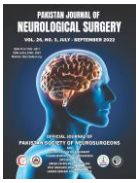

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Short Report

Emerging Challenges in the Management of Initial Traumatic Brain Injury: A Prospective Study from a Developing Country

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ABSTRACT

Objective: To identify and highlight the challenges faced in initial traumatic brain injury management in a developing country

Materials and Methods: The study includes 294 TBI-related admissions. We included all admitted Patients with Traumatic brain injury via. A and E (accident & emergency) departments and all patients of either age or gender. We included information related to the area of the initial trauma, whether the patient was referred from another setup after initial management, whether CT brain was performed at an initial health care facility, time since trauma to our hospital/ER presentation, duration of stay in our hospital, whether ICU was provided or not, and whether the patient was managed conservatively or required surgery at our hospital.

Results: Out of the total patients received male to female ratio was 9 to 1 and the age group most involved was 15 to 45 years old.72% of patients were referred from local healthcare setups. 24% of patients underwent surgery. 64% were received from other districts. CT was performed by 41% before presenting. 61% of patients reached the hospital within 3 hours of injury. 51% stayed in the hospital for 1 – 3 days. 17% were shifted to ICU, Ventilator support was only given to 9.5% of patients. In 25% of patients, Steroids were given, and 5 redo surgeries were performed in the same hospital setting.

Conclusion: This Short report provides a snapshot of the difficulties and weaknesses of the health system in the region.

Keywords: Traumatic Brain Injury, Head injury, Steroids, ICU, Ventilator Support.

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INTRODUCTION

Traumatic brain injury (TBI) is currently defined as "an alteration in brain function, or other evidence of brain pathology, caused by an external forc1.[1] The term head injury is vague and did not show the importance of the brain, it is rapidly being replaced by 'Traumatic brain injury. The incidence of TBI is growing around the world mainly because of road traffic accidents, owing to excessive use of motor vehicles. It has become a major cause of death and accounts for most deaths in young adults and children.[2-3] Centers for Disease Control and Prevention (CDC) in 2014 reported 2.53 million TBI-related emergency department visits, 288000 admissions, and about 57 thousand deaths.[4] About 1% of the US population is affected by TBI and it is estimated that the economic impact from TBI ranges between 56 to 220 billion US dollars annually.[5] According to the CA meta-analysis show, the incidence of TBI-related hospital admissions in Europe is 235 per 100,000 population with an average mortality of 15 per 100,000 population.[6] It is believed that TBI is more common in low-income and middle-income countries because of the inadequately developed health system and therefore the high ratio of morbidity and mortality are observed in these countries.[2,7] In the UK people below the age of 40 are the most affected.[8] TBI management has a vast variety of challenges, studies show only half of the patients are transferred directly to relevant hospitals whereas the rest are referred from other hospitals/healthcare setups. Assessing the severity of TBI is difficult because the patients are not resuscitated, they are sedated or received with prior intubation. A large gap exists in data regarding the risk factors, incidence, sequelae, financial cost, and social impact of TBI. Further research and data are required for proper planning and managing of TBI patients. This study focuses on the challenges and difficulties faced by TBI patients from the incidence to discharge from the hospital and the resources the current health system offers. This study is conducted in Lady reading hospital Peshawar. The hospital is established in 1930 and is the largest and busiest tertiary care hospital in the province, it is nearly 2000 bedded and is located in the downtown area of Peshawar city. The hospital receives patients from every corner of the province and the city. The population of Peshawar city is 1.97 million whereas that of an entire province (Khyber Pakhtunkhwa with the newly included FATA area) is 39 million. The city has 3 public sector tertiary care hospitals and the province in total has about 9 – 10 major public sector teaching hospitals. The Neurosurgery department consists of 60 in-patient beds, 12 Neurotrauma beds in the A&E department, and 10 ICU beds. TBI patients received in ER are admitted in the Neurotrauma bay till 8 am when all patients are shifted to an in-patient facility/ward or ICU if needed. The department consists of 25 residents and 9 consultants.

MATERIALS AND METHODS

Study Design and Duration

It was a short report conducted in the Department of Neurosurgery, Lady Reading Hospital, Peshawar, Pakistan, from 2nd February 2020 to 1st October 2020. The study included 294 TBI patients that were admitted to the neurosurgery ward in the given period. Informed consent was taken. Proper consent was taken from the patients and approval from the ethical review committee of the hospital was granted.

Inclusion Criteria

We included all admitted Patients with Traumatic brain injury via. A and E (accident & emergency) departments and all patients of either age or gender.

Exclusion Criteria

Patients kept in A and E for observation without

admission, Patients received dead or those who died in the course of their stay at the hospital, and patients re-admitted in neurotrauma with previous injury/complication were excluded from the study.

Data Collection

Patients were assessed through structured proforma admission and then on discharge from the neurosurgery ward. The proforma included demographics and questions like Area/district of the initial trauma, presentation to the hospital that was either direct or indirect i.e., referred from another setup after initial management, if CT brain was performed at an initial health care facility, Time since trauma to our hospital/ER presentation, duration of stay in our hospital if ICU was provided or not, whether the patient was managed conservatively or required any surgery at our hospital, etc. The data was analyzed by SPSS version 20 and interpreted in the form of graphs and charts.

RESULTS

Age and Gender Distribution

Out of the total Traumatic Brain injuries, 91% were male whereas only 9% were female patients. Age ranging from 15 to 45 was the biggest group admitted which accounted for 43.5 percent of the total whereas it was followed by an age group ranging from 1 – 15 years of children i.e. 40.8 percent. Ages ranging from 45 – 60 years made the smallest proportion of admissions which was 2.9 percent only.

Presentation of Patients

Referral from other Facilities: Only 28% of TBI patients (n = 82) were brought directly to the hospital whereas 72% of patients (n = 212) were first taken to a local hospital or other healthcare setup and then referred from there (shown in Table 6).

District/area presented from 34% of patients (n = 100) were received locally from the same district of our hospital (Peshawar) whereas 64% of patients (n = 188) were received from other districts. Adjoining and districts ranging less than 100km range constituted 25% of patients received whereas areas more than 100km from our setting still made up a large percent of the total i.e. 39%. The farthest districts of the province such as Chitral, Bannu, and Dera Ismail Khan which take variably 3 to 9 hours journey time depending on the road infrastructure and distance in kilometers constitute a reasonable percentage explained in table-4.

Time-taken to present: 61% (n = 179) of patients were brought to our hospital within 3 hours of the onset of injury while 24% (n = 70) reached the hospital within 3 to 6 hours. 15% accounted for more than 6 hours before presenting to the hospital (shown in Table 4).

Treatment Offered

Modality of treatment: 24% of patients (n = 72/294) had to undergo surgery rest 76% of patients (n = 222) were treated conservatively.5 redo surgeries were performed in the same hospital setting.

CT Scan: Only 59 percent of patients had to undergo immediate CT in our setup as 41% i.e. n = 124/294 patients had CT brain performed before presenting to our hospital. The mean no of CTs performed was 1.5 per patient in the same hospital setting that included rescans for observation and postop scans.

Hospital stay in Days: 16% (n = 48) patients were discharged after less than a day (24 hours) hospital stay while 51% (n = 147) patients stayed in the hospital for 1 or 3 days. 24 percent of TBI

patients stayed in the ward for 6 or more days in the hospital (shown in table 3).

Steroids Given: Steroids were given in 25% of patients either before presenting to our hospital or after admission to our hospital.

ICU care and Ventilator Support: Only 17% (n = 51) of patients were shifted to ICU, and Ventilator support was only given to 9.5% (n = 28) patients.

Table 1: The percentage of different age groups in TBI.

Age	Percent
up to 1 year	6.5
1 – 15 years	40.8
15 – 45 years	43.5
45 – 60 years	2.9
> 60 years	6.3

Table 2: The percentage of patients (operative group) and duration from the time of admission to surgery in the hospital.

Surgery (from the time of admission)	Percent
<3 hours	77.6%
3 to 6 hours	15.3%
6 to 12 hours	4.1%
> 12 hours	3.0%

Table 3: The percentages for the number of days stay in our hospital before discharge or referral back to the local setup.

Hospital Stay in Days	Frequency	Percentage
Less than a day (24 hours)	47	16
1 – 3 days	150	51
4 – 5 days	25	8.5
6 – 10 days	30	10.2
> 10 days	42	14.2

Table 4: The stratification of the patients and their percentage based on the area/district they were received from; it also shows the average distance and time to reach our hospital from the specific area.

District/Area	Percentage TBI Admissions	Distance in KM	Distance in Terms of Time
Peshawar	34%	Local	Local
Kohat	3%	72 km	1 hour 46 min
Hangu	3%	111 km	2 hour 37 min
Karak	2%	140 km	3 hour 10 min
Bannu	4%	200 km	4 hours 5 min
D.I. Khan	1%	298 km	5 hour 44 min
Mohmand Agency	2%	77 km	2 hours 30 min
Nowshera	6%	45 km	1 hour 3 min
Bajaur Agency	3%	126 km	3 hour 46 min
Kurram	2%	216 km	5 hour
North Waziristan	2%	280 km	6 hour
Malakand	3%	93 km	2 hour 4 min
Takht Bhai	1%	69 km	1 hour 31 min
Lakki Marwat	2%	207 km	4 hour 3 min
Charsadda	4%	38 km	50 min
Chitral	2%	318 km	9 hours 30 min
Mardan	6%	64 km	1 hour 10 min
Swabi	7%	104 km	1 hour 30 min
Buner	2%	152 km	3 hours 2 min
Swat	1%	197 km	3 hour
Dir	7%	265 km	5 hours 5 min
Shangla	1%	240 km	4 hour 28 min
Others	2%	---------	———
Total	100%		

DISCUSSION

TBI is a leading cause of death in young adults, it is not only responsible for long-term disabilities but has socioeconomic and psychosocial implications as well,[9-10] therefore we wanted to learn about the basic details and challenges faced in the management of TBI to improve the outcome and suggest improvements where necessary. We found the male population outnumbering female cases significantly greater than reported in the 2017 TBI Model System National Database Statistics i.e., male to female ratio as 3:1.[4] In our setting, we found patients had to travel long distances before coming in contact with a neurosurgical unit, most of the patients were brought to the hospital from other cities and districts only 34% of patients were received from the same district/city. Areas such as Dir which is at a distance of 265 km from the hospital, constituted about 7% of the total received patients this reflects the scarcity of neurosurgical units and centers in the province, and the argument is supported by the fact that 72 % patients were referred from other hospitals, centers, health care setups to our hospital. Although there are studies that do not agree with the golden hour for neurosurgical care and consider it to be a myth yet most studies believe pre-hospital durations greater than 60 to 90 minutes can have a poorer outcome.[9] Our study finds that only about 61% of patients reach the hospital within 3 hours of rest take longer to reach and once in the hospital (surgical group) it may take hours to undergo surgery whereas studies emphasize the need for early surgery in severe traumatic brain injury patients requiring surgery.[10] A pre-hospital CT was performed by a reasonable number of patients mostly in the peripheries, yet there was no significant neurosurgical care to retain the patients and they were referred to our hospital. We think most of these patients could have been managed conservatively in peripheries if neurosurgical/trauma units with basic neurosurgical care were established locally, referring them increases the hospital burden at the center and admissions not only reduce the bed capacity in the center but can account for bed unavailability for much needed surgical group of patients who would require surgery on urgent basis. We found to mean no of CTs performed per admission was 1.5 CTs, in a study conducted in Tanzania by Smart et al.showed, CT was performed only in half of the admitted TBI patients,[12] one reason for this greater mean number of CTs is that imagining at arrival in the Emergency Department was offered free of cost to all trauma patients. Repeat CT cost about 10 dollars (1500 RS) and was a limitation to some

Table-5: Shows the percentage of patients and total duration from the time of injury to first contact with our hospital/Neurotrauma.

Hours from Incidence to Arrival/Admission in the Hospital	Frequency	Percentage
Up to3 hours	179	61 %
3 to 6 hours	70	24%
6 to 12 hours	33	11%
More than 12 hours	12	4%
Total	294	100.0%

Table 6: The number of patients that were either received directly or referred from other healthcare setups.

Patients Admitted	Frequency	Percentage
Directly with no contact with other health care facility	82	28%
After a referral from other healthcare facilities	212	72%

Table 7: The percentage of patients treated with the given modality of treatment.

Modality of Treatment	Number of Patients	Percentage
Conservative	222	75.5%
Surgery	72	24.5%

patients due to affordability. All the patients included in the study are admitted patients and because of the high admission threshold and less number of beds available in the Emergency Department/Neurotrauma (12 beds/24 hours from where patients are sent to the ward the next morning) compared to the turnover of patients referred to Neurotrauma for assessment (300 to 500 patients/day), most of mild TBI patients are not a part of the study. Surgery at ER is offered free of cost and surgery expenses were not limited to poor patients.

As we know Severe TBI management requires integrated ICU and neurosurgical care. In a study conducted by Diac et al. at least 15 – 30% of patients were given ICU care,[13] and we found only 17% of patients could be admitted to ICU, we think a smaller number of ICU admissions account for the limited number of ICU beds that are available in our hospital and most of the patients have to wait to be shifted to Intensive care units and may not get ICU care at all. New guidelines and studies recommend not to use of steroids in traumatic brain injury patients as it does not reduce mortality but it may contribute to an increase in mortality,[11] still some centers reported the use of steroids in TBI patients[14] and we found that a significant number of TBI patients (30%) received steroids either before admission from the centers they were referred from or in our hospital after admission for reasons not known to us.

CONCLUSIONS & RECOMMENDATIONS

This observational study provides a snapshot of the difficulties and weaknesses of the health system in the region and reflects a large number of head injury/traumatic brain injury patient referrals from peripheries and adjacent developed areas that need to develop specialized centers to manage traumatic brain injury patients locally.

Recommendations

- If only patients treated conservatively can be managed locally in smaller healthcare setups in their respective districts within basic neurosurgical care units, 2/3 patients can be managed locally and this would significantly reduce the burden on tertiary care hospitals in the center.
- Only half the patients undergo surgery within 3 hours of admission, Outcome of TBI patients can be improved if the efficiency of the Neurotrauma team and Operation theaters are improved.
- More ICU beds and ventilators should be arranged to manage the current turnover of TBI-related admissions.
- The steroid has been given in 25% of patients either before neurotrauma presentation or after admission and needs a clear indication guideline explained to trauma and neurosurgical teams coming across TBI patients.

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Additional Information

Disclosures: Authors report no conflict of interest.
Ethical Review Board Approval: The study was conformed to the ethical review board requirements.
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Conflicts of Interest:
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AUTHORS CONTRIBUTIONS

Author's Full Name	Intellectual Contribution to Paper in Terms of
Usman Haqqani	Data collection, proforma, literature review, references, and data collection.
Bilal Khan	Data collection, initial write-up, discussion writing, and final review.
Ali Shahjahan	Initial write-up, discussion writing, and data collection.
Sajjad Ullah	Interpretation of results.
Shafaat Hussain	Literature review and references.