Epidemiology of Pediatric Musculoskeletal Injuries and Their Pattern in a Tertiary Care Center of North India

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Abstract

Background: Trauma is emerging as an epidemic and a leading cause of morbidity and mortality in children. Children <15 years of age comprise about 32.8% or about 1/3rd of the total Indian population. In India, up to one fourth of hospital admissions and approximately 15% of deaths in children are due to injury. This study presents the epidemiology, various causes and pattern of musculoskeletal injuries in pediatric population of North India. **Materials and Methods:** This is an observational, prospective hospital-based study conducted in a tertiary care center of North India for 6 months from July to December 2016. All pediatric patients in the age group 0-15 years who presented to the orthopedic emergency and out patient department with a history of trauma were included in the study. **Results:** Children aged 6-15 years (58%) suffered more injuries than children under 5 years of age (42%). Male pediatric population (58.5%) had more musculoskeletal injuries as compared to female pediatric population of the same age group (41.5%) in both the groups. Urban pediatric population (68.78%) suffered more injuries as compared to rural population of the same age group. Right extremities were more commonly involved in both the age groups. Upper limb injuries (50.59% in 0-5 years age group and 47.42% in 6- 15 years age group) were most common followed by lower limb and pelvic injuries. Very few (2.9% in 0- 5 years age group and 4.8% in 6-15 years age group) patients sustained isolated spinal injuries. Out of the 3712 patients 59.40% of patients had a history of fall, followed by road traffic accident related injuries (32%). The most common injuries were superficial injuries i.e., abrasions and bruises. The second most common injury was cut or open wounds mostly seen on hand, forearm and legs. **Conclusion:** The high incidence of pediatric trauma on roads and falls indicates the need for more supervision during playing and identification of specific risk factors for these injuries in our setting. Injuries in pediatric age group by and large is a preventable condition. Therefore, injury prevention in children should be a priority.

Keywords: *Epidemiology, pediatric, fall, musculoskeletal injuries, polytrauma*
MeSH terms: *Epidemiology, pediatrics, multiple trauma*

Introduction

Trauma is emerging as an epidemic and a leading cause of morbidity and mortality in children. Children <15 years of age comprise about 32.8% or about 1/3rd of the total Indian population.[1] In India, up to one fourth of hospital admissions and approximately 15% of deaths in children are due to injury.[2] As per the National Crime Record Bureau report of 2006, there were 22,766 deaths (<14 years of age) due to injuries among children.[3] According to the WHO and United Nations Children's fund in 2008, child injury is a major health problem and projected this as number one disease by 2020.[4] The WHO estimates that injuries are the cause of death in one million children per year.[5] The most common cause of death in youth is trauma in developing countries and also pediatric trauma is a major cause of disability and health related economic losses in these developing countries.[6] There are very few studies from developing nations describing the prevalence and potential risk factors of pediatric trauma. A study on epidemiology of pediatric trauma can help to formulate effective injury prevention programs and hence decrease the pediatric trauma burden and their disability at the initial level.[7]

This study presents the epidemiology, various causes and pattern of musculoskeletal injuries in pediatric population presenting to a tertiary center which mainly caters to the urban population.

As the pattern, mode of injury and anatomical location of pediatric injuries vary from region to region and also in different age groups, therefore it is

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important to understand these various determinants to formulate effective injury prevention programs.

Materials and Methods

This is an observational, prospective hospital-based study conducted in a tertiary care center of North India for 6 months from July to December 2016. All pediatric patients of 0-15 years age group who came to emergency and out-patient departments (OPD) of Orthopedics with a history of trauma involving musculoskeletal system were included in the study. This study also included polytrauma patients with musculoskeletal system injury. The present study included 3712 patients in the age group 0-15 years, divided into two groups:- the first group included children under 5 years of age (infants, toddlers and pre-school children) and the second group included children from 6 -15 years of age (school going children and young adolescents). The present study prospectively collected the data from all pediatric trauma patients by orthopedic residents using a standard pro-forma in the orthopedic emergency room and in OPD. The present study also included patients who took leave against medical advice or discharge on request who could complete the pro-forma which included information regarding age, gender, demography, site and mode of injury; and nature of injuries based on relevant X-ray's. Ethical approval was taken from the Institutional Ethical Committee. Data analysis was done using SPSS 16 (SPSS Inc. Chicago, IL, USA) and results were presented as charts and tables with $P < 0.05$ considered statistically significant.

Results

According to the study children aged 6-15 years suffered more injuries (58%) than children under 5 years of age (42%) as shown in Figure 1. Male pediatric population (58.5%) had more musculoskeletal injuries as compared to female pediatric population of the same age group (41.5%) in both the groups. Urban pediatric population (68.18%) suffered more injuries as compared to rural population of the same age group.

This study shows that right extremities were more commonly involved in both the age groups as shown in Figure 2. Based on the anatomical distribution of injuries, upper -limb injuries (50.59% in 0-5 years' age group and 47.42% in 6-15 years age group) were most common followed by lower limb and pelvic injuries. Very few (2.9% in 0-5 years age group and 4.8% in 6-15 years age group) patients sustained isolated spinal injuries. A total of 142 patients in 0-5 years age group and 318 patients in 6-15 years age group had two or more than two musculoskeletal region injuries.

Based on the mode of injury, out of the 3712 patients, 59.40% of patients had a history of fall, followed by road traffic accident (RTA)- related injuries (32%) as shown in Figure 3. This was followed by assault (2%) and other injuries (6%). Among fall- related injuries under 5 years age group, most of the injuries were accidental such as fall from bed, table, chair and while playing. Fall from bed was mostly seen in infants [Table 1]. In 6-15 years age group most of the injuries were because of fall from roof, stairs, tree, slip on floor and while playing. Mode of fall in both the groups is depicted in Table 2.

Based on the pattern of injuries, the most common injuries were superficial injuries, i.e., abrasions and bruises in both the groups [Figure 4]. The second- most common

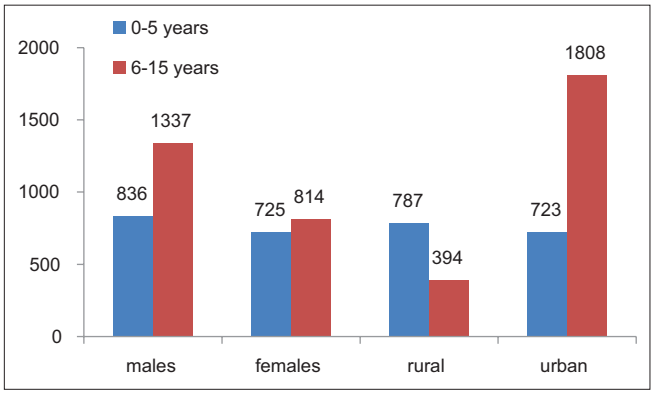

Figure 1: A bar diagram showing distribution according to gender and residence

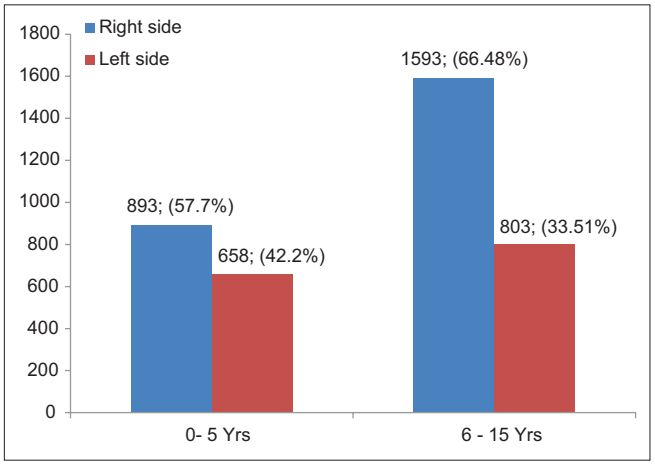

Figure 2: A bar diagram showing distribution according to side involved

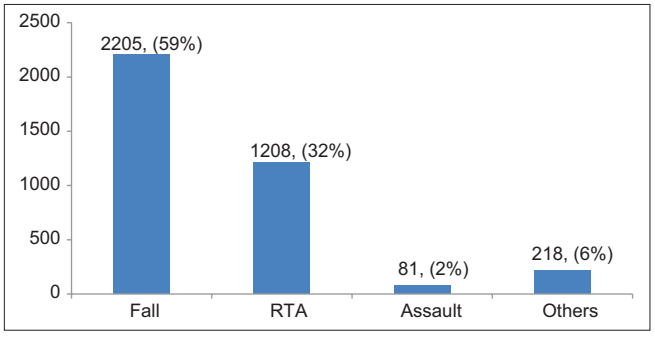

Figure 3: A bar diagram showing distribution according to the mode of injuries

Table 1: Anatomical distribution of injuries

Region	0-5 years	6-15 years
Isolated upper limb	814	1208
Isolated lower limb	591	871
Pelvis	14	27
Spine	48	123
Any above mentioned ≥2 regions	142	318

Table 2: Mode of fall in both groups

Mode of fall	0-5 years	6-15 years
Bed	169	55
Roof	130	287
Table/chair	187	125
Stairs	79	146
Tree	32	127
Pole	9	42
While playing	219	427
Fall due to slip	52	119
Total	877	1328

injury was cut or open wounds mostly seen on hand, forearm and legs. Out of the total injuries, 233 in under 5 years age group and 526 in 6-15 years age group were fractures (including physeal injuries).

Discussion

A fair involvement of children in accidental injuries can be explained based on their adventurousness and inquisitiveness. In India a largely responsible issue is of high risk environments with lack of proper play facilities for children, contributing significantly to the increased susceptibility to injuries. Trauma injuries are the main cause of morbidity and mortality among children and adolescents both in developed and developing countries. Yet there have been few epidemiological studies on pediatric fractures in an urban environment of a developing country.[8] There are several studies on pediatric traumatic injury distribution and pattern but those are mostly from developed countries. Accidental injuries of pediatric population are on the rise and have become an important social problem.[8,9] Many children who survive trauma may develop a temporary or permanent disability, requiring continuing care and has a significant impact on their psychosocial health and financial burden. Although various studies have been done on the epidemiology of pediatric trauma, this study represents the predisposing factors leading to it and its demography, gender distribution, mode of trauma with anatomic site of injuries and nature of injuries which helps to form government policies in working on preventive factors to reduce the pediatric musculoskeletal injuries.

The present study revealed that age is an important risk factor because its influence varies between specific age

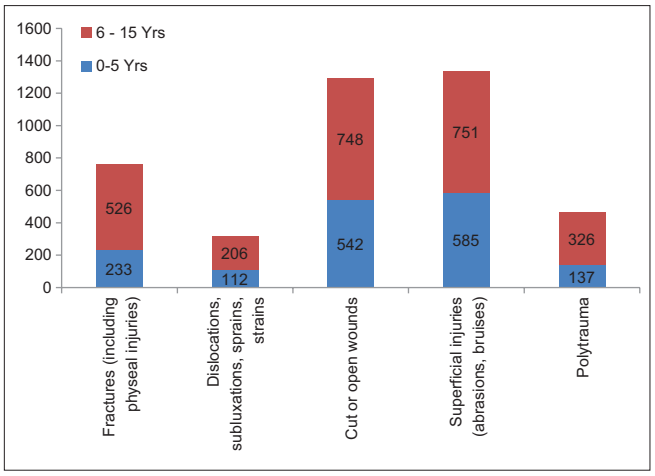

Figure 4: A bar diagram showing pattern of injuries in both the groups

groups in children and the distribution of injuries among both the groups shows that the children aged 6-15 years suffered more injury than children under 5 years. Older children are at higher risk because of natural curiosity, their mode of reaction and their impulsiveness. Also as the recreational, outdoor activities increase with age, so does the frequency of injuries.

This study showed that male pediatric population (58.5%) had more musculoskeletal injuries as compared to female pediatric population of the same age group (41.5%). This could be because male children are given more freedom and also more exposure to potential environment suitable for injuries such as rooftop, roads and trees. The studies of Kulshrestha *et al*., and Verma *et al*. have also revealed that boys were more commonly involved as compared to girls.[10-12] This study shows that urban population suffered more injuries as compared to rural population. It may be because tertiary care center mainly caters to urban population. This study shows that right extremities were more commonly involved in both the age groups as a majority of the population are right handed and also children mostly fall on right upper limb in self protection attitude.

Fall related injuries were the most common cause of trauma in this study. Nearly 59% of patients presented with a history of fall followed by RTA related injuries (32%). This was followed by assault (2%) and other injuries (6%). Among fall related injuries, under 5 years age group, a significant number of fall related injuries were accidental such as fall from bed, table, chair, and while playing. Fall from bed was mostly seen in infants. In 6-15 years age group most of the injuries were because of fall from roof, stairs, tree, slip on floor, and while playing. This could be explained by the lack of safety measures in unsupervised children. There was also considerable number of patients who had a history of fall while kite flying. Our study is in concordance with Sharma *et al's* study which also showed that fall was the

most common cause of pediatric injuries followed by RTA.[13] Similarly, a study by Hyder *et al*. also revealed that about 36% of all injuries were due to falls in under five age group children with an incidence rate of 786 per 10 lakh in Africa.[14] A similar study in Nepal reported that falls were reported as the most common injury, occurring in 65% of study participation.[15] RTA is the second most common cause of pediatric trauma after fall. In this study 32% of the patients had RTA related injuries. Most of the patients of RTA were pedestrians hit by two wheelers. These results were similar to studies from Iran and Mozambique.[16,17] Among assault related injuries, assault by stick was the most common cause of injury followed by assault with stone and sharp weapon. Among others, various causes of pediatric injuries were hot liquid burns, fire cracker burns, animal bites and gunshot wounds. Victims of cross-border firing along India Pakistan border presented with gunshot wounds including pellet or splinter injuries.[18]

In this study based on anatomical distribution of injuries upper limb injuries were most common followed by lower limb injuries. Spinal injuries were very less common. Based on the severity or nature of injury, most common injuries were superficial injuries, i.e., abrasions and bruises. The second most common injury was cut or open wounds. Cut or open wounds were mostly seen on hand, forearm and legs. Bony injuries including fractures and physeal injuries were seen in a significant number of patients. The present study included only those patients who had musculoskeletal system involvement along with other organ injuries and these accounted for 12% of the total patients. In our study polytrauma patients were mostly seen in 6-15 years age group.

Conclusion

This study makes it very clear that childhood injuries are a hazard to children's health and well being. There is a need of international attention to injuries in terms of both policies and resource investments in public health. The high incidence of pediatric trauma on roads and falls indicates the need for more supervision during playing and identification of specific risk factors for these injuries in our setting. Based on the present study we conclude that majority of pediatric injuries are preventable. Therefore successful prevention strategies should be incorporated based on epidemiological trends. Home safety programs for the children to reduce falls, playground safety measures and child safety programs should be started to prevent pediatric injuries. Injuries in pediatric age group by and large is a preventable condition. Therefore, injury prevention in children should be a priority.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patients guardians have given their consent for their patients images and other clinical information to be reported in the journal. The patients guardians understand that their patients names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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