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## CORRESPONDING AUTHOR:

Ram Kumar Yadav

Orthopaedic surgeon, Department of Orthopedics

Koshi hospital, Nepal

Email: contactdrram@gmail.com

ORCID: <https://orcid.org/0000-0003-1301-9723>

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## Epidemiology of Paediatric Fractures at Koshi Hospital, A Tertiary Center in Eastern Nepal

Ram Kumar Yadav<sup>1</sup>, Safal Yadav<sup>2</sup>

<sup>1</sup> Orthopaedic surgeon, Department of Orthopaedics, Koshi Hospital, Nepal.

<sup>2</sup> Resident/department of pathology, BPKIHS, Dharan, Nepal.

### ABSTRACT

**Introduction:** Paediatric trauma is a leading cause of disability, hospitalization and may lead to mortality in pediatric population. Incidence and nature of fracture varies according to region, culture, seasonal variations and age. Children are more prone to have injury at play grounds, due to fall from height and also due to road traffic accident due to unmanaged traffic and lack of road safety measures. Identification of specific high-risk injury patterns may lead to improved care and outcome. This study aims to find out the epidemiological profile of paediatric injuries presenting to a tertiary care hospital in eastern Nepal.

**Objective:** To study the common fractures and their management in the paediatric age group at Koshi hospital.

**Methodology:** This was a hospital based retrospective cross-sectional study done among 424 paediatric patients at Koshi hospital from January 2021 to December 2021. Ethical clearance was taken from Nepal health research council. Data collection was done from the outpatient (OPD), emergency and the operation room records and was compiled in Microsoft excel 2007.

**Results:** A total of 424 paediatric fractures were taken into study over the duration of one year. Out of which 288 were male (67.92%) and 136(32.08%) were female. Playground injuries were the most common cause of paediatric fractures (49.76%) followed by fall from height (27.35%) and road traffic accident (12.26%). Distal radius and ulna fracture was found to be most common (30.89%).

**Conclusion:** Distal radius and ulna is the commonly fractured bone followed by supracondylar fractures of the humerus. Most of the paediatric fractures can be managed conservatively. Supervised play in the grounds, at home and at schools are important because paediatric injuries most of the times can be prevented to decrease the morbidity and mortality in the paediatric population. Proper knowledge and awareness of the traffic rules and zebra crossings should be implemented with local community participation and cooperation.

### INTRODUCTION

Paediatric population comprises around 40 percent of the total population in Nepal.<sup>1</sup> Trauma is a leading cause of disability, hospitalization and increases the morbidity and mortality in pediatric population. Paediatric trauma however is very common occurring on the roads, playgrounds, schools or at home. It results in chaos in the family members. Trauma has been reported as the leading cause of death for children over the age of 1 year.<sup>2</sup> It has a huge social and economical impact on the society.<sup>3</sup>

Incidence and nature of fracture varies according to region, culture, age and has seasonal variations.<sup>4</sup> Since the nature of fracture and its healing process has been well explained in literatures but at recent times due to the increasing burden of the paediatric fracture it is high time to focus on minimizing the incidence and its consequences.

Children are more prone to have injury at play grounds, due to fall from height and also due to road traffic accident due to unmanaged traffic and lack of road safety measures. Some are high velocity and some are low velocity injuries. However the severity of

the injury greatly affects the outcome. Injuries in children and adolescent represent a major public health challenge facing paediatric patients, families and health care providers worldwide. For the past few years paediatric trauma has been recognised and addressed as significant public health issue.<sup>5</sup>

Paediatric injuries accounts for 13% of childhood disease burden and almost 1million deaths per year in developing countries.<sup>6</sup>

Proper knowledge regarding epidemiology, fracture pattern and outcome of fracture is required to reduce burden to community and healthcare.<sup>2</sup> Children has no or little understanding of the risks while playing and lack of care and unsupervised play leads to paediatric trauma. Male children are more prone of injury because of their adventurous tendencies, involvement in sports and greater freedom given to them by their parents.<sup>7</sup> Forearm fractures are the commonest long bone fractures with annual incidence of approximately 1.5 per hundred children per year comprising 40% of all fractures.<sup>8</sup>Injuries requiring medical care and attention or resulting in decreased activity affect more than 20 million children and adolescents and cost 17 billion dollars annually for medical treatment.<sup>9</sup> The chance of child sustaining a fracture severe enough to require hospital admission and treatment during the first 16 years of life is 16%. Thus on an annual basis in an average community, 0.43% of the children will be admitted for fracture related problem.<sup>10</sup>The literature on paediatric trauma epidemiology in the outskirts of Nepal, still remains limited. Identification of specific high-risk injury patterns may lead to improved care and outcome. Local community participation and cooperation can help to minimize the morbidity and mortality secondary to paediatric injuries. A clear understanding of the epidemiology of paediatric trauma is essential for the evolution of optimal care strategies and to develop effective preventive measures.<sup>11</sup>

### METHODOLOGY:

It was a hospital based retrospective study conducted at Koshi Hospital, Biratnagar which is a government run tertiary center in eastern Nepal. Prior to the start of the study permission was taken from the hospital administration. Ethical clearance for the study was taken from Nepal health research council(141/2022 P). Data were taken from the hospital records of the out-patient(OPD), emergency and the operation room records for a period of one year starting from January 2021 to December 2021.Convenience sampling technique was used for sample collection. All cases of paediatric trauma below age of 14 yr were included in the study while head injuries, soft tissue injuries, birth trauma, pathological fractures, and age more than 14 years were excluded. Personal details of the patients have not been used in this study to maintain the anonymity. Parameters taken into study were the demographic profile, mode of injury, geographic distribution, limbs involved and the pattern of fracture in the paediatric population. The type of fracture was named as per the anatomical location of the fracture. They were classified into three age groups 0-5 years, 6-10 years and 11-14 years. Data were then compiled in Microsoft excel 2007. Descriptive statistics were used to analyze the data.

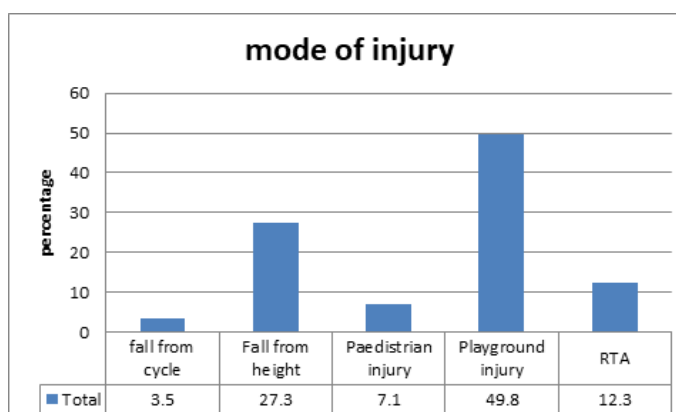
### RESULTS

A total of 424 paediatric fractures were taken into study over the duration of one year. Out of which 288 were male (67.92%) and 136(32.08%)were female. Age group distribution revealed that paediatric fractures are more common in the age group of 6-10 yrs. (table: 1)

**Table 1: Distribution of fractures by age**

Age group(in years)	Number of cases
0-5	104
6-10	201
11-14	119
Total	424

Playground injuries were the most common cause of paediatric fractures followed by fall from height and road traffic accident (RTA).(fig1)



**Fig 1: distribution of fracture by mode of injury**

We had maximum number of patients attended from morang district (83.96%),followed by sunsari (9.43%), saptari(3.53%), udaypur(1.41%), siraha(0.7%), jhapa(0.47%)and bhojpur (0.47%).

Paediatric injuries were found to be more common in July/ August/September(45.99%) followed by October/November/ December(23.34%) and January/February/March(20.51%). Least injuries were observed in the month of April/May/June(10.14%).

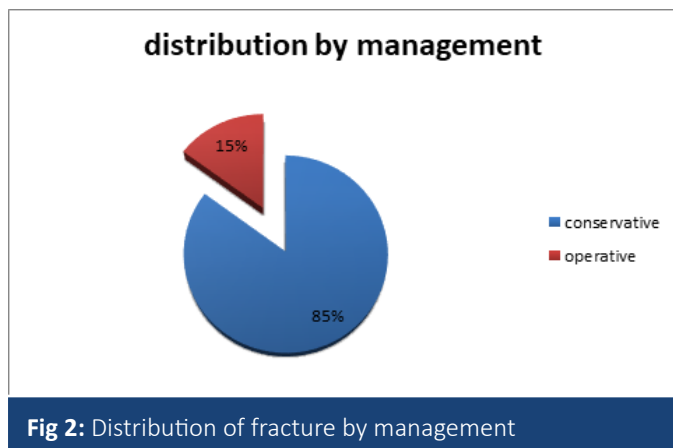
The common fractures are summarised in table 2. Distal radius and ulna fracture was most common in the paediatric population (31.89%) followed by supracondylar fracture of the humerus. Spine and pelvis injuries were least common.

Upper limb was more commonly involved (67.68%) than lower limb (27.83%). Clavicle fracture was seen in 3.53% of cases.

Most of the paediatric fractures were managed conservatively with slab and cast (85%) and 15% of the cases were managed operatively. (fig 2).

**Table 2: Distribution by type of fracture**

Diagnosis	No of cases
proximal humerus fracture	18
shaft of humerus	8
supracondylar fracture of humerus	65
lateral condyle fracture of humerus	21
medial epicondyle fracture of humerus	5
dislocation of elbow	4
forearm fracture	30
distal radius and ulna fracture	131
hand injuries	5
clavicle fracture	15
proximal femur fracture	8
shaft of femur fracture	20
distal femur fracture	6
tibia fracture	48
ankle injury	10
foot injuries	26
spine fracture	2
pelvis fracture	2
TOTAL	424



## DISCUSSION

Paediatric fractures were found to be more common in the age group of 6-10 years which was similar to other studies.<sup>12,13</sup> Similar results were seen in a study done in Turkish population in a metropolitan city.<sup>14</sup> Age specific fractures patterns and locations are generally influenced by many factors which includes different age related activities and the changing in the properties of the bone. Since this age group children are more active in indoor and outdoor game might be the reason behind the increase in incidence in this age group.

We found male child to be more affected (67.92%) which was similar to study by Gupta et. al.<sup>13</sup> For all age groups, the overall ratio of male to female child who sustained a single fracture was found to be 2.7:1.<sup>10</sup> The reason being that male child are more

active in sports. However the injury incidence may not be caused by the exposure rate only but also behavior might be the major factor.<sup>15</sup> The difference in the injury rate between genders might change in the future as the frequency of girls being involved in active sports is increasing.

We observed playground injuries as one of the most common cause of paediatric fractures followed by fall from height and RTA. While other studies suggested RTA being the most common cause.<sup>16</sup> Due to the second wave of covid 19 upsurge, as the whole country was in lockdown with minimal travel outside home could be the cause behind decrease in RTA and increase in the playground injuries and fall from height. Playground injuries can occur in individual or in team and could be contact or non contact injuries. Fall from height are mainly due to fall from stairs, furnitures, tree or fences. In a study by Mott et al. on incidence and pattern of injuries to children using public playground, they found out that around 1% of children using playground sustained injuries with some kind of fractures. Swings, climbers, and slides are the common playground equipments associated with 88% of the playground injuries.<sup>17</sup> We also found 15 cases of injuries occurring either due to fall from cycle or because of the lower limb being got entangled in the spokes and crushing the foot or leg against the cycle frame. With respect to bicycle-related fractures, attention should also be given to bicycle-spoke injuries because many of our patients live in the sub-urban and the rural areas where bicycle is used as a common mode of transport.

We received maximum number of patients attending our hospital to either OPD or emergency for acute care and admission for operative intervention from morang district(356 cases), followed by Sunsari (40 cases), Saptari (15cases), Udaypur(6 cases), Siraha (3 cases), Jhapa (2 cases)and Bhojpur (2cases). Koshi hospital being the tertiary hospital in eastern Nepal with multispeciality services serves morang district as well as the adjoining districts. The quality of care and treatment provided by this hospital has managed to receive patients from wide geographical area. There has been a decrease in cases from adjoining districts because of availability of the Orthopaedics and trauma care services in the various centers and outskirts in recent times.

Paediatric injuries were found to be more common in July/ August/September. Because of the favourable climate children spend more time in outdoor activities which increases the chances of getting injured. Least injuries were observed in the month of April/May/June. It might be because of the upsurge of second wave of COVID19 in the month of april and may, which resulted to children being stranded in homes and decrease in outdoor activities.

Distal radius fracture was the most common fracture in children followed by supracondylar fracture of the distal humerus. This was consistent with the study by Hedstrom et al. in Swedish population.<sup>18</sup> Similar results were found in a study in the American population by Naranje et al.<sup>19</sup> This happens as an attempts to avoid the fall and because hand and forearm takes the protective role during injury. However we have taken the liberty to combine the distal radius metaphyseal and physeal fractures to combine as distal radius fracture.

Upper limb was found to be more commonly involved (67.68%) than lower limb (27.83%) in our study, similar to study by Tandon et al.<sup>16</sup> Lower extremity was found to be more commonly involved in a study by Alomran et al.<sup>20</sup> Upper limb has a reflex protecting role during injury leading to the fractures of the upper extremity more common.

Most of the fractures were managed conservatively in around 85% of cases in slabs and cast while only 15% were managed operatively. Paediatric injuries are commonly low velocity injuries other than RTA. Moreover paediatric bones have a high remodeling capacity and heals effectively despite being managed non operatively. Children form a larger diameter callous than adults because the thick periosteum comes off the bone easier and forms wider and large barrier to callous. In addition to it during the proliferative phases of the fracture repair and remodeling, children form new bone faster than adults. All these factors enhance the child bone regain its strength to its optimum and much quicker than in adults.

## CONCLUSION

Distal radius and ulna is the commonly fractured bone followed by supracondylar fractures of the humerus. Most of the paediatric fractures can be managed conservatively. Pediatric fractures have social-economical and psychological impact on our community leading to chaos in the family members. Through proper treatment measures the outcome of paediatric fractures are found to be excellent probably due to its high bony remodeling tendency but we should focus on decreasing its incidence. For effective accident prevention programs local community participation and cooperation is very essential. Awareness programs regarding the traffic rules should be implemented. Supervised play in the grounds, at home and at schools are important. Trauma registries should be maintained that can document clinical and demographic profile and the care provided at different centers.

Recommendations: We recommend a multicenter study to find out the epidemiology of fractures in the paediatric age group and to formulate safety measures to decrease its incidence.

**LIMITATIONS OF THE STUDY** This study is a single center retrospective study with relatively small sample size.

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**CONFLICT OF INTEREST** None

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