

# Fractures in Children.

C. U. Nwadinigwe MBBS, FWACS, C.O. Ihezue MBBS, FMCorth, E.C. Iyidiobi MBBS  
National Orthopaedic Hospital, Enugu, Nigeria.

## ABSTRACT

**Background:** The burden of diseases in children in our environment is dominated by infections and malnutrition; paediatric trauma has low advocacy and as such is given scant attention. The aim of this study is to review and describe the pattern of paediatric fractures in our local setting.

**Method:** A retrospective review of all the medical records of children below the age of fourteen years who were admitted to our center on account of major trauma between January 1999 and December 2003 was done. Those with incomplete records were excluded.

**Results:** The patients ranged in age from 1-13 years with mean of 6.7±2.9 years. They were mostly males 60(61.2%) and females 38(38.8%). The causes of the accidents were diverse. Road traffic accidents were most common 47(51%). A great number of these resulted from unguarded children hit by motor vehicles while crossing the road 33(36.7%). Forty-one (41.8%) patients fell from various heights. Of these number thirty (30.6%) fell while playing. Most fractures were close 70(71.4%) while 25(25.5%) were open fractures and 3 (3.1%) pathological fractures. The most common site of injury was the femoral shaft 33.7%; this was followed by fractures of the supracondylar region of the humerus 17.3%, distal radius 15.3% and tibia/fibula 15.3%. More than half of the patients 58 (59.2%) presented fresh to our hospital, while 27(27.6%) presented initially to traditional bonesetter (TBS) and 13 (13.3%) were referred from private practitioners. Of those twenty-seven patients from the TBS, seven came with compartment syndrome and three had frank gangrene. Most of the patients were managed conservatively. Preliminary traction followed by plaster of Paris (POP) application in 36 (36.7%), and manipulation under anaesthesia (M.U.A) and POP (30.6%), were common definitive treatments given. Sixteen patients (16.3%) had open reduction and internal fixation. Acute compartment syndrome 7(7.1%) and frank gangrene 3(3.1%) were the commonest complications and were due to late referral by traditional bonesetters.

**Conclusion:** In our environment, fractures in children are common and are frequently associated with morbidities due to interference by traditional bonesetters. These injuries are highly preventable and paediatric trauma prevention strategies directed at parents, children as well as other road users would help to reduce the burden of such fractures especially in the developing countries where the burden of other childhood diseases obscures trauma care.

**KEYWORDS:** Fractures; Children; Enugu; Nigeria.

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## INTRODUCTION

The burden of diseases in children in our environment is dominated by infections and malnutrition. Paediatric trauma has low a advocacy and as such is given scant attention. All over the world, trauma has been recognized as a leading cause of morbidity, mortality and disability in childhood. Fractures are one important component of paediatric trauma. It constitutes a cardinal indication for patronage of traditional bonesetters by the local folks with the attendant complications<sup>1</sup>. The exact burden of fractures in children in our environment is not known. In this study we describe our experience at National Orthopaedic Hospital Enugu over a 5-year period.

## PATIENTS AND METHODS

From January 1999 to December 2003, 112 paediatric trauma patients who had fractures were admitted through the accident and emergency unit of the National Orthopaedic Hospital Enugu. We reviewed the records of these patients and noted the age, sex, mechanism of injury, type of injury, place of initial treatment and the interval between injury and presentation. Definitive care given, duration of hospitalization and complications were also recorded. Fourteen patients with incomplete records were excluded. Special attention was given to unusual circumstances surrounding the injury as well as delayed presentation of the child to medical personnel. Data were analyzed by using SPSS for window version 9.

## RESULTS

During the 5-year review period, 112 children were admitted with fractures, but only 98 patients with analyzable records were used for this study. The age of the subjects ranged from 1-13 years, with a mean of 6.7±2.9 years. Children between ages of 6 years and 10 years were most often affected (Fig 1). Males were mostly affected while there were females 60(61.2%) 38(38.8%). The duration of hospitalization ranged from 1-228 days.

The causes of the accident were diverse. Road traffic accidents were most common 47(51%). A great number of these resulted from unguarded children hit by motor vehicles while crossing the road 33(36.7%). Forty-one (41.8%) patients fell from various heights of this number thirty (30.6%) fell while playing, (Table I). One child had a closed femoral fracture under a curious circumstance, which we considered an intentional injury.

Most fractures were close 70(71.4%) while 25(25.5%) were open fractures and 3 (3.1%) pathological fractures. The commonest site of injury was the femoral shaft 33.7%, this was followed by supracondylar region of humerus 17.3%, distal radius 15.3% and tibia/fibula 15.3%. Seventy five percent of the tibia/fractures were open injuries of various grades (Table II). Fourteen patients had other associated injuries mainly head injury and facial abrasions, ( Table III).

More than half of the patients 58 (59.2%) presented fresh to our hospital, while 27(27.6%) presented initially to the traditional bone setter (TBS) and 13 (13.3%) were referred from private practitioners. Of those twenty-seven patients from the TBS, ten (10.3%) came with compartment syndrome, of which three (3.1%) had frank gangrene, two had stiff elbow and another two had established chronic osteomyelitis, (Table IV).

Preliminary traction followed by plaster of Paris (POP) application was the definitive treatment in 36 (36.7%), and manipulation under anaesthesia (M.U.A) and POP application in 30 (30.6%). Sixteen patients (16.3%) had open reduction and internal fixation while 3 (3.1%) patients had amputation as a result of gangrene from traditional bonesetter's intervention, see Table V.

**Table II: Site of injury of Fractures in Study Subjects**

Site	frequency %
Femoral shaft	33(33.7%)
Supracondylar of humerus	17(17.3%)
Distal radius	15(15.3%)
Tibia /fibula	15(15.3%)
Multiple fractures	6(6.1%)
Shaft of humerus	4(4.1%)
Spine	4(4.1%)
Fracture neck of femur	3(3.1%)
Clavicle	1(1.0%)
Total	98(100.0%)

**Table III: Pattern of associated injuries in study subjects**

Associated Injuries	Frequency (%)
Head injury	4(4.1%)
Facial injury	5(5.1%)
Abdominal injury	1(1%)
Multiple abrasions	3(3.1%)
Burns	1(1%)
Total	14(14.3%)

**Table IV. Complications in study subjects with fractures**

Complications	frequency (%)
Compartment syndrome	7(7.1%)
Failed MUA	5(5.1%)
Mal-union requiring further treatment	5(5.1%)
Stiff elbow	2(2.0%)
Compartment and gangrene	3(3.1%)
Chronic infection	2(2.0%)
Nerve injury	1(1.0%)
Total	25(25.4%)

**Table V. Pattern of definitive treatment given to study subjects**

Definitive treatment	frequency (%)
Skin traction followed by Pop	36(36.7%)
MUA + POP	30(30.6%)
Open reduction and internal fixation	16(16.3%)
Wound debridement +external Fixation	9(9.2%)
Fasciotomy +external fixation	4(4.1%)
Amputation	3(3.1%)
Total	98 (100%)

**Fig 1. Age distribution of patients in years.****Table I: Aetiology of Fractures in Study Subjects**

Aetiology	frequency
Road Traffic Accidents	
<input type="checkbox"/> Pedestrian	33 (36.7%)
<input type="checkbox"/> Passenger	14 (14.3%)
Fall	
<input type="checkbox"/> While playing	30 (30.6%)
From mango tree	6 (6.1%)
Stairs	3 (3.1%)
Ladder	1 (1.0%)
From mothers back	1(1.0%)
Gunshot injury	3 (3.1%)
Pathological fracture	3 (3.1%)
Collapsed building	2 (2.0%)
Intentional injury	1 (1.0%)
Birth injury	1 (1.0%)
Total	98 (100%)

## DISCUSSION

Trauma has remained the leading cause of death and morbidity world over in persons aged 1-34 years and a major contributor to health cost<sup>2</sup>. It has also been reported to be the commonest cause of death and morbidity among persons less than 19 years of age<sup>2,3,4,5</sup>. Traffic related injuries have been found to be the dominant aetiological factor of trauma in this age category<sup>5,6</sup>, and pedestrians are most often involved in such traffic related injuries<sup>6</sup>.

In our environment, much attention has not been given to the epidemiology of fractures resulting from these injuries in children in the literature despite the teeming association between fractures and paediatric trauma. The situation is similar to that of other African countries where the burden of malaria, infectious diseases and malnutrition has blurred the focus on paediatric trauma in public health research and policies<sup>5,8</sup>. It has nonetheless, been estimated that the risk is there<sup>9</sup>.

The majority of the cases in our study were between the ages of 6-11 years with mean age of 6.7±2.9. This age range in our study is of special interest in our environment. It coincides with the age of starting primary school and those who are unable to go to school engage in street hawking. Seventy percent of RTA related cases were pedestrians who were either crossing major roads unguarded on their way to and from school or were hawking along the road. This supports the observation of Unger *et al*, Adesunkanmi *et al* and Nwomeh *et al*. Hawking by children which is considered a form of child abuse, has remained a very important aspect of family support and commerce in Nigeria, despite calls by various Non governmental Organizations to discourage this. It has remained rampant due to the harsh economic reality in this country, which compels every member of most families to contribute to the financial upkeep of the family.

Our study agrees with other studies<sup>4,6,8</sup> that RTA is the most common cause of paediatric fracture. However a study of paediatric fractures in Maiduguri, Nigeria by Tahir and Hassan<sup>10</sup> found fall related incidents to be responsible for 75% of fractures in children seen in that environment while RTA accounted for only 23%. Another study of paediatric injuries in Tehran by Zargar *et al*<sup>8</sup> found RTA to be second to fall in the aetiology of paediatric trauma. The difference in the prevalence of aetiological factors between our study and that of Tahir and Hassan can be explained by the differences in road traffic density and vast cultural differences between the two areas of the country where the studies were conducted. More so, the two studies that reported fall related injuries as the most common

aetiological factor in paediatric trauma was carried out in areas with similar way of life. However, a multi-centre prospective study may be required to harmonize this disparity.

Fall while playing was the most common mechanism of fall-related injuries followed by fall from mango trees. The latter has been widely noted to be a very common source of paediatric injuries in our sub-region where mango trees are rife and the fruits are most often plucked by children who, in a bid to hand-pluck the mango fruits from the tip of the branches, fall with the rather brittle branch when the latter breaks.

Intentional injuries are either rare or under reported in our environment. In this series we only observed one child whose mechanism of injury was a bit curious. Both parents and the nanny gave conflicting reports.

The finding of male preponderance in paediatric fractures is also in line with records in the literature<sup>5,11</sup>. Van As *et al* in a similar study on paediatric trauma found a male: female ratio of 1.5: 1<sup>4</sup>. Naturally the male child being more adventurous is more likely to take risks

Femoral shaft fractures, which have been described as the most incapacitating fracture in children<sup>12</sup>, constituted 33.7% of the cases in our series forming the most prevalent paediatric fracture in our series. This was followed by supracondylar humeral fractures. Fractures of the distal radius and tibia/fibula tied in the third position. This is an interesting finding considering that most studies in the literature report distal radial<sup>9,13,14</sup> fracture, followed by supracondylar humeral fracture, as the most common fracture in childhood. Dicke and Nunley have reported that "the most common fractures in children occur in the distal one-third of the forearm" and that such fractures account for 35.8% to 45% of all reported paediatric fractures<sup>13</sup>. Similarly, Solomon *et al* have stated that "the elbow is second only to the distal forearm for frequency of fractures in children"<sup>14</sup>. Robert E.Lins *et al* have also stated that because children use their outstretched arms to protect themselves when they fall, fractures about the elbow in the paediatric population are common and 65-75% of fractures in the children occur in the upper extremity<sup>15</sup>. Tahir and Hassan found a predominance of fractures involving the radius, followed by those involving the humerus and then femur, in their series. The fracture distribution in our series may be explained by the observation that RTA involving pedestrians was the predominant injury mechanism in our series and most of these occurring as bumper injuries, which usually affect the lower limbs and the torso.

Seventy-one percent of the fractures in our study were closed fractures. A survey of correlation between site and nature of injury demonstrated that most (44%) of the open fractures in children, like in adults, involved the tibia and

fibula. Majority (73.3%) of the tibial fractures in our study were open. This contradicts the findings by Jones and Duncan<sup>16</sup> of 6.5 % open fractures in 1276 cases of tibial fractures studied. The finding in our study may be related to the high incidence of motorcycle related RTA in our environment.

Three percent of the fractures in our series were pathological fractures mainly from bone cysts.

Head and facial injuries were the most common associated injuries in our series. Head injuries have been acknowledged as a common variety of injury in children following RTA<sup>5,17</sup>. The low incidence of chest and abdominal injuries in our study may owe its occurrence to the usual practice in our center of referring most chest and abdominal injuries presenting to us to the nearby university hospital where Cardio-thoracic and General surgical services exit.

Conservative treatment remains the choice for managing fractures in children<sup>18</sup>. Sixty-seven percent of our cases were treated conservatively. Nonetheless operative treatment is fast gaining popularity in the care of certain varieties of paediatric fractures. We used surgical methods in treating 30% of our cases. Most of the cases that needed internal fixation were badly displaced supracondylar humeral fractures (Gartland Type 3). Others were physeal fractures involving the distal radius, and tibia. Kirshner wire was the most used internal fixation device. Intramedullary nails, which are getting popular in paediatric fractures<sup>19,20</sup> were not used in the studied group.

The most common complication in our study was compartment syndrome, which accounted for 10.3% of all the complications. Three cases suffered gangrene of the extremities necessitating amputation. These cases that had compartment syndrome and gangrene had initial treatment with the traditional bonesetters and presented to us with the complications. This is a pathetic observation, which is fairly rampant in our environment<sup>1</sup>

## CONCLUSION

Fractures in children are common findings in paediatric trauma and frequently involve unaccompanied children. These injuries often lead to life long complications. Paediatric trauma prevention strategies directed at parents, children as well as other road users would help to reduce the burden of such fractures especially in the developing countries where the burden of other childhood diseases obscures trauma care.

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