Pattern and Outcome of Pediatric Traumatic Head Injury at Tertiary Care Center of Nepal

Sudhir Raman Parajuli[1], Balgopal Karmacharya[2], Angana Parajuli[3], Sumi Maharjan[4], Anil Bhusal[3]

[1]*Department of Forensic Medicine, Manipal College of Medical Sciences, Pokhara, Nepal*

[2]*Department of Neurosurgery, Manipal College of Medical Sciences, Pokhara, Nepal*

[3]*Department of Emergency Medicine, Manipal College of Medical Sciences, Pokhara, Nepal*

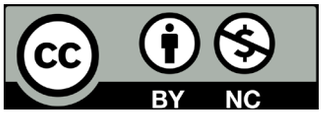
[4]*Department of Forensic Medicine, Rapti Academy of Health Sciences, Dang, Nepal*

CORRESPONDENCE

Dr. Sudhir Raman Prajuli
Department of Forensic Medicine
Manipal College of of Health Sciences,
Pokhara, Nepal
Email: sudhir.parajuli@manipalpokhara.edu.np
Orchid ID: 0000-0002-4987-4054

ARTICLE INFO
Article History
Submitted: 16 October, 2023
Accepted: 6 July, 2024
Published: 8 August, 2024

Source of support: None
Conflict of Interest: None



ABSTRACT

Introduction: In Nepal, traumatic brain injury (TBI) stands out as a significant contributor to both mortality and disability. Its incidence is estimated at 382 per 100,000 people, surpassing the global average of 369 per 100,000. In order to implement preventive measures against traumatic brain injuries, we require epidemiological evidence to inform our actions. The objective of this study was to investigate the causes, pattern and outcomes of traumatic brain injuries in children.

Methods: This study was a descriptive study of all children (under 18 years of age) who presented with head injuries to the Emergency of Manipal teaching Hospital in Pokhara. Fifty-one pediatric head injury patients aged up to 17 years were studied from 1st August 2022 to 30th July 2023.

Results: The results indicated that male to female ratio was 2:1 with fall from height accounted for 54.9% of head injury. Mild head injuries were most common requiring conservative treatment. Preventive measures should be taken to reduce the head injuries in such a young age group.

Conclusion: In this study, falls account for the majority of the accidents, followed by road traffic accidents. Most injuries are superficial. However, a careful clinical examination combined with judicious CT scan can help the physician to separate mild head injury from severe and help in their management.

Keywords: Child injury; Fall; Glasgow Coma Scale; Traumatic Head Injury.

INTRODUCTION

Injuries have emerged as the foremost contributor to illness and death among children and young adults in the prime of their lives.[1,2] While infectious diseases once dominated childhood health concerns in low and middle-income nations, there's been a notable shift.[3] Presently, the World Health Organization reports that injuries have taken the forefront as the primary cause of mortality in recent decades.[4] Injuries on a global scale stand as a significant contributor to the overall burden of disease, claiming over 950,000 lives annually among individuals under 18 years old. Of these fatalities, at least 60 percent are linked to unintentional incidents.[5] In a developing country like Nepal where 33.84% of total population is below 18 years of age, head injury is one of significant causes of death and disability among these children.[4,6]Head injury is defined as any trauma to the head (scalp, skull, or brain) other than superficial injuries to the face.[5,7] Head injuries constitute the single most common injury seen in the pediatric age group and also contributing their profound impact on pediatric mortality.[8] RTA and fall injury are the top two leading cause of such accidental or unintentional injury worldwide.[9] The vast majority of pediatric head injuries include minor soft tissue injuries with a Glasgow Coma Score of 13, fractures, and open/superficial wounds. With proper evaluation and treatment, the outcome should be excellent, with zero mortality and minimal long-term disability.[8] Though majority of head injuries are minor, sometimes even such mild traumatic brain injuries can leave significant impairments.[7] An estimated 5% of head trauma have intracranial complications and associated morbidity and mortality, with long-term disability and intellectual, personality and behavioral problems.[5] Manipal Teaching hospital is one of the largest tertiary hospitals in the

western part of Nepal with round the clock neurosurgical facilities where the majority of the patients visiting emergency department belongs to the pediatric age group with the history of injury. Focusing on pediatric head injuries is crucial due to their occurrence in the pre-productive age group, where they can have long-term consequences disproportionately greater than adult injuries. This study aims to describe the epidemiology, injury patterns, and outcomes of patients with traumatic head injuries admitted to our institute during the study period. Understanding the causes of these injuries is expected to yield significant insights for implementing preventive measures to reduce pediatric head injuries.

METHODOLOGY

This prospective cross-sectional study was conducted in Manipal Teaching Hospital, Pokhara from 1st August 2022 to 30th July 2023 after taking approval from the institutional review board for the study. All the pediatric patient under the age of 18 with history of head injury meeting inclusion criteria were taken for the study. Age, sex, cause, severity of brain injury and outcome were used as study variables. Severity of brain injury was assessed by Glasgow coma scale (GCS). Mild, moderate and severe brain injury was taken as GCS score of 13-15, 9-12 and 3-8 respectively. Conservative and surgical management was done according to standard head injury protocols.

A written consent was taken from guardian before conducting the research maintaining their confidentiality. Data were collected from a questionnaire in proforma and analyzed using Microsoft Excel and SPSS version 19. The result of the study was interpreted on tabular and graphical form. Appropriate inferential statistics were used wherever necessary to identify the association of head injury with the study variables.

RESULTS

Table 1: Age distribution of pediatric head injury

Age group (year)	Frequency (n)	Percentage (%)
0-5	18	35.3
6-11	20	39.2
12-17	13	25.5
Total	51	100

Falls were the most common cause for head injuries in this study (54.9%) followed by road traffic accidents (33.3%). Other causes were assaults and sports related. (Figure 1) 74.5% of people who have sustained a head injury presented with a normal or minimally impaired conscious level (GCS greater than 12) but the majority of fatal outcomes were in the moderate (GCS 9–12) or severe (GCS 8 or less) head injury groups, which account for 13.7% and 11.8% respectively. (Figure 2)

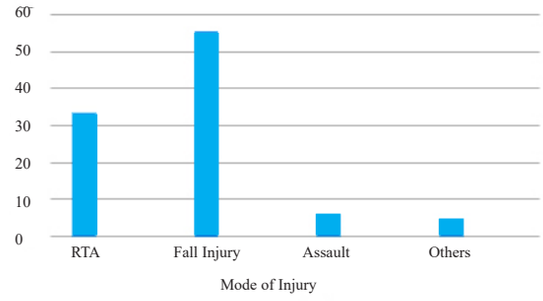


Figure 1: Mode of Injury among participants

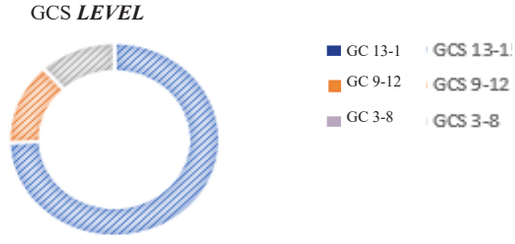


Figure 2: Severity of head injury among partcipants

Table 2: Pattern of Injury

Type of injury	Frequency (n)	Percentage (%)
Abrasion	25	49.0
Superficial bruise	1	2
Laceration	8	15.7
Fracture	22	43.1
Hemorrhage	15	29.4
Internal contusion	10	19.6
Penetrating injury	1	2
Total	51	100

Forty patients (78.4%) patients required only conservative management while 9 patients (17.6%) underwent surgical procedures. One patient went on LAMA (leave against medical advice) and unfortunately one patient with severe head injury expired.

DISCUSSION

This research contributes to the increasing evidence on injuries among children in developing nations. Despite the tender age of the children studied, a time when they might typically encounter fewer hazards, a notable portion of them had suffered significant injuries.

The predominant pediatric age group presenting to the emergency room with head injury were from 6 to 11 years (39.2%) with a male preponderance. Similar observations were reported by Kirsch TD et al and Magnus D et al.[10,11] Even in the young age, boys are more outgoing than girls and are involved in assaults and road traffic accidents which may be the cause of males outnumbering the females.Falls were the commonest mode of injury as mentioned in a study of risk factors in young age by Howe LD et al.[12] This was demonstrated in this study also, as 54% of the falls causing head injury. Contrary to our study, Kafle P et al and Magnus D et al in their studies showed RTA were more significant issue for head injuries.[2,13] Preventable head injuries from falls demands our attention. Supervising children at heights, securing windows and rooftops is crucial. In Nepal, children gathering fodder from trees risk injury and should be deterred. Parents need education on prevention, legally enforced if necessary. School health programs must teach children safety measures at home, during sports, and on roads. The most common location for childhood injury in our study was on road. Similar findings were seen on the study done by Kraus JF et al where two thirds of brain injuries were from motor vehicle crashes.[14] Unlike our study, majority of patients had accidental injury at home (41%) followed by street (32%) as observed by Gajuryal SH et al and Magnus D et al.[13,15] Hence, to lower pediatric head injury rates, a focused strategy could involve developing road safety materials for kids, constructing sidewalks, and establishing safe playgrounds. This approach requires reinforcing road safety in traffic regulations and ensuring legislative enforcement.

As the outcome depends on the level of consciousness also, the study focused on assessing GCS level. Majority of head injuries were mild with GCS of 13-15 requiring conservative management which is similar to the study reviewed by Karmacharya BG et al., Turner MS et al., Shrestha A et al and Bhandari R et al.[4,11,16,17] Most injuries were soft tissue injury and superficial in the form of abrasions, followed by skull fracture which is similar to the study reviewed by Gajuryal SH et al, Sah SK et al. and Henriksson T.[15,18,19] Penetrating head injuries in children constitute only a small part of the total number of traumatic head injuries in our study. Karim T reported an unusual case of a 4-year-old male child with the history of a fall into a gutter while walking on the road; when he fell, an iron rod penetrated into his head.[20] Head injuries are a leading cause of death and disability in children. Like other traumas, prevention is key through appropriate measures. Child accidents are a significant public health issue, causing preventable deaths, severe injuries, and lasting disabilities. These findings highlight the impact of childhood injuries on health facilities.

CONCLUSION

Traumatic head injuries in pediatric population remain a pressing issue as an important and preventable cause of morbidity and mortality in Nepal. In this study, falls account for the majority of the accidents, followed by road traffic accidents. Most injuries are superficial. However, a careful clinical examination combined with judicious CT scan can help the physician to separate mild head injury from severe and help in their management. The epidemiological parameters highlighted here offer a means to gauge the burden of injury and establish research priorities for targeted interventions. Furthermore, the knowledge gained regarding causes, patterns, and modes of injury is anticipated to inform policy-making, guide research endeavors, enhance health management strategies, facilitate rehabilitation efforts, and contribute to the formulation of standardized protocols for research and management on a national scale in Nepal and other developing nations alike.

REFERENCES

1. Peden M, Oyegbite K, Ozanne-Smith J, Hyder AA, Christine B, Rahman AF, et al. World report on child injury prevention. Vol. 45, World Health Organization. 2008. [Full Text] [PubMed]

2. Kafle P, Khanal B, Yadav DK, Poudel D, Karki T, Cherian I. Head Injury in Nepal: An Institutional Based Prospective Study on Clinical Profile, Management and Early Outcome of Traumatic Brain Injury in Eastern Part of Nepal. Birat J Heal Sci. 2019;4(2):750–4. [Full Text]

3. Sharma M, Lahoti B, Khandelwal G, Mathur R, Sharma S, Laddha A. Epidemiological trends of pediatric trauma: A single-center study of 791 patients. J Indian Assoc Pediatr Surg. 2011;16(3):88–92. [Full Text] [PubMed] [DOI]

4. Gopal Karmacharya B, Acharya B. Pediatric Head Injuries in a Neurosurgery Center of Nepal: An Epidemiological Perspective. Am J Public Heal Res [Internet]. 2015;3(4A):76–9. [Full Text] [DOI]

5. Trefan L, Houston R, Pearson G, Edwards R, Hyde P, Maconochie I, et al. Epidemiology of children with head injury: A national overview. Arch Dis Child. 2016;101(6):527–32. [FullText] [PubMed] [DOI]

6. Newall N, Gajuryal S, Bidari S, Karki A, Karki P, Bodkin P, et al. Epidemiology and Pattern of Traumatic Brain Injuries at Annapurna Neurological Institute & Allied Sciences, Kathmandu, Nepal. World Neurosurg [Internet]. 2020;141:413–20. [FullText] [PubMed] [DOI]

7. De Sousa Petersburgo D, Keyes CE, Wright DW, Click LA,

Sasser SM, Macleod JBA. The epidemiology of childhood injury in Maputo, Mozambique. Int J Emerg Med. 2010;3(3):157–63. [FullText] [PubMed] [DOI]

8. Shafi S, Gilbert JC. Minor pediatric injuries. Pediatr Clin North Am. 1998;45(4):831–51. [FullText] [PubMed] [DOI]

9. Nagele P, Hüpfl M, Kroesen G. Epidemiology and outcome of pediatric trauma treated by an emergency-physician-staffed advanced life-support unit. Wien Klin Wochenschr. 2004;116(11):398–403.[PubMed] [DOI]

10. Kirsch, T. D., Beaudreau, R. W., Holder, Y. A., & Smith, G. S. (1996). Pediatric injuries presenting to an emergency department in a developing country. Pediatric Emergency Care, 12(6), 411. [PubMed] [DOI]

11. Turner MS. Pediatric head injury. Indiana Med. 1985;78(3):194–7. [FullText]

12. Howe LD, Huttly SRA, Abramsky T. Risk factors for injuries in young children in four developing countries: The Young Lives Study. Trop Med Int Heal. 2006;11(10):1557–66. [FullText] [PubMed] [DOI]

13. Magnus D, Bhatta S, Mytton J, Joshi E, Bhatta S, Manandhar S, et al. Epidemiology of paediatric injuries in Nepal: evidence from emergency department injury surveillance. Arch Dis Child. 2021;106(11):1050–5. [FullText] [PubMed] [DOI]

14. Kraus JF, Fife D, Cox P, Ramstein K, Conroy C. Incidence, Severity, and External Causes of Pediatric Brain Injury. Am J Dis Child. 1986;140(7):687–93. [FullText] [PubMed] [DOI]

15. Gajuryal SH, Shrestha P, Newall N, Singh M, Shah MB, Pant B. Accidental Injury in Children and its Clinical Pattern at Tertiary Neurological Center in Kathmandu. Annapurna J Heal Sci. 2023;3(1):32–6. [FullText] [DOI]

16. Shrestha A, Paudel N, Adhikari G, Shrestha S, Lamichhane S, Subedi S, et al. Traumatic Brain Injury among Patients Admitted in Neurosurgical Unit in a Tertiary Care Centre: A Descriptive Cross-sectional Study. J Nepal Med Assoc. 2023;61(262):514–8. [FullText] [PubMed] [DOI]

17. Bhandari R, Mahato IP, Paudel M, Giri R. Head Injury-A Case Profile Study from Eastern Region of Nepal. Health Renaissance. 2010;8(2):110-3. [FullText]

18. Sah SK, Neupane BR, Atreya A, Karki N. Pattern of Head Injuries in Western Hilly Region of Nepal: A Hospital-based Cross-sectional Study. J Lumbini Med Coll. 2020;8(1):65–70. [FullText] [DOI]

19. Henriksson T. Traumatic head injuries at the emergency department, Tribhuvan University Teaching Hospital, Kathmandu, Nepal. [FullText]

20. Karim T, Topno M. An unusual case of penetrating head injury in a child. J Emergencies, Trauma Shock. 2010;3(2):197–8. [FullText] [DOI]