Paediatric trauma epidemiology in an urban scenario in India

T Tandon, M Shaik, N Modi
Department of Orthopaedics, King Edward VII Memorial Hospital, Mumbai, India.

ABSTRACT

Purposes. To identify the epidemiology of paediatric trauma in an urban scenario of India and compare results with studies from developed countries, and to formulate preventive measures to decrease such traumas.

Methods. Between January 2004 and 2005 inclusive, 500 paediatric, orthopaedic trauma patients presenting to our hospital were prospectively studied. Information was recorded in a prescribed proforma.

Results. The children’s ages ranged from 0 to 16 years; 274 were males. Most fractures occurred in children aged 7 to 12 years and decreased in older children. The ratio of fractures in left versus right upper extremity was 2:1. In children aged 0 to 6 years, the most common injured site was the elbow, whereas in children aged 7 to 16 years it was the distal radius. In descending order, most injuries were sustained at home (47%), in school (21%), due to sports (17%), and due to vehicular accidents (13%).

Conclusion. An effective accident prevention programme in developing countries requires changes in lifestyle and environment, and overcoming obstacles such as ignorance, illiteracy, and inadequate resources.

Key words: environment and public health; epidemiology; traumatology; wounds and injuries

INTRODUCTION

In the USA, trauma is the leading cause of death in children after the first year of life, accounting for 50% of mortality, with an injury occurring every 4 minutes and death every 6 minutes. Fractures are among the most common adverse events in their lives. Moreover, the urban scenario is associated with overcrowding and is fraught with risks to the lives of children. Yet there have been few epidemiological studies on paediatric fractures in an urban environment of a developing country.

We aimed to identify how, when, and why fractures occur in children in an urban scenario of India and compare results with previous studies from...
developed countries, and to formulate preventive measures to decrease such traumas.

MATERIALS AND METHODS

Between January 2004 and 2005 inclusive, 500 trauma patients aged 0 to 16 years presented to the accident and emergency or orthopaedic out-patient departments of our hospital in Mumbai, India. The hospital is a tertiary level-4 trauma centre, with a catchment area for approximately one third of the city population. It handles almost 75 to 80% of paediatric trauma cases, from minor damage to severe high-velocity injuries. Resident doctors on duty recorded the characteristics of all patients and their fracture patterns in a prescribed proforma. Based on clinical and radiological findings, the duty orthopaedic registrar made the diagnosis.

RESULTS

Table 1 shows the numbers and percentages of various fracture patterns in each age-group. Of the 500 patients aged 0 to 16 years, 274 were male. The number of patients presenting with fractures increased with age until 12 years and decreased in older children. Fractures occurred more commonly in boys. In children aged 0 to 6 years, the most commonly encountered injured site was the elbow, whereas in those aged 7 to 16 years it was the distal radius. The association was statistically significant (Chi squared test, p<0.001). The most commonly encountered fracture site among all age-groups was the distal radius, followed by the elbow, forearm shaft, and tibial shaft. Fractures in the left upper extremity were almost twice as common as in the right upper extremity (210 [42%] vs 125 [25%]). By contrast, fractures encountered in the lower limbs were more commonly on the right than left side (105 [21%] vs 60 [12%]). The association was statistically significant (Chi squared test with Yates correction of 31.6, p<0.001). The numbers of these fractures that occurred in the morning, afternoon, or evening were 173, 167, and 160 respectively. The time of day the injury occurred did not appear to have a significant pattern.

180 children had been treated by traditional
modalities prior to hospital presentation (all within 10 days of the injury) [Table 2]. This reflects a high level of ignorance among people in developing countries. The numbers of physeal fractures, open fractures, multiple fractures, non-accidental fractures, amputations, and neurovascular injuries encountered are shown in Table 3. The environmental aetiology of fractures among infants, toddlers, and school-age children is shown in Table 4; 47% occurred at home, 21% at school, 17% due to sports, 25% due to vehicular accidents, and 2% under other circumstances. In the home environment, among infants and toddlers, most fractures were related to falls from cots, beds, tripping over furniture, or from heights. Injuries from playground fixtures near the house (peridomestic) or scuffles/fights among siblings/friends were more commonly seen in older children. In the school environment, fractures were mainly due to athletic/sporting activities or scuffles/fights. Child abuse by teachers was occasionally seen. In sports, athletic activities and field/contact sports contributed equally to the causes of fracture. Among vehicular accidents, 52% involved school-age children; bicycle accident being the most common and none of the victims wore a helmet. Train accidents were more common in school-age children when boarding or alighting local suburban trains. Among vehicular accidents in school-age children, vehicle versus pedestrian contributed to 56% of the injuries, compared to 44% due to vehicle versus passenger.

DISCUSSION

The knowledge base of fracture healing in children was developed in the 40s and 50s. The effects of cultural differences on fracture among Indian, Malay, and Swedish children were compared. The epidemiological data on limb fracture patterns were analysed and preventive programmes set up.

The predominance of boys among paediatric fracture patients is common, presumably due to a higher level of exposure and active behaviour. Male preponderance was slight in our study; the reason is unknown and may be unique to this region. A unimodal peak was found in children aged 11 to 12 years, consistent with other studies.

The predominance of fractures of the left upper extremity was statistically significant. It is likely that the right upper extremity is in use and the left assumes the protective role during injury, regardless of hand dominance. The less mature neuromuscular coordination of the non-dominant extremity may also be responsible.

The time of the day the fractures occurred was evenly distributed in the morning, afternoon, and evening. This may be related to the constant level of activity of our children throughout the day under Mumbai’s tropical climate. This is in contrast to studies from Sweden and Texas, which reported that fracture incidence peaked during the daytime, because of the favourable weather and temperature.

The usual fracture sites vary with age. Common fracture sites we encountered are consistent with studies from the USA, Sweden, and Malaysia. Notable exceptions were an Austrian survey reporting that the tibia was the most common involved, due to skiing accidents and a Canadian study showing a high frequency of skull fractures. This variation in fracture site pattern may also be due to referrals of severe injuries. Differences in frequency may be attributed to external factors and variations in registration procedures.

Incidences of physeal injuries varied from 15 to 28%. In our study, it was 17% and mostly occurred in adolescents and predominantly involved the distal radius. The incidence of open fractures has been consistent, ranging from 1.5 to 2.6%. In our series, it was 2.8% and mostly involved the tibial shaft; multiple fractures and traumatic amputations contributed to 2% and 0.8% of the injuries respectively. Neurovascular injuries were noted in only 0.6% of
the fractures, mainly associated with supracondylar fractures of the humerus. Non-accidental injuries contributed 1%, due to bone dysplasia (n=2) and battered baby syndrome (n=3). In India, many non-accidental injuries may go undetected due to a poorly developed child welfare system. The present study may not truly represent the extent of this problem in a developing country.

Understanding environmental aetiology is the first step to formulating preventive measures. As most fractures occurred in the home environment, efforts should be directed at reducing childhood injuries in the home. In developing countries, most parents go to work and leave their younger children (infants and toddlers) under the care of their elder siblings. Provision of crèches and supervised nurseries at workplaces could reduce such accidents. Simple measures are recommended such as increased awareness of risk factors in the peridomestic environment, adequate parental supervision, and child-friendly homes with safeguards on windows and covered balconies in multi-storey buildings. The success of the ‘Kid’s can’t fly’ campaign developed by the New York health department highlights the effectiveness of simple accident prevention programmes in the peridomestic environment.19

Supervised environments at school are generally safe, with an injury rate of 2.8 to 9.2%.20,21 In our study, the high proportion of injuries children encounter at school is of great concern, necessitating the need to improve student-to-teacher ratios to enhance supervision, and legislation to discourage physical abuse by teachers.

In developed countries, implementation of guidelines on the use of playgrounds has led to a reduction of injuries associated with playground equipment. Children aged <5 years should be under constant supervision and play on separate equipment from older children. The equipment should be in good condition and checked for loose joints, exposed bolts, sharp edges, and rust. Deteriorating paint on equipment is a source of lead poisoning. The floor around playground equipment should not be made of asphalt, cement, dirt, and grass, as these materials do not cushion a fall adequately. Loose-fill surfacing materials of 12-inch depth made of sand, pea gravel, wood and shredded rubber products are recommended. Guidelines for athletic/professional sporting activities coupled with the use of protective gear may also reduce injuries at school or during sporting activities.

Vehicular accidents predominantly involved school-age children. Education on traffic rules and construction of sidewalks, bridges and tunnels to separate vehicles from pedestrians were recommended. Increasing the use of safety helmets by cyclists, through legislation, education and subsidies on helmets has been effective.22

An effective accident prevention programme requires participation of both national and local communities to make changes in lifestyle and environment.19,23 In developing countries, campaigns to overcome obstacles such as ignorance, illiteracy, and inadequate resources are needed. Although the children’s living environment is created by adults, the needs of children and their right to safety are often ignored, neglected or made subservient to economic considerations.

REFERENCES

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