ORIGINAL ARTICLE

Changing spectrum of traumatic head injuries: Demographics and outcome analysis in a tertiary care referral center

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Abstract

Objective: To determine the causes, epidemiological characteristics and clinical outcomes related to cases of head trauma.

Methods: The retrospective study was conducted at Combined Military Hospital, Quetta, and comprised data from September, 2007, to September, 2011. Treatments offered to each patient and their outcomes were recorded. Glasgow coma scale score was noted on admission and Glasgow outcome scale was used to determine the outcome at 6-month follow-up. Data was analysed using IBM SPSS statistics 21.

Results: Of the 1056 patients in the study, 805(76%) were males. Majority of patients 498(47.2%) belonged to 21-40 years age group, with average age of 27±16 years. The most common cause identified were road traffic accidents 461(43.6%), followed by fall injuries 266(25%). Bomb blast injuries were 60(5.6%). The commonest finding on computed tomography scan was contusion in 124(11.7%) patients. Of the total, 709(63.9%) patients were treated conservatively. Major surgical procedure was done in 125 (11.8%) patients. Excellent recovery was seen in 907(85.8%) patients.

Conclusions: In our environment, risk of head injury is increasing. The government should take measures for the improvement of infrastructure and strict implementation of traffic laws. Trauma centres with trained staff need to be ensured.

Keywords: Head trauma, Cortical contusions, Traumatic brain injuries, Blast injuries. (JPMA 66: 864; 2016)

Introduction

Head injuries include injury to the scalp, skull fractures, concussions, bruises (contusions) and tears (lacerations) of the brain, accumulation of blood within the brain or between the brain and skull (intracranial haematoma), and damage to nerve cells throughout the brain (diffuse axonal injury). Most commonly, traumatic brain injury occurs in the presence of additional injuries to other major organ systems, but it can also occur in isolation.[1] Head injury can be either closed or open (penetrating). A closed (non-missile) head injury is where the dura mater remains intact while a penetrating head injury will compromise the dura.

The major cause of head injury is motor vehicle accidents, accounting for approximately 70% of the head traumas. Other common causes include falls (especially in young children and older adults), assaults, firearms, workplace accidents and trauma during sports or recreational activities. Globally and especially in South East Asia the incidence of traumatic brain injury (TBI) in particular is rising besides other factors like falls and ballistic traumas.[2]

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Head trauma accounts for one-fourth to one-third of all accidental deaths and for two-third of trauma deaths in hospitals.[3]

The most dangerous form of head trauma is TBI which results due to a blow to the head that could make the person's physical, cognitive and emotional behaviours irregular. The global incidence rate of TBI is reported at 200 per 100 000 people per year. The Injury Expert Group within the Global Burden of Disease 2005 (GBD) Project aims at providing better estimates of the incidence, prevalence and duration of TBI in each of the 21 GBD regions.[4] Brain injury is the most common cause of death in trauma victims, accounting for about half of deaths at the accident site. Head injuries are the major cause of morbidity and mortality in childhood trauma victims, accounting for an annual mortality rate of 1 per 1000 in this age group.[5]

According to the United States Centre for Disease Control (CDC), 32% of TBIs are caused by falls, 10% by assaults, and 16.5% by being struck by or against something, 17% by motor vehicle accidents, and 21% by other/unknown ways. In addition, the highest rate of injury is among children aged 0-14 years and adults age 65 years and older.[6]

The management of head injury has been revolutionised

by round-the-clock monitoring, computerised axial tomography (CAT), magnetic resonance imaging (MRI), monitoring of intracranial pressure and carotid angiography (CA). Intermittent positive pressure ventilation, dehydration therapy and better techniques of operations have made a tremendous difference in the ultimate outcome of severe brain trauma.[7] Prevention of serious complications and lifelong impairments and disabilities requires immediate and vigilant management of head trauma patients. The majority of patients require conservative management and only 10-20% of patients need surgical intervention.[8]

The protection of head from trauma is of paramount importance. Implementation of preventive efforts and education regarding head safety and early response and management of the minor as well major head traumas can effectively reduce the rate of these injuries and decrease the overall morbidity and mortality as a result of head traumas.

The current study was planned to determine the causes, epidemiological characteristics and clinical outcomes related to cases of head trauma.

Materials and Methods

The retrospective study was conducted at the Department of Neurosurgery, Combined Military Hospital (CMH), Quetta, and comprised data from September, 2007, to September, 2011. All patients referred to the department by the Emergency Department for head trauma were included. The operational definition of head trauma was set as trauma in which the scalp, cranium and/or its content were injured irrespective of the nature of injuries.

Radiological investigations and other baseline investigations were carried out. In the Emergency Department, detailed history had been taken and examinations were done and neurological status was recorded according to the Glasgow coma scale (GCS). The patients were classified in to three groups on the basis of GCS in mild (13-15), moderate (9-12) and severe (3-8).

Computed tomography (CT) scan was performed in all head injury patients and was the investigation of choice. Two main modalities of treatment were used, conservative and surgical, depending on the type of lesions. Those treated conservatively were given antibiotics, tetanus toxoid booster doses, analgesics and anti-epileptics in patients with moderate and severe head injury who were deemed to be at risk for seizures. They were kept under strict observation for the development of life-threatening symptoms.

Based on clinical and radiological findings, patients were treated operatively or conservatively. The patients who had lateralizing signs, anisocoria, severe headache, vomiting, midline shift of more than 5mm on CT scans, depressed compound fractures and GCS of less than 13 were treated operatively. Those patients who had mild headache, no midline shift of less than 5mm on CT scans, no lateralizing signs, normal pupillary reflex, normal CT scan findings, and GCS of 13 or greater were treated conservatively.

Various surgeries that were performed included wound debridement, suturing of scalp lacerations, craniotomies, elevation of depressed skull fractures and craniectomies. Follow-up of all the patients with Glasgow outcome scale (GOS) determination was done 6 months after the injury. Complete neurological examination was done and GCS was noted. The patients at follow-up were divided into various categories depending on GOS category. Category A included patients who had died; category B had patients with persistent vegetative state; category C had severely disabled patients who were conscious with score of 1-3; category D had patients who were moderately disabled with score of 4-5; and category E had patients with excellent recovery. Data was analysed by IBM SPSS statistics 21.

Results

Of the 1056 patients in the study, 805(76%) were males. The overall mean age was 27±16 years. Majority of patients 498(47.2%) belonged to 21-40 years age group (Table-1). Overall, 871(83%) patients scored satisfactorily on the GCS (Table 2). The most common cause identified were road traffic accidents (RTAs) 461(43.6%), followed by

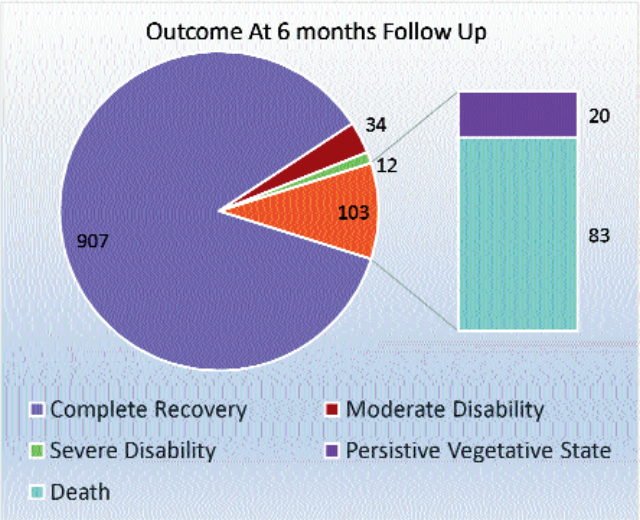

Figure: Outcome of patients.

Table-1: Age distribution of head trauma patients.

Age in Years	Number of patients	Percentage
0-10	105	9.9
11-20	160	15.1
21-30	287	27.1
31-40	213	20.1
41-50	105	9.9
51-60	72	6.8
61-70	52	4.9
71-80	65	6.1
Total	1056	100%

Table-2: GCS score in head trauma patients on admission.

Severity of Head Trauma	Glasgow Coma Scale score	Frequency of patients	Percentage
Normal Consciousness	15	871	83.0
Mild Injury	13-14	86	8.2
Moderate Injury	8-12	68	6.5
Severe Injury	<8	31	2.9
	Total	1056	100

Table-3: Mechanism of Trauma.

Mechanism of injury	Frequency	Percentage
Road traffic accident	461	43.6%
Falls	266	25.1%
Gunshot wounds	68	6.4%
Social Violence	70	6.6%
Bomb blast	60	5.6%
Sports related	54	5.1%
Mine blast	45	4.2%
Splinter injury	16	1.5%
Not known	16	1.5%

Table-5: Glasgow outcome scale category of patients at 6 months follow up.

Categories for recovery of patients	Comments	Frequency	Percentage
Category E	Complete Recovery	907	85.8%
Category D	Moderate Disability	34	3.2%
Category C	Severe Disability	12	1.1%
Category B	Persistive Vegetative State	20	1.8%
Category A	Death	83	7.8%

fall injuries 266(25%). Bomb blast injuries were 60(5.6%) (Table-3).

The commonest finding on computed tomography scan was contusion in 124(11.7%) patients. Of the total, 709(63.9%) patients were treated conservatively, while 381(36.1%) patients underwent operative management; and 256 (24.2%) had minor operative treatment for scalp lacerations, which were treated with surgical suturing and patients were prescribed antibiotics, analgesics and tetanus toxoid booster doses; 125 (11.8%) had major operations which included craniotomies, craniectomies and treatment for different fractures (Table-4).

Excellent recovery was seen in 907(85.8%) patients (Table-5; Figure).

Discussion

Head trauma is a very common neurosurgical emergency which usually affects young age group. It has been found that incidence for head injuries is increasing mainly due to usage of vehicles by low and middle income countries.[9] As young people are affected by head injuries, there is loss to society because of the loss of important productive years due to disability or death.[9] In our study, young age group 21-40 years (47.1%) was affected with male-to-female ratio of 3.2:1.

In our study the most common cause of head injury were

Table-4: Injuries and Treatment.

CT Scan Finding	Percentage	Total	Conservatively Management	Operative Management
Contusion	11.7%	124	124	0
Isolated fracture	4.2%	45	40	5
Subdural Haematomas (SDH)	4.5%	48	08	40
Extradural Haematomas (EDH)	3.7%	40	08	32
Diffuse Axonal Injury	3.5%	38	38	0
Compound depressed fracture	1.8%	20	0	20
Frontal sinus fracture	1.8%	20	4	16
EDH/ SDH combined	1.1%	12	0	12
Normal study	67.1%	709	709	0

CT: Computed tomography.

RTAs. It has been observed that the cost of road crash injuries is quite large. It is estimated to be roughly 1% of gross national product (GNP) in low-income countries, 1.5% in middle-income countries and 2% in high-income countries.[10] In countries with low income like in Africa, Asia, the Caribbean and Latin America, RTAs are common among passengers, pedestrians, cyclists, occupants of buses and users of motorised two-wheelers.[11,12] Around 85% of all global road deaths, 90% of the disability-adjusted life years lost due to crashes, and 96% of all children killed worldwide as a result of RTAs occur in low-income and middle-income countries. It has been estimated that more than 50% of deaths due to traffic accidents occur in the younger age group of 15-44 years.[13] For this purpose, recommendations were provided in a world report on road traffic injury prevention.[14] Some of the recommendations to the government for the road safety included: making road safety a political priority, a multidisciplinary approach to road safety, enforcement of legislation to use seat-belts, child restraints, the wearing of motorcycle and bicycle helmets. Besides, safe speed limits should be set and infrastructure should be promoted. Public health authorities should include road safety in health promotion and disease prevention activities and should build trauma care skills at the primary, district and tertiary healthcare levels. The vehicle manufacturers should ensure that all motor vehicles meet safety standards which are set for high-income countries.

The second common cause in our study was falls which was more common in the elderly. The increased rate of social violence was the third common cause of injury in our study which has been linked to illiteracy, poverty, unemployment, and poor law reinforcement capacities. Increasing number of patients (5.6%) were seen with head trauma due to bomb blast injuries. Bomb blast injuries are among top 5 causes of head trauma. Most affected people are young. According to one study, total fatalities due to terrorism in Pakistan, between 2003 and 2016 are 60,014.[15] The country's annual death toll, due to terrorist attacks, rose from 164 in 2003 to 3318 in 2009.[16]

The most common CT scan finding in our study was cerebral contusion 11.7%, followed by sub-dural haematomas 4.5%, isolated vault fractures 4.2% and extra-dural haematomas 3.7%. Patients with subdural haemorrhages have poor prognosis while extra-dural, if operated in time, have good outcomes.[17] Subarachnoid haemorrhage doubles the mortality.[18] Diffuse axonal injuries are associated with poor outcome.[9]

Most of the head trauma patients had mild injuries which were treated conservatively (63.9%). Operative treatment was done in 36.1% of patients. Mostly the patients had scalp suturing (24.2%). Due to mild injury, the outcomes were excellent in our studies with recovery seen in 85.8%patients. The mortality rate was 7.8% in our study at 6-months follow-up, while in another study the case fatality rate was 21% after 30 days of traumatic head injury.[19] Another study conducted on the patients of Iraq war noted mortality of 30-50%.[20]

A study conducted in Karachi,[21] the largest city of Pakistan, showed similar results. Mostly young age groups of 20-39 years (54%) were involved in head trauma with males being predominantly affected. RTAs (43%), falls (20%), assaults (12%) and domestic violence (15%) were the main causes. As compared to Karachi, Quetta has a higher incidence of terrorist attacks and increasing percentage of head injury was seen in our study due to these bomb blasts. Kashmir has been one of the war-affected zones. One of the studies conducted in Kashmir[7] showed that younger age groups were affected compared to our study. The age groups affected were, 0-10 years (25.5%), 21-30 years (21.2%) and 31-40 years (18.2%) in decreasing order. GCS noted in the patients of Kashmir study[7] was similar to our study. Majority (80.2%) were conscious with GCS of 15, 9.9% had mild head injury with GCS of 13-15, 5.3% had moderate injury with GCS of 8-13, 4.6% had severe head injury with GCS of less than 8. While in our study, majority (83%) of patients were conscious with GCS of 15, 8.2% had GCS of 13-15, corresponding to mild injury, 6.5% had GCS of 8-12 with moderate head injury, and 2.9% had GCS of less than 8 with severe head injury.

TBI is a global problem. In USA, it has been estimated that 1.4 million people suffer from head trauma; 50,000 people die; and 200,000 people are hospitalised because of it.[22] Permanent disability due to TBI affects about 80,000 to 90,000 people every year.[23] In England, in 2001-2002, a hospitalised incidence rate of 229 per 100000 was noted for head injuries[24] and risk factors included alcohol intoxication, age, and gender.[25,26] The pattern of head trauma seen in our countries is different from the West. According to one study, TBIs in USA were caused by firearm injuries, vehicle accidents and falls in decreasing order.[27]

Conclusion

Motor vehicle accidents are the leading cause of head trauma in our region. Various studies have shown the beneficial effect of helmets, air bags and children seat-belts. Therefore there should be strict implementation of the traffic laws by the government. Trauma centres should

be built which should be equipped with modern instruments and professional staff with training of advanced trauma and life support programmes. Children in the schools should be educated regarding the safety measures and hazards of head traumas. Attention of the government is specially called towards peripheral areas where trained personnel (neurosurgeons and paramedical staff) and equipment are lacking. The increasing rate of terrorism is responsible for considerable rate of head trauma and is seen in the top 5 causes of head injury in terrorism-hit cities of Pakistan.

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