Head Injuries In Kathmandu, Nepal

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ABSTRACT

Head trauma is an important cause of morbidity and mortality. Few studies, however, have described the occurrence of these injuries in developing countries. This study examines head trauma in a large series of cases presenting for emergency care in Kathmandu, Nepal. Two hundred and eighty-three consecutive cases presenting to Tribhuvan University Teaching Hospital in Kathmandu, Nepal between May 14 and August 14, 2001 were abstracted from a comprehensive manual review of 6,183 emergency records. Head injuries were included if a Glasgow Coma Scale (GCS) score was provided and/or a skull x-ray/CT scan was performed. Blunt head traumas accounted for 283/6,183 (5%) of the emergency visits. Significantly more deaths in the Emergency Department (ED) were attributed to head injury than to other causes. Head trauma patients were predominantly male (201/280; 72%), and in the 20-44 year age group (151/280; 54%). The injury severities were as follows: 137/283 minimal (48%), 81/283 mild (29%), 44/283 moderate (16%) and 21/283 severe (7%). Falls were the leading external cause in all demographic subgroups. Head injuries are an important cause of mortality and morbidity in Nepal. Findings from this study could be used to develop rational strategies for early identification of significant head injuries that need tertiary care and to develop preventive legislative strategies.

INTRODUCTION

Every year head injuries account for a large number of hospitalizations and considerable mortality throughout the world. It has been estimated that, each year, over 1.2 million people sustain a traumatic brain injury in the United States. Of these, approximately 50,000 die, 230,000 are hospitalized and survive, and 80,000 to 90,000 develop a long-term disability.¹ In Canada, approximately 9,000 patients are admitted to hospital per year with brain injuries.² However, there is a paucity of research examining the epidemiology of head injuries in a developing country.

The setting of this study was Tribhuvan University Teaching Hospital (TUTH) in Kathmandu, Nepal. Nepal, known for Mt. Everest, is a small South Asian country bordered in the North by Tibet (China), and in the South, East, and West by India. With a per capita income of approximately $240 US per year, Nepal remains among the poorest and least developed countries in the world.³ In 1997, the government health expenditure was 6% of total expenditures or approximately $3 per person.⁴ The average lifespan in Nepal is currently 57 years.⁵

There are 83 hospitals in the country with 4,124 beds in total (population per hospital bed is 5,249).⁴ Health care is based on a private, fee-for-service model with some government-funded care available. Presently, no insurance systems exist within the health system. Tribhuvan University Teaching Hospital, associated with the Institute of Medicine of Tribhuvan University, is one of the largest hospitals in Nepal. It is a 444-bed hospital with a variety of specialty services. The emergency department at Tribhuvan has 13 beds and serves approximately 74 patients per day.

This study involved the examination of a large case series of head injuries presenting to the emergency department at Tribhuvan University Teaching Hospital. Tribhuvan is one of two hospitals in Kathmandu to operate a CT Scanner. However, during our study, the CT Scanner at the alternate institution was non-functional, and thus all head injury cases requiring CT investigation were referred to Tribhuvan. This article provides an examination of the age, sex, severity, external causes, and dispositions of head injuries presenting to this emergency department during a three-month period in Kathmandu. The paper also identifies challenges faced by emergency physicians in Nepal, and in other developing countries, in preventing and treating head injuries. Suggestions are offered for improving diagnosis of head injuries in a country where only a handful of medical centres have the ability to appropriately manage patients with such injuries. As well, recommendations with regard to injury prevention, through implementation and enforcement of public safety legislation, are provided. Challenges of con-
ducting research in a developing country are acknowledged and ideas for designing and enhancing research in Nepal and other developing countries are proposed.

METHODS

At Tribhuvan, emergency records are arranged in chronological order in weekly binders with one ‘ticket’ per person. Three types of binders are maintained. One binder is for ‘police cases’ and identifies cases where the police was involved (i.e. assaults, motor vehicle crashes). The second binder is for all cases without police involvement, and the final binder is a daily census/tally of all the persons admitted to the emergency room and their overall disposition.

Stage one

A comprehensive manual search was performed of 6,183 emergency ‘tickets’. 283 cases of head injury were identified for the three-month study period ending August 14, 2001. Head injuries were included if: 1) a GCS score was provided and/or a skull x-ray/CT scan was performed; and, 2) a diagnosis was made of ‘head injury’, ‘multiple injury’, ‘skull fracture’, ‘assault’, ‘haemorrhage due to trauma’, ‘motor vehicle accident’, or ‘concussion’. In the 38 cases where GCS was not provided, but a head X-Ray or CT scan was ordered, the reviewers gave the patient a severity score of “minimal” providing that there was no demonstrated loss of consciousness or amnesia, and a score of minor if there was documented witnessed loss of consciousness, amnesia, or disorientation. Patients with eye injuries, dental injuries, and with facial and skull lacerations were excluded from the analyses if their GCS was 15. The ‘census’ binder was used to calculate the total number of cases admitted to the emergency department during this time period by gender and disposition (discharge, admit, or death). The binder for the ‘non-police’ emergency tickets was missing for one week. Age and gender were not identified in three cases.

Stage two

Upon returning to Canada, the head injuries were classified into four categories of severity: minimal, minor, moderate, and severe. Minimal head injuries included those with a GCS of 15, who had no witnessed loss of consciousness, amnesia, or disorientation, and who were discharged from hospital. Any other injuries with a GCS between 13-15 were classified as minor. Head injuries with a GCS between 8-12 were defined as moderate and those with a GCS below 8 were defined as severe. Injuries were then described by gender, age, severity, cause, disposition, and whether a CT scan was performed.

RESULTS

Two hundred and eighty-three head injuries were identified during the study period, constituting 5% of total emergency room visits (Table 1). The average time between injury and presentation to the emergency department was 15.7 hours (only 35% of charts reported time to presentation). Head injury patients were significantly more likely to be admitted to hospital than the average emergency department patient. Seventy-seven of the 283 (28%) head injury patients were admitted to hospital compared to 1,015/6,183 (16%; \( \chi^2 = 31.8, p \leq 0.001 \)) of all emergency room patients. Nine of the 30 (30%) deaths in the emergency department during this three-month period were due to head injuries; this is significantly higher than deaths attributable to other causes (\( \chi^2 = 44.68, p < 0.001 \)).

<p>| Table 1. Number (and %) of total emergency room visits and head injuries by gender and disposition, TUTH, May 14 to Aug 14, 2001 |
|----------------------------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Head Injuries</th>
<th>Head Injuries as a % of total emergency visits</th>
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<tbody>
<tr>
<td></td>
<td>Emergency cases</td>
<td>Head Injuries</td>
<td>% of total emergency visits</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Total</td>
<td>6,183</td>
<td>283</td>
<td>5%</td>
</tr>
<tr>
<td>Female</td>
<td>2,795</td>
<td>77</td>
<td>3%</td>
</tr>
<tr>
<td>Male</td>
<td>3,388</td>
<td>203</td>
<td>6%</td>
</tr>
<tr>
<td>Discharged</td>
<td>5,168</td>
<td>189</td>
<td>3%</td>
</tr>
<tr>
<td>Admitted§</td>
<td>1,015</td>
<td>77</td>
<td>8%</td>
</tr>
<tr>
<td>Died in Emergency§</td>
<td>30</td>
<td>9</td>
<td>30%</td>
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<tr>
<td></td>
<td>* In cases where data is missing, percentages are calculated from total – missing data</td>
<td>§ ( p&lt;0.001 )</td>
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Head trauma patients were more likely to be male (201/280; 72%) and in the 20-44 year age group (151/280; 54%). Females under the age of 10 and over the age of 65 were slightly more likely to be injured than males.

The injury severity scores were distributed as follows: 137 minimal (48%), 81 mild (29%), 44 moderate (16%) and 21 severe (7%). Eight of the 21 (40%) patients with severe injuries died in the emergency room.

Falls, accounting for 103/283 (36%) of the injuries, were the largest external cause for all age groups in both genders (Figure 1). Falls represented 30/41 (73%) of head injuries in young children (< 9 years of age). In women, 39/77 (51%) of injuries were due to falls and 11/77 (19%) were due to physical assault. In contrast 63/203 (31%) of head injuries in men were due to falls and 43/203 (21%) were due to physical assault. Physical assault was not as common in children nine years and under, but was equally common in all the older age groups. Motor vehicle and bicycle crashes 92/283 (24%), and injuries to pedestrians 92/283 (14%) were also important contributors.
CT scans were performed in 121/283 (42%) of cases. Eleven of the 12 (92%) individuals with severe head injuries in the emergency department, who remained alive, received CT scans. Conversely, only 34 of 137 (25%) of those with minimal head injuries obtained CT scans.

DISCUSSION

This paper examines the epidemiology of head injuries in Kathmandu, Nepal. An investigation of this type is a necessary first step in enabling the public health system to develop possible prevention strategies, including opportunities for public safety legislation. Challenges to the implementation of such changes in a developing country are highlighted below.

One-half of the head injury patients observed were between the ages of 20 and 44 years. The shorter lifespan in Nepal (55 years vs. 80 years in developed countries) may explain the decreased percentage of injuries seen amongst the elderly as compared to other countries. The percentage of head injuries among children under nine years of age constituted almost 15% of total head injuries; this is a trend similar to that of a recent Canadian study (11%).

Males in Nepal were more likely to sustain head injuries than females. The gender ratio of 2.6:1.0 (male:female) was slightly higher in Nepal than in some developed countries (1.7-2.3:1.0). The preponderance of injuries among men was partly accounted for by the differential roles between genders in Nepal. Anecdotally, men are more likely to drive, ride bicycles, and be involved in other hazardous activities.

Falls accounted for 36% of all injuries and were the largest cause of injury across genders and age groups. The percentage of head injuries as a result of falls is comparable to studies from both North America and Europe (36%-40%). Falls represented 73% of injuries found in children under the age of nine (vs. 47% in a Canadian study). These were predominantly falls from heights (such as out windows or off roofs). Windows in Nepal are often open with no passive barriers to keep children from falling. Similar problems have been faced historically in New York City. A subsequent program was based on the provision of inexpensive window guards (designed to decrease the size of the opening and prevent a small child from falling out) to 4,200 families with pre-school age children in high-risk homes and apartments. Risk of falls decreased by 50% and deaths decreased by 35% over two years. More importantly, no falls were reported from windows where the guards had been installed. In Canada and the U.S., it is now mandatory to have these safety barriers. It is admittedly a challenge for prevention efforts in a developing country to enforce such safety precautions, but one that could be addressed via a concerted effort.

In Nepal, transportation related accidents (pedestrians, motorbikes, cyclists, and motor vehicles) were the cause of 38% of head injuries, considerably less than the 49% of all traumatic brain injuries, in the United States and the 90% observed in Taiwan. A recent British Medical Journal article reported that in 1998 more than 85% of all deaths due to road traffic and 96% of all children killed in road crashes occurred in developing countries. This trend will probably increase as rural populations move to motorized cities.
Unlike developed countries, which are experiencing a decline in traffic-related head injuries due to safety enforcement,1,10,14,15 Nepal will likely see no change, or an increase in rates, unless public safety legislation is enacted. There is currently no enforced seatbelt legislation and motorbike passengers are not required to wear helmets. In addition, there is no legislation surrounding public transportation. Passengers are often required to ‘hang on’ to the sides of buses or ride on the roof. Two of the head injuries encountered during the study were a result of passengers falling off the roofs of buses. Public legislation geared towards decreasing the practice of riding on roofs would intuitively result in decreased rates of injury. Enforced seatbelt use and mandatory helmets for all motorbike riders would have a similar result.

The long duration before presentation to the emergency room is an important patient management issue. With population per hospital bed equal to 5,249 (vs. 476 in Canada) and the large proportion of rural residents without access to tertiary healthcare, many patients have to travel long distances. Developing standardized protocols for the triage of patients between rural health centres and tertiary centres may be a sensible recommendation.

CT scans were performed in 92% of severe cases and 25% of minimal cases. Following the Canadian CT Head Rules (currently being validated),16 the minimal cases likely would not have been scanned here in Canada as they represented head injuries with a GCS of 15 and no witnessed loss of consciousness or amnesia. While the CT Head Rules were created in Canada, adaptations could be established for developing countries like Nepal where there are limits to the level of care available and accessible. In Nepal, the patient or their family is responsible for the cost of a CT Scan ($40US). Given the national per capita income of $210US, the cost of these CT Scans to families is significant. The development of a standardized protocol for head injury management in the emergency department, including rules for CT scans, may result in considerable savings to families and the health care system.

The number of head injuries discussed in this paper is an underestimation. Many patients do not come to the emergency department due to financial constraints and/or transportation difficulties. Families are responsible for the costs of care including drugs, investigations, and room and board. In addition, the unavailability of one binder for the Nepali week of 02/17/58 to 02/29/58, further underestimates the number of head injuries by approximately 15 (the average number of injuries/week of the other 11 weeks). The census tally and the police cases were available for that time period.

Although our research involved the study of head injuries, it was also conducted in order to understand the possibilities of undertaking research in a developing country. Lack of research infrastructure in Nepal made it difficult to ensure standardization of charting demographics and clinical observations amongst clinicians. For example, clinical observations (i.e. amnesia, loss of consciousness) may not have been consistently recorded thereby affecting our classification of minimal and minor head injuries. In addition, lack of computerization imposed obvious limitations. While doing research in a developing country such as Nepal is challenging, studies such as this can still provide evidence useful to the community being served. Given the paucity of research in developing countries, it is hoped that this investigation can also be used as an example of how to design and enhance future research in Nepal.

This study demonstrates that head injuries constitute a major preventable cause of morbidity and mortality in Nepal. Head injuries represented 5% of emergency room visits and 30% of emergency room mortality. Many of these head injuries were a result of falls from heights and from motor vehicle crashes. Some of these injuries could be prevented with proper safety legislation such as mandatory window barriers, enforced seatbelt use, and enforced helmet use for motorbike passengers. Standardized protocol for limiting the use of CT scans to appropriate patients would save patients money while ensuring access for those who need it. In addition, improved triage of head injuries in rural communities could result in earlier access to care. These changes could potentially decrease the number of head injuries experienced in Nepal and the morbidity and mortality that often follows.

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Sarah McClennan and Carolyn Snider graduated from McMaster’s Medical Programme in May 2003. McClennan has a background in epidemiology, and Snider has a background in commerce. Both are in their first year of an Emergency Medicine residency program in Hamilton or Toronto, respectively.
REFERENCES


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