark in all parts of state. It is estimated that nearly 1.5 to 2 million persons are injured and 1 million succumb to death every year in India. Road traffic injuries 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. In severe head injury cases the ambulance services and pre hospital care is not up to the mark everywhere i.e. Golden hour management is not available in all cases and is responsible for high mortality. Although things are improving day by day but till date it is not of state of art level. In India, 1 out of 6 trauma victims die, while in the United States this figure is 1 out of 200.TBIs are a leading cause of morbidity, mortality, disability and socioeconomic losses in India and other developing countries. India and other developing countries face the major challenges of prevention, pre-hospital care and rehabilitation in their rapidly changing environments to reduce the burden of TBIs this is the aim to describe the hospital based clinical and demographic data This analyses the differences in severity and in short- and long-term outcome of TBIs with different causes that could help to make policies and recommendation to improve the care of head injury patients in developing areas of India.

1. Introduction

In India because of increasing modern and high speed vehicles, there is a high incidence of road traffic accidents and there is high prevalence of head injury in western Uttar Pradesh which is a semi urban part of India. Road conditions in some parts are good and in some parts are very bad. Road maintenance departments are not up to the mark in all parts of the state. It is estimated that nearly 1.5 to 2 million persons are injured and 1 million succumb to death every year in India. Road traffic injuries 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. In severe head injury cases the ambulance services and pre hospital care is not up to the mark everywhere i.e. Golden hour management is not available in all cases and is responsible for high mortality. Although things are improving day by day but till date it is not of state of art level. In India, 1 out of 6 trauma victims die, while in the United States this figure is 1 out of 200.TBIs are a leading cause of morbidity, mortality, disability and socioeconomic losses in India and other developing countries. India and other developing countries face the major challenges of prevention, pre-hospital care and rehabilitation in their rapidly changing environments to reduce the burden of TBIs this is the aim to describe the hospital based clinical and demographic data This analyses the differences in severity and in short- and long-term outcome of TBIs with different causes that could help to make policies and recommendation to improve the

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care of head injury patients in developing areas of India.

2. Materials and Methods

This study was conducted at Neurosurgery department LLRM Medical college Meerut, CNS Hospital (Neuro super speciality hospital, Meerut) and nearby hospitals of Meerut city. The patients admitted in emergency of SVBP Hospital and transferred to neurosurgery for treatment after FAST (focused assessment sonography for trauma) from January 2019 to December 2019 are included and studying demographic profiles, injury details and outcomes of these patients. The study tools were predesigned and pretested questionnaires. The situational detailed analysis of all the study participants was recorded in a pretested semi-structured data collection tools that included socio demographic profile (age, gender, occupation, and location), details of injury(injury mechanism, place of injury, and alcohol intake), precise clinical features including GCS score on admission, pupillary reflexes, hemodynamic variables, and CT findings. All the patients of head injury in the age group of 1.5 -80 years had registered themselves in emergency and were admitted to LLRM Medical College Hospital and nearby private hospitals. Exclusion criteria are the patients not giving consent to be a part of study, patients who were immediately referred to higher centre, patients who were brought dead. Pre hospital treatment history was taken from the attendant by questionnaire. Before reaching the Hospital (level -III Hospital) what type of neuro care patients had received, whether patients got golden hour management or not.

The severity category was based on an assessment of patient consciousness on arrival to the emergency department, using the Glasgow coma scale (GCS) to categorise, as is the practice in the emergency department.

GCS 13-15 was regarded as mild head injury

GCS 9-12 as moderate head injury

GCS <8 as severe head injury.

All patients were primarily assessed by general surgery and emergency residents. Blood investigations and CT scan head were done in all patients of head injury. The results of CT were considered abnormal if there were signs of any one of acute traumatic injury (haemorrhage, oedema, and skull fracture) than patients transferred to neurosurgery department. CT showing only extracranial injury was not considered for study. A complication was defined as deterioration due to head injury that necessitated neurological interventions, medical treatment, or intensive care. The outcome of the patients at discharge was categorized according to G O S. The Glasgow Outcome Scale (GOS) was first published in 1975 by Bryan Jennett and Michael Bond. The original GOS and the subsequently developed extended GOS (GOSE) are recommended by several national bodies as the outcome measure for major trauma and for head injury. The enduring appeal of the GOS is linked to its simplicity, short administration time, reliability and validity, stability, flexibility of administration (face-to-face, over the telephone and by post), cost-free availability and ease of access. These benefits apply to other derivatives of the scale, including the Glasgow Outcome at Discharge Scale (GODS) and the GOS paediatric revision. The GOS was devised to provide an overview of outcome and to focus on social recovery. Since the initial development of the GOS, there has been an increasing focus on the multidimensional nature of outcome after head injury. The Glasgow Outcome Score applies to patients with brain damage allowing the objective assessment of their recovery in five categories. This allows a prediction of the long-term course of rehabilitation to return to work and everyday life. [1]

1. Death: Severe injury or death without recovery of consciousness
2. Persistent vegetative state: Severe damage with prolonged state of unresponsiveness and a lack of higher mental functions.
3. Severe disability: Severe injury with permanent need for help with daily living
4. Moderate disability: No need for assistance in everyday life, employment is possible but may require special equipment.
5. Low disability: Light damage with minor neurological and psychological deficits

3. Observation and Results

During the period 0f study from1st January 2019 to December2019, 986 admission were made to the emergency department of SVBP Hospital associated with LLRM Medical college, Meerut, and CNS Neuro speciality Hospital.

3.1. Sex distribution

Out of 986 male patients were 690 i.e.70% and female were296 i.e.30%as shown in Table 1.

3.2. Age distribution of head injury patients

The ages of the patients ranged from 1.5 year to 80 years. The median age was 27 years (32 years for males, 25 years for females). Children within the age range of 1.5 years to 5 years were 40 patients and age group 6-10 years of age where 161 patients were included. So total children were 201 in which male children were 131 and female were 70. So male children were more prone to head injury, the difference was significant. It was also observed that head injury due to fall from height is more common in winter months i.e. December, January and February because children and ladies bask in the sun on their terraces which usually do not have railings.

Table 1: Sex Distribution of head injury patients.

Gender	No. of patients	Percentage %
Male	690	70 %
Female	296	30%
Total	986	100 %

Table 2: Age distribution of head injury patients.

Age group(years)	Male no.	Female no.	Total	Percentage (%)
1-5 years	30	10	40	04.05%
6-10 years	101	60	161	16.32%
11-20 years	40	15	55	05.57%.
21-30 years	221	78	299	30.32%
31-40 years	130	70	200	20.28%
41-50 years	102	30	132	13.38%.
51-60 years	46	21	67	06.80 %
61-70 years	14	07	21	02.12%
>70years	06	05	11	1.11%
Total	690	296	986	100%

3.3. Pre hospital treatment and duration

Pre hospital care and transportation of road traffic accident victims to hospitals have a significant impact on the outcome of head trauma. Transportation of the patients by unprofessional ill-trained staff in ill- equipped ambulances or in equipped ambulances may cause secondary central nervous system damage as compared to well trained emergency management staff in a well equipped ambulance by

1. Denying the patients the vital and badly needed urgent care, such as intubation, stop bleeding, replacement of blood loss and manage the shock may cause cerebral, ischemia, hypoxia and hypotension [1]
2. Loosing and wasting time to reach the proper hospital, where neurosurgical or trauma units are available. Many patients died in cars while touring between non specialized hospitals where no neurosurgeon nor trauma surgeon nor Intensive Care Unit (ICU) beds nor computed tomography-scan facilities are available
3. The concept of golden hours (which is definitely far <60 min) is simply lost with an unnecessary delay to provide urgent care and urgent neurosurgical intervention if needed. Such delay may be the cause of brain herniation due to failure to control the intracranial pressure (ICP) [2,3]
4. The risk of permanent severe damage of cervical spinal cord is high

In our study as shown in Table 3, there were about10.54% patients admitted to hospital less than 2hours have received tertiary care early. About 25.96% of patients reached to level III hospital from 2 to 6 hours while 29% reached between 6 hrs to24 hrs. These patients first went to PHC, CHC OR Level -I or II hospital. 19.97% patients were shifted between 1day to 3days period from private hospitals either due to financial issues or when patients' condition deteriorated. Around 9.43% of patients were shifted to our hospital between 3 day to 7 days due to the same reasons. About 5% of patients were shifted for terminal care only as there was no hope of improvement.

The transportation of head injury patients to our hospital was mainly through private vehicles. In our study as shown in Table 4. About 64.60 % patients were transported through private vehicles like Cars, tempo, mini truck, and 27.38%Patients were shifted through ambulance with BLS but had no trained staff to manage patients during transportation. IT has been observed that about 30% patients deteriorated during transportation to tertiary care hospitals. About 10% of patients expired before reaching the hospital. Observations made by questionnaire from attendants whose patients expired before reaching to hospitals and considered as brought dead patients. Patients shifted from hospital to tertiary care hospital are usually transported through well equipped with ALS (advanced life support) and have trained para medical staff. So patients transported from primary site to first hospital i.e. Level I&II care hospitals usually don't receive golden hour management. Hence the outcome of patients is affected. The current status of patient's transportation to the hospital, which has a direct impact on the deterioration of the patient's condition and increases the risk of mortality or severe morbidity is very disheartening. The study published [Asian J Neurosurg2018 Jul-Sep] revealed the failure of prehospital care in their country as none of the 830 patients, who are included in the study received any form of prehospital care and showed as well

Table 3: Pre hospital period care in head injury(Before tertiary Care hospital).

Duration before admission to tertiary (LEVEL-III) hospital	No. of patients	Percentage (%)	Remark
Less than 2hours	104/986	10.54%	Accident /patients from nearby areas. Direct admission to SVBPH /CNS Hospital.
2 hours to 6 hours	256/986	25.96%	Nearby villages / primarily treated either PHC/CHC/ District hospital
6 hours to 24 hours	286/986	29.00%	
1day to 3days	197/986	19.97%	
3 to 7 days	93/986	09.43%	Patients treated in different private hospital and shifted to SVBP hospital after either deterioration or due to financial issue
After 7days	50/986	5.07%	Treated out side initially and when no hope to improve/ for terminal care
Total patients	986/986	100%	

Table 4: Transportation of head injury patients to tertiary care hospital

Mode injury	Transportation by private vehicle	Transportation by ambulance by nonprofessional but equipped with BLS.	Transportation by well-equipped ambulance and well trained emergency medical services (EMS)	Total no. of patients
RTA	298	137	42	477
Fall from height	186	88	12	286
Physical Assault	134	36	18	188
Firearm injury	3	4	4	11
Domestic trauma and other cause	16	5	3	24
Total	637	270	79	986
Percentage (%)	64.60%	27.38%	08.012%	100%

that 65.4% of these patients had been transported by what wrongly called ambulances! While 33.1 were transported by private vehicles. Transportation of the patients by nonprofessional unequipped and untrained emergency medical services (EMS) staff may cause secondary central nervous system damage. {Asian J Neurosurg. 2018 Jul-Sep; 13(3): 955–956.}.[2]

In our study as shown in Table 5. The most common cause of head injury was RTA (Road traffic accident) i.e. 48.37%. Male were more than females. The second most common cause was fall from height, in this group children were affected i.e. about 29%. About 19.07 % were due to physical assault, firearm injury were1.11%. Other causes like sport injury, domestic causes were about2.43%. Road conditions and driver's temperament are also responsible for increased RTA. Dangerous road conditions may be the result of natural events, such as tropical rains and flooding, that make driving unsafe. Dangerous conditions can also arise from the poor physical condition of a road and its surroundings. While driver errors such as speeding, distracted driving and drunk driving are among the leading causes of automobile accidents in most parts of India, the dangerous road conditions are also a significant contributor. There are few of the unsafe road conditions that can lead to a vehicular accidents i.e. Cracks and potholes that can cause a driver to lose control of the vehicle; Signs that have fallen or can't be seen because of overgrown foliage; Faded paint markings that are invisible from the driver's seat; Inadequate guardrails on curves and overpasses; Lack of rumble strips on freeways; Poor traffic control in construction zones; Placing construction materials and utility poles in a way that obstructs a driver's vision.

3.4. Use of Helmet in two wheelers and head injury

Helmets reduce the incidence of head trauma in low-speed accidents, at moderate and high speeds their sole function is to prevent brain matter from being spread over the highway. There is a classic line that goes, "Buy your son a motorcycle for his last birthday" This, in a way, summarizes motorcycle accidents. The motorcycle, by its design, is intrinsically dangerous. An accident that might result in minor injuries with an automobile can result in death with a motorcycle. Approximately 6% of all traffic fatalities involve motorcycles. In accidents involving automobiles, the most dangerous thing that can happen to an individual is to be ejected from the vehicle. Motorcycles involved in accidents always eject their operators or passengers.

Table 5: Etiological distribution of head injury patients.

Etiology	Male	Female	Total	Percentage (%)
Road traffic accident	321	156	477	48.37%
Fall from height	192	94	286	29.00%
Physical Assault	147	41	188	19.07%
Firearm injury	010	01	011	01.11%
Domestic trauma and sport injury	020	04	024	02.43
Total	690	296	% 986	100%

Table 6: Analysis of RTA and use of HELMET in two wheeler accidental cases.

		Not wear Helmet		Use helmet	
Motorbike accident.	110/160	90	90/110=81.81%	20	20/110=18.18
Scooter and scooty etc.	50/160	32	32/50=70%	18	18/50=36%
Total two wheeler accidents	160	122	122/160=76.25%	38	38/160=23.75
Total RTA cases	477				

Individuals dying in motorcycle accidents typically die of either head or neck injuries, with the former more common.[4] In our study 160 /477 RTA cases were with two wheelers. Analysis was done from history and questionnaire from attendants. Helmet use was found in 23.75% cases.

3.5. Severity of head injury

Traumatic brain injury severity is commonly described as mild, moderate, or severe. Injury severity is traditionally based on duration of loss of consciousness and/or coma rating scale or score, post-traumatic amnesia (PTA), and brain imaging results. The Glasgow Coma Scale (GCS) is a tool for measuring the degree of unconsciousness and is thus a useful tool for determining the severity of the injury. Mild, moderate, and severe TBI may be characterized as follows:

4. Classification of severity of TBI

4.1. Mild TBI

GCS between 15 to 13,Brief loss of consciousness, usually a few seconds or minutes, PTA(Post traumatic amnesia) for less than 1 hour of the TBI, Normal brain imaging results

4.2. Moderate TBI

GCS between 12-9, Loss of consciousness for 1 – 24 hours, PTA for 1 – 24 hours of the TBI, Abnormal brain imaging results.

4.3. Severe TBI

GCS below 8, Loss of consciousness or coma for more than 24 hours, PTA for more than 24 hours of the TBI, Abnormal brain imaging results.

In our study out of total 986 cases severe head injury cases were 510/986 i.e. 51.72%. moderate head injuries were 256/986i.e. 25.96%. and mild head injury cases were noted in 22.31%, i.e.220/986Cases.

4.4. Clinical presentation of head injury cases

Head injuries include both injuries to the brain and those to other parts of the head, such as the scalp and skull. Head injuries can be closed or open. A closed (non-missile) head injury is where the dura mater remains intact. The skull can be fractured, but not necessarily. A penetrating head injury occurs when an object pierces the skull and breaches the dura mater. Brain injuries may be diffuse, occurring over a wide area, or focal, located in a small, specific area. A head injury may cause skull fracture, which may or may not be associated with injury to the brain. Some patients may have linear or depressed skull fractures. If intracranial haemorrhage occurs, a hematoma within the skull can put pressure on the brain. Types of intracranial haemorrhage include subdural, subarachnoid, extradural, and intraparenchymal haematoma. Brain injury can occur at the site of impact, but can also be at the opposite side of the skull due to a contrecoup effect (the impact to the head can cause the brain to move within the skull, causing the brain to impact the interior of the skull opposite the head-impact). If the impact causes the head to move, the injury may be worsened, because the brain may ricochet inside the skull causing additional impacts, or the brain may stay relatively still (due to inertia) but be hit by the moving skull (both are contrecoup injuries).

In our study loss of consciousness (LOC), vomiting and bleeding from ENT are the common presentations. LOC present in about 79.72 % cases. vomiting was present in69.98% cases. Bleeding from ENT (Ears, Nose, Throats)were present in 32.555% cases .Patients gain consciousness commonly in mild and moderate head injury cases. Headache vertigo and decline cognitive

Table 7: Severity of head injury based on G.C.S

G.C.S.	No. of patients	Percentage (%)	
15 TO 13	220	22.31%	Mild head injury
12 TO 09	256	25.96%	Moderate head injury
08 and<08	510	51.72%	Severe head injury
Total	986	100%	

Table 8: Clinical presentation of head injury

Symptoms and sign	No. of patients	Percentage (%)	Remark
Loss of consciousness	876/986	79.72%	More than 30 min
Vomiting	690/986	69.98%	
Convulsions	136/986	13.793%	
Bleeding from ENT (Ears, Nose, Throat)	321/986	32.555%	Usually associated with basal skull fracture.
Aphasia	79/986	08.01%	Patients gain consciousness/ drowsy patients.
Hearing loss	91/986	09.22%	do
Vision problem	127/986	12.88%	Do, optic nerve injury/eye globe injury
Hemiparesis	248/986	25.15%	Patients gain consciousness/ drowsy patients
Focal Neurological deficit	156/986	15.82%	Facial palsy, Brachial plexus injury, ophthalmoplegia, monophasic
Post traumatic amnesia	372/986	37.72%	More than 2hours
Headache	574/986	58.21%	Patients who gain consciousness, mild / moderate head injury cases.
Vertigo	316/986	32.04%	Patients who gain consciousness mild/ moderate head injury cases.
Cognitive symptoms (confusion, aggressive, abnormal behaviour, slurred speech).	296/986	30.02%	Patients who gain consciousness mild / moderate head injury cases.
Black eye (RECKON EYE)	98/986	09.93%	Associated with #frontal bone
Battle sign (Ecchymosis in behind ears)	106	10.75%	Associated with #middle cranial fossa /#occipital bone

function were noted frequently in such patients. Others sign and symptoms were shown in Table 8

4.5. Head injury associated with poly Trauma

The management of a head injury patient with multiple other injuries presents one of the most challenging and difficult clinical scenarios in trauma critical care. This is, in part, due to the fact that the treatment of other injuries, such as orthopaedic, spine, and craniofacial fractures, has the potential for worsening the neurologic outcome. This potential worsening is not necessarily directly related to the primary repair or the timing of surgery, but more to the fact that additional surgery with potential blood loss and possible resultant hypotension or hypoxia can adversely affect an injured brain. A single episode of hypotension or hypoxia can adversely affect the outcome of all severities of head injury. Chest injury and abdominal injury, fractures of long bones are commonly seen in major road traffic accidents.in our study about 34.78% patients have other injuries (polytrauma) along with head injury. Chest injury 8.82%and long bone fractures 12.77% were usually associated with bad outcomes in patients. Rest results of our study are shown in table no.9.

4.6. CT scan finding analysis

CT Scan head was done in all the patients i.e.986, admitted in emergency as a case of head injury. In about 151 patients i.e.15.31% CT Scan was normal. Cerebral oedema was found in 531/986 i.e.53.85% In rest of the CT Scan the common lesions were SDH 233/986 i.e.23.63% and hemorrhagic contusion was in 160/986 i.e.16.22%.EDH was in 156/986 i.e. in15.82%.

4.7. Outcome of head injury patients

The Glasgow Outcome Score applies to patients with brain damage allowing the objective assessment of their recovery in five categories. This allows a prediction of the long-term course of rehabilitation to return to work and everyday life. [5]

Patients having normal CT scans were usually discharged after 24 hours in satisfactory conditions GCS 15/15. Overall in-hospital mortality was 44% (434/986 cases).

Table 9: Head injury associated with polytrauma

Associated injury	No. of patients	Percentage (%)
Chest injury	87/986	08.82%
Blunt injury abdomen	56/986	05.67%
Bone fracture	126/986	12.77%
Spinal cord injury	32/986	03.24%
Cranio-facial /Maxillofacial injury	98/986	09.93%
Eye injury	42/986	04.26%
Brachial plexus injury	18/986	01.82%
Total	343/986	34.78 %

Table 10: CT Scan Head findings

Pathology	Patients no.	Percentage (%)
EDH	156	156/986=15.82%
SDH	233	233/986=23.63%
SAH	121	121/986=12.27%
Hemorrhagic contusion	160	160/986=16.22%
Intra ventricular	89	89/986=09.02%
Depressed fracture	107	107/986=10.85%
Pneumocephalus	82	82/986=08.31%
DAI	126	126/986=12.7%7
Cerebral oedema	531	531/986=53.85%
Linear fracture	226	226/986=22.92%
Normal	151	151/986=15.31%
Total No of Patients	986	986/986=100%

Table 11: Outcome of head injury patients.

1. Death	**Severe injury or death without recovery of consciousness**	**434/986**	**44%**
2. Persistent vegetative state	Severe damage with prolonged state of unresponsiveness and a lack of higher mental functions	56/986	5.89%
3. Severe disability	Severe injury with permanent need for help with daily living	102/986	10.34%
4. Moderate disability and 5. Low disability	No need for assistance in everyday life, employment is possible but may require special equipment. Light damage with minor neurological and psychological deficits.	394	40%

30% (328/986) died within one week of injury. About 8%(79/986) of minor and moderate head injury died and 36%(355/986) of severe head injured patients expired; Amongst those who survived 552/986 i.e.55.98%. About 394/986 i.e.40% had good outcomes (GOS 4 or 5), 10.34% i.e.102/986 were severely disabled (GOS 3) and 5.89% i.e.56/986 were vegetative (GOS 2).

5. Conclusion

This study showed that the patients of head injury deteriorated due to improper transportation by simple car or ill- equipped ambulance services and poor pre hospital care. It is evident in our study that the factors which affect the outcome of head injury patients are influenced by proper transportation of patients from the site of accidents and proper pre hospital care. This study further revealed that the failure of proper transportation and poor pre hospital care have a direct impact on deterioration of patients conditions and increase the risk of mortality and severe morbidity.

6. Source of Funding

None.

7. Conflict of Interest

None.

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