

Epidemiology and Injury Pattern in Head Injury: The Pediatric Perspective

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Abstract

Original Research Article

Background: Traumatic Brain injury is a frequent cause for presentation of children to the Emergency Department. The type of accident and outcome could be different in children from adults. Objectives of this study are to assess the various epidemiological parameters that influence the causation of trauma as well as injury pattern to brain in pediatric population. **Methods:** The present observational hospital based prospective study was carried out in 96 brain injury patients of both sexes aged up to 12 years, over a period of 2 years. Data regarding the demographic characteristics, mechanism of trauma, type of injury, hemodynamic findings and outcome of the patients were collected. **Results:** The most common mode of injury was road traffic accidents (54.2%) followed by fall from height (41.70%). The majority of the patients were male (61.45%) and aged between 6-12 years (54.16%). The mean age of presentation was 6.8 years. Epidural hematoma (EDH) and brain contusion were the most encountered type of brain injury. **Conclusions:** The majority of pediatric injuries are preventable by knowing the epidemiology and pattern of pediatric trauma. **Keywords:** Brain injury, Trauma, Computed tomography, Epidemiology, Pediatric.

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INTRODUCTION

Pediatric trauma is a very significant cause of mortality and disability, being responsible for more deaths than all diseases combined [1]. Despite the frequency of head injury in children, epidemiologic data in this area are relatively limited. Overall, 85% of the brain injuries sustained in childhood are mild and non-life threatening. Boys are injured at a rate approximately twice that of girls [2]. The severity and mechanism of brain injury are determinants of outcome. The mechanism of injury also depends on age. The most common mechanism of injury was a fall from low heights but rarely cause severe injury in young children. In older children, severe brain injury is most commonly seen in relation to road traffic accident. The mortality was 18.2% [3].

The primary focus of present study was to know clinical manifestation, role of investigation protocol, outcome of requisite treatment at the earliest and the feasibility of non-operative management of head injury in a setup lacking angiography and sophisticated pediatric intensive care unit.

MATERIALS AND METHODS

This observational hospital based prospective study was conducted in total 96 pediatric patients of both sexes having aged between 1-12 years and who were presented with traumatic brain injury. The study was carried out in the Department of Neurosurgery, Pushpanjali Hospital and Research Center, Rewari (Haryana) over a period of two years (July 2019- June 2021). Inclusion criteria were head trauma, GCS<14, hospitalization in the ward and age<12 years old. Criteria of exclusion were incomplete hospital record, discharge from emergency room and death in emergency room. A detailed history was taken from parents and examination was done. All patients were assessed with regards to their age, sex, mode of injury, type of injury, site of trauma, place of trauma, and mortality.

RESULTS

Total 96 patients of head injury were enrolled in the study. Most of patients were male (59) and in the range of 6-12 years age. [Table] The mean age of presentation was 6.8 years.

Table-1: Age distribution of patients admitted

Age in years	No. Of Patients	Percentage
0-3	10	10.44%
3-6	35	35.50%
6-12	51	54.16%

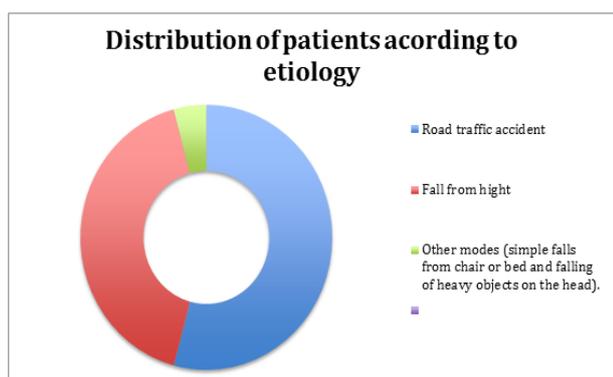
Table-2: Distribution of patients according to sex

	No. Of Patients	Percentage
Male	59	61.45%
Female	37	38.55%

The most common mode of injury was road traffic accident seen in 54.16% of patients, followed by fall from height accounting for 41.66% of injuries. Other modes were simple falls from chair or bed and falling of heavy objects on the head (4.18%). Graphic representation is shown in figure 1.

Table-3: Distribution of patients according to etiology of injury

Etiology	Patients	Percentage
Fall from height	40	41.66%
Motor vehicle accident	52	54.16%
Direct trauma	4	4.18%



The most common injury accompanied with head trauma, was blunt trauma abdomen (21.2%) and the most common traumatic brain events were EDH and contusion. 11 patients (10.56%) underwent brain surgery [Table 4]. Seizure was seen in 13% of the patients. Six (5.76%) patients eventually died.

Table-4: Management protocol.

Management	Patients	Percentage
Conservative	85	89.44%
Surgical	11	10.56%

DISCUSSION

Head trauma leading to brain injury is common cause of morbidity and mortality in children [4]. A child is not a miniature adult. The principle applies to traumatology as well. The lesser body surface of area of children creates a higher impact for the same amount of force. Added to this, the unique anatomy of

children may make them more likely to develop an intracranial lesion due to head trauma [5]. They have a larger head-to-body size ratio, a thinner cranial bone and less myelinated neural tissue. Pediatric traumatology is a concern that should be managed with priority.

In the present study, the incidence of head injury is higher in boys than girls; Memararzadeh *et al.* and Brehautet *et al.* also found the same results in their study [6, 7]. The overall mortality rate among head injury patients in our series was 5.76%, which is relatively high. Previous studies have reported mortality rate of 4.02%-13% [7].

Vehicle accidents are a common cause of head injury. In our study motor vehicle accidents are the leading etiological factors causing brain injuries. However, this status does not hold true in most developing nations. Yousefzadeh *et al.* also found road traffic accident as a common cause of head injury in the pediatric population, whereas few studies reported fall from height as the most common cause of head injury [8, 9].

The referral system has always been a concern in developing nations. The less number of trauma centers with poor inter-center referrals result in delayed management in most cases.

The vast majority of head injury in pediatric patients is mild, requires no specific therapy and leaves no major complication. However, it is important to identify individuals at risk of significant injury, and thus in need of specific evaluation. The Pediatric patients with traumatic brain injury more commonly develop a pattern of diffuse axonal injury and secondary cerebral edema compared with adults. Lesions actually requiring neurosurgical intervention, such as evacuation of a hematoma, are relatively rare. In our study 61% of children having brain injury could be managed by non-operative means. Patients treated conservatively had extensive monitoring with serial imaging and vitals statistics records. Surgical repair was individualized with correction of etiology in most cases. Borg *et al.* demonstrated that only 1% of patients needed surgery. Dunning *et al.* also demonstrated that 0.6% patients had a neurosurgical operation and 0.1% children died [10].

Traumatic brain injury (TBI) is the leading cause of traumatic death and disability worldwide. In most cases, the main cause of death is brain injury. The incidence of death in our study was 7%. Previous studies have reported mortality rate of 4.02%-13% [11].

CONCLUSION

Many accidental brain injuries that occur in children are preventable. Proper use of occupant restraints in motor vehicle and wearing helmets for bicycle riding, skating and other recreational activities

can prevent serious injuries in young children. Vigilance regarding open window and stairways, including the use of gates or bars substantially reduce the occurrence of these injuries.

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