Original Research Article

Risk factors of pediatric head injury

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Abstract

In developing countries, accident rates in general and traumatic brain injuries in particular are increasing as traffic increases besides other factors like industrialization, falls and ballistic trauma. Given Prospective observational study conducted at Acharya Vinoba Bhave Rural hospital, Sawangi, Wardha for one year of duration. In India, children between 1 and 16 years about 35% of the total population. Head Injury in infancy and childhood has been documented as the single most common cause of death. Our results are in accordance showing fall from height as the most common cause of pediatric head injury with male preponderance, followed by road accidents, assaults, sports injuries, and various other mechanisms,

Key Words:

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INTRODUCTION

Pediatric head injury is considered as a major health concern that is a frequent cause of death and disability and makes considerable demands on health services. In developing countries, accident rates in general and traumatic brain injuries in particular are increasing as traffic increases besides other factors like industrialization, falls and ballistic trauma. Head injuries account for one quarter to one third of all accidental deaths, and for two thirds of trauma deaths in hospitals[1] Traumatic brain injury (TBI) is commonly used as synonym for head injury, acquired brain injury and brain injury[1]. It is a common occurrence in the paediatric population and accounts for the largest cause of acquired disability in childhood[2]. The field of pediatric head injury is broad and versatile. Recommendations and opinions are deviating and proposed management regimes are not always optimal or easily applied. The study focuses on understanding risk factors, clinical presentation, treatment options and outcome of these patients and to strengthen these aspects further with preventive issues and imparting health education.

MATERIAL AND METHODS

Place of study: Acharya Vinoba Bhave Rural hospital, Sawangi, Wardha.
Study Design: Prospective observational Study.
Study Duration: one year.
Inclusion Criteria: Children (under 16 years of age) presenting with head injury.
Sample Size: 50
Methodology: Study was started after obtaining the permission from ethical committee of the hospital. Informed consent from the parent/guardian/relative of the patient. A detailed clinical history will be obtained from the parents/guardian/relative admitted in the hospital with head injury. After that detailed clinical examination was performed on the patient and data acquired, was entered in a predesigned validated pro forma, The result of Blood investigations and imaging studies was entered in the pro-forma. Clinical course and immediate outcome (death or discharge) was noted.
Analysis: Statistical analysis was done by using the collected data on incidence and clinical – radiologic correlation.

OBSERVATIONS AND RESULTS

Table 1: GCS scale

TOTAL	GCS (3-8) SEVERE HEAD INJURY	GCS (9-12)MODERATE HEAD INJURY	GCS (13-15) MILD HEAD INJURY
50	0	9	41

Table 1 shows severity of head injury by physical examination (GCS scale), Total number of cases were 50 out of which 41 (82%) had mild head injury, and remaining 9 (18%) had moderate head injury and none of them had severe head injury. Ratio of mild head injury to moderate head injury was 4.5:1.

Table 2: Sex distribution

	Mild Head Injury	Moderate Head Injury	Chi value	p-value
Male	29	6	0.05	0.80,NS
Female	12	3		

Table 2 shows sex wise distribution of mild to moderate head injury. Out of 50 children 35 (70%) were males and 15 were females (30%), Ratio-2.33:1(M: F),out of which 41 children (82%) had mild head injury and 9 (18%) had moderate head injury, none of the children had severe head injury. In mild head injury out of 41 children 29 (70.7%) were males and 12 (29.3%) were females, at ratio of 2.4:1(M: F). In moderate head injury 6 (66.6%) were males and 3 (33.3%) were females at ratio of 2:1(M: F).

Table 3: Age distribution of cases

Age Group	0-5Years	6-10Years	11-16Years	Chi value	p-value
Mild Head Injury	25	13	3		
Moderate Head Injury	4	3	2	1.99	0.36,NS
Total	**29**	**16**	**5**		

Table 3 shows age wise distribution according to the severity of head injury. Age wise distribution was done into 3 groups. First group (n=29) comprises of children up to 5 years of age in which 25 (86.2%) children had mild head injury and remaining 4 (13.8%)children had moderate head injury. Second group (n=16) comprises of children from 6-10 years of age in which 13 (81.25%) had mild head injury and 3 (18.75%) had moderate head injury. Third group (n=5) comprises of children from 11-16 years of age in which 3 (60%) had mild head injury and 2 (40%) had moderate head injury.

Table 4: Incidence of location

Total	Home	Out Side Home	ϰ2-Value	P-Value
Mild Head Injury	23	18		
Moderate Head Injury	5	4	0.0008	0.99,Ns
Total	**28**	**22**		

Table 4 shows incidence of location according to the severity of head injury. Out of 50 children, 28 (56%) children had head injury at home from which 23 (82%) had mild head injury and 5 (18%) had moderate head injury. Remaining 22 children had head injury outside their home in which 18 (81.81%) children had mild head injury and 4 (18.18%) children had moderate head injury. Ratio of head injury home to outside home was 1.27:1.

Table 5: Mode of injury

	RTA (road traffic accident)	FALL FROM HIGHT	HIT BY SOME OBJECT	Chi value	p-value
Mild Head Injury	13	23	5		
Moderate Head Injury	4	5	0	1.45	0.48,NS
Total	**17**	**28**	**5**		

Table 5shows mode of head injury and their severity. Maximum number of cases (n=28) (56%) of head injury were due to fall from height, out of which 23 (82.14%)had mild head injury and 5 (17.86%)had moderate head injury followed by head injury due to RTA (n=17) (34%) in which 13 (76.47%)had mild head injury and 4 (23.53%)had moderate head injury and remaining 5 (10%)children had head injury due to hit by some object and all of them had mild head injury. Ratio of fall from height to RTA to hit by some object was 5.6:3.4:1.

Table 6: site of injury

Total	Face	Frontal	Occipital	Temporal	Parital
Mild Head Injury	9	19	6	7	1
Moderate Head Injury	2	4	0	2	0
Total	**11**	**23**	**6**	**9**	**1**
Chi-value	**1.66,p-value=0.79,NS,p>0.05**				

Table 6 shows different sites of head injury in which most common site is frontal region(n=23) (46%) with 19 (82.6%) children had mild head injury and 4 (17.4%) children had moderate head injury, followed by face (n=11) (22%) with 9 (81.8%) had mild head injury and 2 (18.2%)children had moderate head injury, followed by temporal site (n=9) (18%) with 7 (77.8%)children had mild head injury and 2 (22.2%)children had moderate head injury, followed by occipital (n=6) (12%) had mild head injury, remaining 1 child had head injury in the parietal region which was mild.

Table 7: ENT bleed and vomeiting

	Mild Head Injury	Mod. Head Injury	Chi Value	P-Value
ENT BLEED	3	4		
VOMITING	7	2	2.06	0.35,NS
CONVULSION	14	8		

Table 7 shows different symptoms in head injury in which 22(44%)children had convulsion of which 14 (63.6%)had mild head injury and 8 (36.4%)children had moderate head injury. 9 (18%) children had vomiting of which 7 (77.8%) children had mild head injury and 2 (22.2%)children had moderate head injury. Children with ENT bleed were 7 (14%) of which 3 (42, 8%) children had mild head injury and 4 (57.2%) children had moderate head injury.

Table 8: Abnormal report finding

Abnormal Report	Mild Head Injury	Mod. Head Injury	Chi Value	P-Value
EDH	0	3	17.77	0.0005,S
IVB	0	1		
Fracture	1	3		
Normal	20	2		

Table 8shows abnormal findings of CT scan in which 4 (50%) children were found to have skull fracture in which3 (75%) children were found to have moderate head injury and 1 (25%) children found to have mild head injury. 3 (37.5%) children found to have extradural hematoma, All were having moderate head injury, and 1 child found to have intraventricular bleeding with moderate head injury. Out of 22 normal CT study 2 found to have moderate head injury. These values are statistically significant (p=0.0005)

Table 9: Duration of stay

TOTAL/ DAYS	0-3 DAYS	4-7 DAYS	MORE THEN 7DAYS	Chi value	p-value
Mild Head Injury	27	12	2	16.09	0.0003,S
Moderate Head Injury	2	2	(5		
Total	29	14	7		

Table 9shows duration of hospital stay after head injury which were divided into 3 groups. First group comprises of stay up to 3 days (n=29) (58%) in which 27 (93.1%) children found to have mild head injury and 2 (6.9%) children found to have moderate head injury. Second group comprises of stay from 4-7 days (n=14) (28%) in which 12 (85.7%) children found to have mild head injury and 2 (14.3%) children found to have moderate head injury. Third group comprises of stay more than 7 days (n=7) (14%) in which 5 (71.4%) children found to have mild head injury and 2 (28.6%) children found to have moderate head injury. These values are also found to be statistically significant (p=0.0003)

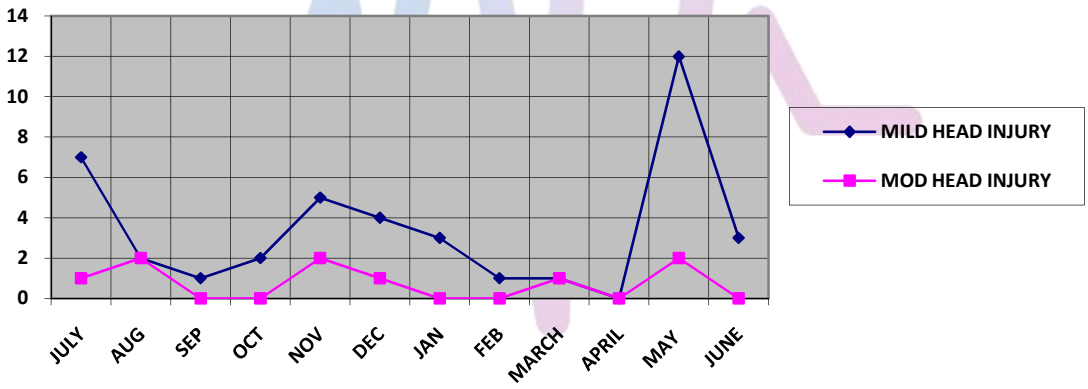

Figure 1: Incidence of head injury monthwise

Figure 1 shows graphical presentation of incidence of head injury monthly wise, In which maximum number of cases were found in the month of May followed by July.

DISCUSSION

In India, children between 1 and 16 years about 35% of the total population.[3] Head Injury in infancy and childhood has been documented as the single most common cause of death.[4] Moreover, the modes of injury, the mechanisms of damage, and the management of specific problems differ significantly between the adult and pediatric populations. Various studies on pediatric head injury have confirmed a male preponderance (70 % of cases).[5-8] However, Sambasivan[6] has reported an equal number of males and females in his series on pediatric head injury. Fall from height has been cited by most studies as the most common cause of pediatric head injury.[5-10] This is followed by road accidents, assaults, sports injuries, and various other mechanisms like coconut injury.[6] This study was done to analyse the clinical profile of pediatric head injury in relation to age distribution, sex, mode of injury, and types of injuries. Our results are in accordance showing fall from height as the most common cause of pediatric head injury. This

peculiarly occurs from unguarded rooftops while the child is playing. However, Osmond[5] from Canada cites motor accidents as the most common cause. The most common lesion seen on CT scan was an EDH and Fracture, whereas Mahapatra reports contusion as the most common. Seizure was seen in 28% of our children; a similar incidence has been reported by others also.[6] This study found that in rural Vidarbha head injury mostly affects young boys, due to RTA. These injuries resulted in a spectrum of imaging features and expected pathology. Low Glasgow coma score at admission was significantly associated with mortality as an outcome. This report is similar to many other reports from urban India, and other parts of the world, as there is disproportionate burden of motor vehicle-related injury morbidity and mortality.[7] It is important to understand the dynamics of RTA in rural India. Most vehicle ownership is in the urban areas, and those vehicles which are owned by rural population are typically low-speed (such as tractors, two-wheelers and cycles. However, a vast number of highways pass through rural and remote areas with extensive use of heavy motor vehicles travelling at high speed. Residential areas and highways are not segregated, and safety laws are not universally applied. Many interventions (e.g., road lighting, traffic signals, guard railing, seatbelts, helmets, airbags, and antilock brakes) have also demonstrated success in more industrialized setting and are likely to be valuable in resource-constrained setting such as India.[8] For example, in the United States, the rate of motor vehicle-related TBI fatalities decreased substantially from 11.4/100,000 in 1979 to 6.6/100,000 in 1992.[8] This decrease was largely attributed to an increase in seat belt and child safety seat use, standardized implementation of air bags, infrastructure investments and improved safety engineering.[9]In India, vehicles, especially those designed locally; do not conform to international safety standards in materials or design (e.g., roll-over prevention or passenger ejection).[10] There is a need to improve pre-hospital care to reduce morbidity and mortality.[11] Apart from safety laws, prompt transport to a hospital after an accident is another important measure to reduce mortality.[12] The majority of patients in India are brought to the emergency department by relatives or bystanders in private vehicles, and pre-hospital emergency medical services remain under-organized. Field triage often relies on bystanders who transport injured victims to the nearest clinic, which is often unable to provide appropriate treatment.[13] Major urban areas also have a loosely networked trauma system, untrained emergency medical services personnel and unequipped ambulances.[14] Our observation of family and bystander transport supports the notion that pre-hospital care in rural India requires much improvement. Additionally, during each year of the study, TBI admissions experienced a bimodal peak, during the months of March to June and from October to November. These months coincide with the Vacation. However, there is further need to confirm this pattern as it would be useful to plan preventive strategies. Children play in the streets, have less supervision of the parents and above all there is lack of safety measures in place where they play. Males predominate was also seen in our study also. The male: female ratio being 3:1. Most of the USA reports show an incidence ratio of 2.0 or more for males compared to females[15]. Adam et al (1996), Adam et al (1996), in their series of 672 patients showed 533 was male and 139 female patients[16]. Our observation corresponds with the observations made by other authors. The reason is that male child move out more frequently than female child. Our results are in accordance showing Age group 0-5 had most cases n=29 (58%) cases, followed by 6-10 age group (n=16) (32%) and in age group of 11-16 i.e. 5 cases (10%), similarly, In a recent study, Yattoo *et al*. from India investigated TBI in children, found that most (55.5%) of these injuries were recorded in the youngest, 0-5 age group[17]. This isconsistent with data reported from other studies, where the highest incidence of head trauma was found in the 6-10 age group[17]. According to the Accident and Emergency Department data, the maximum is observed at age 10-16 age group[18]. Similar data have been reported by Kennedy et al. from their study including 192 injured patients, of which the majority (90%) were in the 10-16 age group[19]. Severe injuries of neurocranium are still less commonin childhood [heavy bleeding with hematoma (epidural bleeding, subdural bleeding, intracerebral bleeding, traumatic (SAH)]. According to Case's results, epidural bleeding is generally found in around 6% of all head injuries. Such bleeding is not common in the first two years of age becausethe dura is tightly connected to the inner side of theskull[20]. On the other hand, Hahn et al. analyzed found a history of epidural bleeding in 44% of intracranial bleeding cases[21].

CONCLUSION

Our results are in accordance showing fall from height as the most common cause of pediatric head injury with male preponderance, followed by road accidents, assaults, sports injuries, and various other mechanisms. This peculiarly occurs from unguarded rooftops while the child is playing or rolled off bed etc. The most common lesion seen on CT scan was an EDH and fracture, and frontal lobe being the most common site as children. May month have more cases of head injury, Seizure was seen in 28% of our patients and limited to patients of mod head injury. Falls form the most important cause of pediatric head

injury and slight carefulness on the part of parents can help avoid disastrous consequences for the children. TBI in rural areas is mostly among the young male population and is increasing every year with majority coming from nearby villages which is very alarming and highlights the need for taking urgent steps for establishing good pre-hospital care and provision of trauma services at site in India. Recovery with minimal disability was observed in only approximately all of cases in this sample. Availability of good neurosurgical care is essential for these patients. A computerized trauma registry is urgent required to bring out the risk factors, circumstances, chain of events leading to the accidents and will be extremely helpful in policy making and health management at the national level in India.

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