



Full Length Research Article

FACTORS INFLUENCING OUTCOME OF HEAD INJURY PATIENTS AT A TERTIARY CARE TEACHING HOSPITAL IN NORTH-WEST RAJASTHAN

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ABSTRACT

The demographic, epidemiological, and economic transition in India has changed the health scenario in a significant way during the last two decades. Because of this transition, the non-communicable diseases and injuries lie on the forefront of health care delivery system. Among all types of injury, head injury has serious consequences and major implications. The present study assesses the burden of head injury and identifies the factors influencing outcome of head injury patients at a tertiary care teaching hospital in North West Rajasthan.

Key Words:

Head injury,
GCS (Glasgow Coma Score),
MLS (Mid Line Shift),
Basal cistern compression,
GOS (Glasgow Outcome Score).

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INTRODUCTION

This prospective study was conducted on all head injury patients admitted in the department of Neurosurgery, S.P. Medical College and A.G. Hospitals, Bikaner, Rajasthan for the period of July 2014 to December 2014. During the study period, a total number of 645 head injury patients were registered.

Inclusion Criteria

A case of traumatic brain injury for the purpose of this study was defined as "An occurrence of injury to the head (arising from blunt or penetrating trauma or from acceleration deceleration forces) by an external agent with at least one of the following:

- Observed or self-reported alteration of consciousness or amnesia due to head trauma, and/or,

- Neurological or neuropsychological changes (determined from neurologic and neuropsychological examinations) or diagnosis of skull fracture or intracranial lesions (determined from radiological examination or other neuro-diagnostic procedures) that could be attributed to head trauma and/or,
- Occurrence of death resulting from trauma with head injury.

Exclusion Criteria

The clinical definition of TBI excludes (Agarwal et al., 2012) lacerations, avulsions or concussion of face, eye, ear, scalp or forehead without the other criteria listed above; (Sambasivan and Ramachandran, 1973) fractures of facial bones without the other criteria listed above; (Yattoo and Tabish, 2008) birth trauma; (Shrestha et al., 2011) cerebral anoxia that is not a complication of brain trauma; (Coronado et al., 2011) inflammatory infarction, toxic or metabolic encephalopathy that are not complications of brain trauma; (Gururaj, 2005) neoplasm; (Tjahjadi and Arifin, 2013) brain infarction (stroke) or intracranial hemorrhage without associated trauma. Specially designed, pre-tested, and pre-coded proforma was developed for the study.

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A questionnaire was developed and data collected under following headings-name, age, sex, area of residence, risk factors specially history of alcohol consumption, mode and pattern of injury, use of safety measures (helmet or seatbelt), mode of transportation, time interval between occurrence of injury and reaching a definitive hospital, referral from other hospital, referral to higher centre, severity and nature of brain injuries; clinical diagnosis and management aspects; disabilities at the time of discharge. The severity of brain injury was assessed based on Glasgow Coma Scale (GCS). All subjects were evaluated at hospital discharge time with Glasgow Outcome Scale (GOS).

Above table shows the distribution of patients according to age and sex. The maximum number of patients was in most active period of life i.e. 3rd decade of life constitute around 27.3%. Youngest patient was 1 month old and eldest patient was 85 years. The overall male: female ratio was 5.32:1 (84.2% : 15.8%). The Male to female ratio in pediatric age group (<10yrs) was 1.68:1; (9.6%:5.7%). In each group of patients male constitute more than female patients. Median age in the present study population was 28 years (range 1 month to 85 year). Pediatric age group (<10 years) constitute around 15.3% cases. This table gives the mortality pattern with age. Overall percentage of mortality was 18%.

Table 1. Distribution of cases according to age and sex incidence

Age Group (years)	Sex				Total	
	Female		Male			
	No.	%	No.	%	No.	%
< 10	37	5.7	62	9.6	99	15.3
11-20	6	0.9	104	16.1	110	17.1
21-30	12	1.9	164	25.4	176	27.3
31-40	17	2.6	97	15.0	114	17.7
41-50	9	1.4	61	9.5	70	10.9
51-60	15	2.3	33	5.1	48	7.4
61-70	1	0.2	14	2.2	15	2.3
>70	5	0.8	8	1.2	13	2.0
Total	102	15.8	543	84.2	645	100

Table 2. Distribution of cases according to Mortality in relation to age group (years)

Age Group (years)	Total No. of Patients	No. of Mortality	% of Mortality	Percentile mortality
≤ 10	99	13	13.1	9.3
11-20	110	14	12.7	8.7
21-30	176	30	17.0	31.8
31-40	114	20	17.5	21.7
41-50	70	12	17.1	7.0
51-60	48	14	29.2	12.4
61-70	15	5	33.3	7.9
>70	13	8	61.5	1.2
Total	645	116	18.0	100

Table 3. Distribution of cases according to mode of injury

Age Group (years)	Mode of Injury								Total	
	RTA		Fall		Assault		Misc			
	No.	%	No.	%	No.	%	No.	%	No.	%
≤ 10	9	1.4	58	9.0	0	-	32	5.0	99	15.3
11-20	88	13.6	7	1.1	5	0.8	88	1.6	110	17.1
21-30	127	19.7	16	2.5	24	3.7	9	1.4	176	27.3
31-40	83	12.9	12	1.9	17	2.6	2	0.3	114	17.7
41-50	47	7.3	8	1.2	6	0.9	9	1.4	70	10.9
51-60	29	4.5	6	0.9	9	1.4	4	0.6	48	7.4
61-70	8	1.2	5	0.8	2	0.3	0	-	15	2.3
>70	7	1.1	1	0.2	1	0.2	4	0.6	13	2.0
Total	398	61.7	113	17.5	64	9.9	148	10.9	645	100

Observations

The present study "Factors influencing outcome of head injury patients at a tertiary care teaching hospital in North West Rajasthan" was carried out on 645 patients, admitted in department of Neurosurgery, S.P. Medical College and A.G. of Hospitals, Bikaner, Rajasthan from July 2014 to December 2014. Out of 645 patients, 33 patients were excluded from outcome of head injury patients because they were absconded or referred to higher centre or LAMA or discharged on request. In this study following observations were made.

Percentile mortality were highest in age group of 21-30 years (31.8%) followed by 31-40 years (21.7%) and <20 years (18%). Mortality in age group of 21-50 years was 51.6%. Younger age <40 years having mortality 15.4%, at older age group >40. In our study above table shows mode of injury. 61.7% patients had head injury due to road traffic accidents while 17.5% sustained head injury due to fall from height and 9.9% patients were sustained injury due to assault. RTA was the commonest mode of head injury in adults 2nd to 4th decade of life approximate 46.2% while in pediatric age group (0-10

Table 4. Distribution of Cases according to Type of Vehicle in relation to RTA

Type of Vehicle	Total Cases	Percentage	Safety Measures used	
			Yes	No
Two Wheeler	266	66.8	11	255
Four Wheeler	110	27.7	7	103
Heavy Vehicle	22	5.5	0	22
Total	398	100	18	380

Table 5. Distribution of cases according to Alcohol Consumption

Alcohol Consumption	Mode of Injury								Total		Mortality
	RTA		Fall		Assault		Misc		No.	%	
	No.	%	No.	%	No.	%	No.	%			
No	294	73.9	103	91.2	64	100	67	95.7	528	81.9	92
Yes	104	26.1	10	8.8	0	-	3	4.3	117	18.1	24
Total	398	100	113	100	64	100	70	100	645	100	116

Table 6. Distribution of cases according to Referred From Various Health Centres

Referred From	Mode of Injury								Total	
	RTA		Fall		Assault		Misc		No.	%
	No.	%	No.	%	No.	%	No.	%		
CHC	178	44.7	39	34.5	25	39.1	30	42.9	272	42.2
District Hospital	75	18.8	14	12.4	20	31.3	15	21.4	124	19.2
Direct	145	36.4	58	51.3	19	29.7	24	34.3	246	38.1
PHC	0	-	2	1.8	0	-	1	1.4	3	0.5
Total	398	100	113	100	64	100	70	100	645	100

Table 7. Distribution of cases according to Time to Reach Hospital (hrs)

Time to Reach Hospital (hrs)	Mode of Injury								Total		Mortality
	RTA		Fall		Assault		Misc		No.	%	
	No.	%	No.	%	No.	%	No.	%			
1	114	28.6	50	44.2	15	23.4	22	31.4	201	31.2	33
2-6	248	62.3	53	46.9	34	53.1	39	55.7	374	58.0	79
>6	36	9.0	10	8.8	15	23.4	9	12.9	70	10.9	4
Total	398	100	113	100	64	100	70	100	645	100	116

Table 8. Distribution of cases according to mode of transport from site of trauma

Mode of Transport	Total Cases	
	No.	%
Ambulance	70	10.9
Private	575	89.1
Total	645	100

Table 9. Distribution of cases according to Mortality in relation to Glasgow Coma Scale

Glasgow Coma Scale	Total No. of Patients	No. of Mortality	% of Mortality
3-8	140	97	69.3
9-12	183	18	9.8
13-15	322	1	0.3
Total	645	116	18.0

Table 10. Distribution of cases according to basal cisterns in relation to outcome

Basal cisterns	Total No. of Cases	No. of Death	Percentage
Absent or Compressed	125	62	49.6
Normal	520	54	10.4
Total	645	116	18.0

Table 11. Distribution of cases according to Midline Shift in relation to outcome

Midline Shift	Total No. of Cases	No. of Death	Percentage
No or \leq 5 mm	584	92	15.7
$>$ 5 mm	61	24	39.3
Total	645	116	18.0

Table 12. Distribution of cases according to repeat CT Scan done within 24 hours

Repeat CT Scan	No. of Patients	Changed in Treatment Modality	% of Change Treatment
Done	342	51	14.9
Not Done	303	-	-

Table 13. Distribution of cases according to pathology in CT scan findings and mortality pattern

Pathology	No. of Patients	% percentage	No. of Mortality	% of Mortality
Extra Dural Hematoma	147	22.8	14	9.5
Subdural Hematoma	55	8.5	22	40.0
Contusion	313	48.5	56	48.3
Fracture	192	29.8	17	8.9
Pneumocranium	69	10.7	3	4.3
Subarachnoid Haemorrhage	76	11.8	36	47.4
Diffuse Axonal Injury	40	6.2	28	70.0

Table 14. Distribution of cases according to Glasgow Outcome Score (GOS)

S.N.	Outcome Score	No.	%
1	Death	116	19.0
2	Persistent Vegetative	15	2.4
3	Severe Disability	21	3.4
4	Moderate Disability	58	9.5
5	Good Recovery	402	65.7
	Total	612	100

years) 58.6% sustained head injury due to fall. In older people $>$ 70 years 7.69% patients had fall and 53.8% patients had RTA. Out of total 398 RTA patients, 266 patients were driving two wheeler vehicle and out of them only 11 used safety measures, 110 patients were driving four wheeler vehicle and out of them only 7 used safety measure while 22 were driving heavy vehicle and no one used safety measures. Out of total 645 patients 117 patients were under alcohol intoxication and out of them 24(20.5%) patients were expired while 528 patients were not having history of alcohol consumption or drug intake and out of them 92(1.7%) were expired. This table shows patients who referred from health centers. Out of total 645 patients, 272(42.2%) patients were referred from CHC, 124 (19.25) patients were referred from district hospital, 246(38.1%) patients came direct to our hospital while 3(0.5%) patients were referred from PHC. Out of total 645 patients, 201 patients reached to hospital within 1 hour and out of them 33 expired, 374 patients reached to hospital between 2-6 hours and out of them 79 expired while only 70 patients reached to hospital after 6 hours and out of them only 4 expired.

According to mode of transport, 70(10.9%) patients reached to hospital in ambulance while 575(89.1%) patients reached to hospital with the private vehicle. Above table shows that GCS score was \leq 8 in 21.7% of patients, 9-12 in 28.4% patients and 13-15 in 49.9% of patients, mortality rates were 69.3%, 9.8% and 0.3% in glasgow coma scald 0-8, 9-12 and 13-15 groups respectively. According to above table, basal cisterns was absent or compressed in 125 patients and out of them 62(49.6%) expired while basal cisterns was normal in total 520 patients and out of them 54(10.4%) expired.

According to above table, No midline shift or \leq 5mm midline shift was present in total 584 patients and out of them 92(15.7%) patients expired, midline shift was $>$ 5mm in total 61 patients and out of them 24 (39.3%) were expired. This table shows out of 645 patients, 342 patients subjected to repeat CT done within 24 hours and 51 (14.9%) patients changed in treatment modality. This table shows the pathology in CT scan findings and mortality pattern. The CT scan finding of maximum patients were contusion (48.5%) than followed by Fracture (29.8%), EDH (22.8%), SAH (11.8%), pneumocranium (10.7%), SDH (8.5%) then DAI (6.2%). This table shows that mortality rate in present series was 19%, 65.7% patients had good recovery, 9.5% patients had moderate disability, 3.4% patients were severely disabled while 2.4% patients were discharged in vegetative state. Patients had favorable outcome (GOS 4-5) were 75.2% and unfavorable outcome (GOS 1-3) were 24.8%.

DISCUSSION

Head injury is a major public health problem. Incidence of head injury is rapidly increasing in the world, especially in the developing countries like India. In India, the problem has become more acute over last two decades, mainly due to increased vehicular traffic and poor condition of roads. Because of peak occurrence of head injuries in adult population, it adds a great financial loss for the families as well as for country. In addition to significant mortality caused by head injury, devastating physical and functional morbidity is frequently associated with the sequel of head injury. Improved method of investigations like CT and MRI, safer anaesthesia, broad spectrum antibiotics and better

management of metabolic state of patients, improved diagnostic ability and the increasing surgical skill of neurosurgeons have made the outcome better. Yet there is considerable scope for improvement in decreasing the mortality. In our study age of head injury patients ranged from 1 month to 85 years with median age 28 years. Agarwal et al (2012) in year 2012 done a study with age ranged from <1yrs to 98yrs with median age 31yrs. In our study the highest incidence of head injury is in 3rd decade (21-30 years) of life approximate 27.3%. Agarwal et al. (2012) in 2012 found 27.7% cases in 3rd decade of life. Sambisivan and Ramchandran (1973) found 24% cases in 3rd decade of life. Yattoo and Tabish (2008) in year 2008 found 21.2% cases in 3 decade of life. Shrestha et al. (2011) in year 2011 found that most commonly affected age group was in the range of 20-30 years (24.5%). In our study percentile mortality were highest in age group of 21-30 years (31.8%) followed by 31-40 years (21.7%) and <20 years (18%). Yattoo and Tabish (2008) in year 2008 found that mortality were highest in age group of 21-30years (18.8%), followed by 11-20years age group (17.8%) and 31-40 years (14.3%). In our study head injury due to any mode was much more common in males, hence the actual number of deaths was higher for males than females (95 v/s 21) and percentage of mortality in males population was observed to be lower (17.5 v/s 20.6).

Yattoo and Tabish (2008) in year 2008 found that head injury related deaths were more common in males. Coronado et al. (2011) in year 2011 found that head injury related deaths were three times higher for males as compared to females. In our study maximum number of patients approximate 61.7% sustained head injury due to RTA followed by 17.5% cases by FALL and 9.9% cases by assault. RTA was the commonest mode of head injury in adults of 2nd to 4th decade of life approximate 74.9%. Agarwal et al. (2012) in year 2012 found that RTA causes head injury in 56.3% cases. Out of total 398 RTA patients, 266 patients (66.83%) were on two-wheeler vehicle, 110 patients (27.64%) were related to four-wheeler, and 22 patients (5.53%) were related to heavy vehicle. Out of 266 patients on two wheeler only 11 (4.16%) used helmets, and out of 110 on four-wheeler only 7 (6.36%) used seat-belts.

Gururaj et al. (2005) in year 2005, found that the number of two-wheeler riders and pillions wearing helmets at the time of injury was less than 5%. However, two-wheeler riders and pillions constituted 43% of the total injured persons in the study. In this study out of 645 patients, 117 patients (18.1%) were found to be under the influence of alcohol at the time of injury, and out of them 24 (20.5%) were expired. Gururaj et al. (2005) in year 2005, 18.4% patients were found to be under the influence of alcohol at the time of injury. Among them, nearly two-thirds sustained a road traffic injury, one-fourth sustained a fall and about 12% were injured in a violent act. In this study out of 645 patients, 246 (38.1%) reached direct to this hospital, while 272 (42.2%) referred from CHC, 124 (19.25%) from district hospital, and 3 (0.5%) from PHC. Gururaj et al. (2005), in year 2005, found that 13.5% patients reached directly, 42.4% reffered from government hospital, 1.4% from PHC, and rest from private hospitals. In this study 201 patients (31.2%) reached within one hour, 374 patients (58%) between 2-6 hours and 70 patients (10.9%) reached in more than 6 hours. Gururaj et al. (2005) in year 2005,

observed that only 12% reached a definitive hospital in less than an hour and 30% in 1 - 3 hours. In half of the injured, the interval between injury and reaching a hospital exceeded 6 hours, with 10% reaching beyond 24 hours. Out of 645 patients, 70 (10.85%) reached to this hospital in ambulance and 575 (89.15%) by private vehicle. Yattoo et al in year 2009 observed that 66% patients were shifted through ambulance and 34% by private vehicle. In our study patient admitted with GCS score of 13-15 were 49.9%, 9-12 were 28.4%, <8 were 21.7%. Agarwal et al. in year 2012 found that patients of head injury with GCS score of 13-15 were 58%, 9-12 were 21.5%, <8 were 15%. Out of 645 patients, in 125 (19.38%) basal cisterns were absent, among them 62 patients (49.6%) were expired, while in 520 patients (80.62%) basal cisterns were normal among them 54 patients (10.4%) were expired.

Tjahjadi et al., in year 2013, found that basal cisterns were compressed in 44 patients out of 61 severe traumatic brain injury patients, among them 9 (20.5%) survived, and 35 (79.5%) expired. Yet in 17 patients having normal basal cisterns 12 (70.6%) survived and 5 (29.4%) expired. In this study out of 645 patients midline shift \geq 5mm was found in 61 cases among them 24 (39.34%) expired, while in 584 patients having no or < 5mm midline shift, 92 (15.7%) expired.

Tjahjadi et al, in year 2013, found that out of 61 severe TBI patients, midline shift >5mm was in 28 patients among them 3 (10.7%) survived and 25 (89.3%) expired. In our study 342 patients out of 645 subjected to repeat CT and 51 patients changed in treatment modality (operated 14.9%). Lubillo et al (8) in year 1999 found that features of CT scans obtained shortly after craniotomy constitute an independent predictor of outcome in patients with traumatic hematoma. In our study the CT findings of maximum patients were contusion (48.5%) than followed by fracture (29.8%), EDH (22.8%), SAH (11.8%), Pneumocranium (10.7%), SDH (8.5%) than DAI (6.2%). Percentage mortality was maximum in DAI (70%) followed by contusion (48.3%). Yattoo and Tabish, in year 2008 found that highest number of patients was having scalp lacerations (40.4%), contusion (8.8%), EDH (3.2%), SDH (4.2%) and depressed # (3%). In present study overall mortality was 18.0% (out of all 808 patients).

After excluding (33 patients) the mortality was 19%. Patients had good recovery was 65.7%, patients had moderate disability was 9.5%, severely disabled patients were 3.4% while 2.4% patients were discharged in vegetative state. Agarwal et al. in year 2012 found 6.4% mortality (overall mortality). According to table no. 2 mortality was 7.9%, patients had good recovery were 81.5%, patients with moderate disability were 6.6%, patients with severe disability were 2.5% while 1.54% patients were in persistent vegetative state. Shrestha et al(4) in year 2011 found 10% mortality, patients had good recovery were 70.1%, patients had moderate disability were 16.1%, patients had severe disability were 2.6% while 1.2% patients were in persistent vegetative state. In our study 24.8% patients had unfavorable outcome (GOS 1-3) and 70.2% had favorable outcome (GOS 4-5). Shrestha et al (2011) in year found that 13.9% patients had unfavourable outcome and 86.1% had favourable outcome.

Conclusion

This study reveals that the head injury is one of the major health problems in North-West Rajasthan. The age of head injury patients varied from 1 month to 85 years and the maximum number of patients (27.3%) was found in the third decade of life. Glasgow coma score, Midline shift, and Basal Cistern compression are important factors not only to indicate the seriousness of head injury but also to assess the patients as a whole to determine the management, progress & outcome of patients. P.B.M. Hospital attached to S.P. Medical College, Bikaner is the only tertiary care teaching hospital for management of head injury and patients are referred here from all over the North-West Rajasthan, particularly from rural areas. Ambulance service of Rajasthan needs to be increased and properly organized to have all the life saving facility to treat head injury patients on time. Trauma services need to be started at district and sub-district level to treat all trauma patients, without any delay. Referral system in Peripheral Health System need to be improved so that only critically ill patients will be referred to tertiary care center, in time for better management and outcome. Compulsory helmet and seat-belt legislation, speed control, better traffic management, compulsory road safety education to school children, and preventive programs towards control of alcohol-related issues are urgently required. Unless systematic efforts are made in all over India towards prevention, management and rehabilitation of head injury patients, many more individuals, children and middle-aged adults will continue to die and this will be an unbearable loss to Indian society.

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