Original Article

Epidemiology of Childhood Fractures in Cotonou: A Retrospective Observational Study

Pascal S. Chigblo, Fiacre Tidjani, Éric Lawson, Bruno Noukpozounkou[1], Francois Amossou[2], Adébola Padonou, Oswald Goukodadja, Aristote Hans-Moévi Akué, Michel Fiogbe[1]

Departments of Orthopedic-Traumatology and [1]Paediatric Surgery, National Teaching Hospital CNHU-HKM, Cotonou, [2]Department of Surgery, Departmental Teaching Hospital CHUD-OP, Porto-Novo, Benin

Abstract

Background: Childhood fractures are frequent. The aim of this study was to evaluate their epidemiological and clinical peculiarities in our context. **Materials and Methods:** This was a retrospective study that focused on the files of children with a fracture. They were aged 0–15 years and received between January 2011 and December 2015 at the Emergency Department of the National Teaching Hospital of Cotonou. **Results:** Two hundred and eighty fractures were recorded in 257 children. The average age was 8.24 years (7 days–15 years). Older children (6–10 years) were the most affected with 33.8% of cases. The predominance was male (sex ratio = 2.3:1). The aetiologies were dominated by road traffic accidents (45.1%) followed by domestic accidents (42.7%). Fractures were predominant in the lower limbs (52.1%). The most affected segments were the leg (25.4%) and the femur (23.6%). The fracture was open in 13.9% of cases. **Conclusion:** Childhood fractures interest preferentially the older boys. Then, road traffic accidents are the most frequent circumstances of occurrence in our context. Measures to prevent the main causes of these fractures must be taken, in order to reduce their frequency and ensure the development of children.

Keywords: Children, domestic accident, fractures, road accident

Introduction

Trauma is a significant cause of death in children and young adults.[1,2] Globally, more than 875,000 children under the age of 18 die each year from these injuries, especially in low- and middle-income countries where injuries account for 13% of total morbidity amongst children aged 15 and less.[1] Fractures resulting from various trauma are commonly seen in childhood and adolescence and account for 10%–25% of all childhood trauma.[3-6] Several studies report that approximately 45%–55% of all children have at least one fracture before the age of 18 in developed countries.[1-4,7] The peaks in frequency of these fractures and the main sites of them vary from one setting to another, depending on the sex of the child.[3,4,8,9] In addition, the urban environment has been described as a risk factor for the occurrence of trauma in children.[10] The epidemiology of paediatric fractures is crucial in establishing strategies to tackle their main causes, but information on these fractures is scarce in low- and middle-income countries,[11] particularly in sub-Saharan Africa, where most of the action programmes available are geared towards the management of communicable diseases and nutritional problems.[12] In Benin, we are not aware of any study that had been previously done in this area. Hence, the aim of this study was to study the epidemiological and clinical features of fractures in children in the economic capital of Benin, a low-income country in sub-Saharan Africa.

Materials and Methods

This was a retrospective, descriptive and analytical study covering a period of 5 years, between January 2011 and December 2015. It included children from 0 to 15 years old, admitted in emergency to the National Teaching Hospital Hubert K. Maga in Cotonou for fracture and having a complete medical file with regard to the studied variables. Children over 15 years old and those transferred from a peripheral

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Address for correspondence: Dr. Pascal S. Chigblo, Department of Orthopedic Traumatology, CNHU HKM Cotonou 10 BP 423, Cotonou, Benin.
E-mail: chispaer@yahoo.fr

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hospital for further care were excluded. The variables were epidemiological and clinical. Epidemiologically, we evaluated the frequency of childhood fractures, the age of patients, their sex and the aetiological circumstances of the fractures. Clinically, we assessed the time to admission, the site of the fracture and the openness or not of the fracture. When the fracture was located on a limb segment, the affected side was specified. Open fractures were classified according to Gustilo *et al*.[13] The data collected were processed using Epi Info 7 (Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA) and Excel 2013 software.

Results

Epidemiological characteristics

We collected 392 cases of fractures in 370 patients. Patients with fractures accounted for 13.5% of hospitalisations in the department with a monthly incidence of 6.5 cases. Two hundred and fifty-seven children meeting our inclusion criteria were selected. Those presented 280 fractures. The mean age of the children was 8.2 ± 5.3 years, with extremes of 7 days and 15 years. Older children (6–10 years) were the most affected with 33.8% of cases. The predominance was male with 178 (69.3%) boys and 79 (30.7%) girls, i.e., a sex ratio of 2.3:1. Figure 1 gives the age distribution according to the sex of the children affected.

The aetiological circumstances were dominated by road traffic accidents (116 cases; 45.1%) and domestic accidents (110 cases; 42.8%) [Figure 2].

In road traffic accidents, patients were pedestrians struck by a motorbike/car in 26.8% (69 cases), motorbike passengers in 14.4% (37 cases) or car passengers in 3.9% (10 cases).

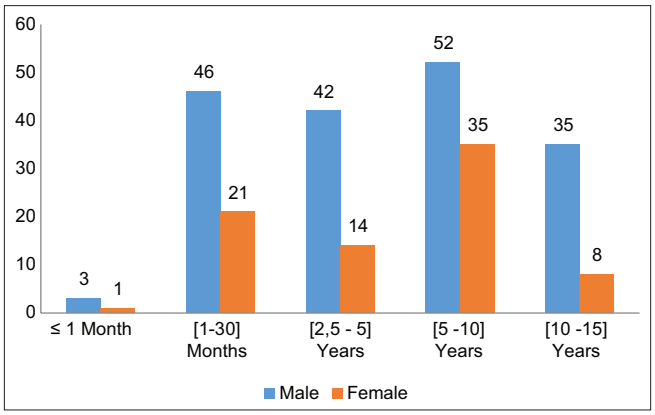


Figure 1: Distribution of children by sex and age ($P = 0.0001$; $\chi^2 = 42.67$)

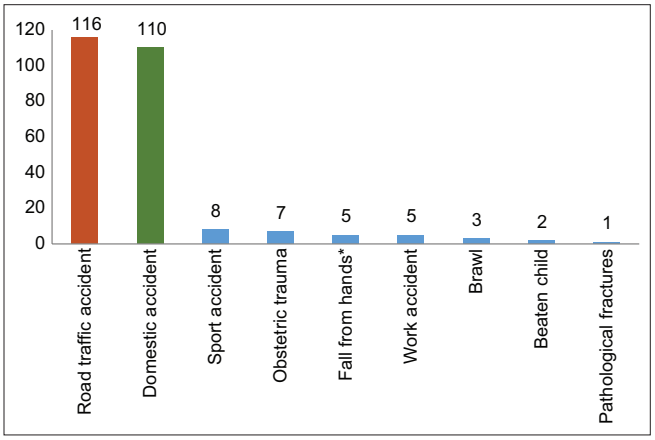


Figure 2: Distribution of children according to aetiological circumstances

Table 1: Distribution of aetiological circumstances according to age

	≤1 month, *n* (%)	2–30 months, *n* (%)	31 months–5 years, *n* (%)	6–10 years, *n* (%)	11–15 years, *n* (%)	Total, *n* (%)
Road traffic accident	0	30 (11.7)	28 (10.9)	35 (13.6)	23 (8.9)	116 (45.1)
Domestic accident	0	34 (13.2)	20 (7.8)	43 (16.7)	13 (5.1)	110 42.8
Sports accident	0	0	1 (0.4)	3 (1.2)	4 (1.6)	8 (3.1)
Obstetric trauma	4 (1.6)	3 (1.2)	0	0	0	7 (2.7)
Fall from hands	0	0	5 (1.9)	0	0	5 (1.9)
Work accident	0	0	0	4 (1.6)	1 (0.4)	5 (1.9)
Brawl	0	0	0	0	2 (0.8)	2 (0.8)
Beaten child	0	0	1 (0.4)	0	0	1 (0.4)
Pathologic fracture	0	0	1 (0.4)	2 (0.8)	0	3 (1.2)
Total	4 (1.6)	67 (26.1)	56 (21.8)	87 (33.9)	43 (16.7)	257 (100.0)

Table 2: Aetiological circumstances according to sex

	Road accident, *n* (%)	Domestic accident, *n* (%)	Sports accident, *n* (%)	Obstetric trauma, *n* (%)	Fall from hands, *n* (%)	Work accident, *n* (%)	Brawl, *n* (%)	Beaten child, *n* (%)	Bone tumour, *n* (%)	Total, *n* (%)
Male	100 (38.9)	57 (22.2)	5 (1.9)	4 (1.6)	3 (1.2)	5 (1.9)	2 (0.8)	0	2 (0.8)	178 (69.3)
Female	16 (6.2)	53 (20.6)	3 (1.2)	3 (1.2)	2 (0.8)	0	0	1 (0.4)	1 (0.4)	79 (30.7)
Total	116 (45.1)	110 (42.8)	8 (3.1)	7 (2.7)	5 (1.9)	5 (1.9)	2 (0.8)	1 (0.4)	3 (1.2)	257 (100.0)

Table 3: Distribution of fractures

	n (%)
Upper limb	
Clavicle	4 (1.4)
Humerus	
Proximal	11 (3.9)
Diaphysis	21 (7.5)
Distal	33 (11.8)
Radius/ulna	
Proximal	4 (1.4)
Diaphysis	19 (6.8)
Distal	21 (7.5)
Hand	
Carpus	0
Metacarpal	1 (0.4)
Phalanges	0
Total 1	114 (40.7)
Lower limb	
Iliac bone	2 (0.7)
Femur	
Proximal	16 (5.7)
Diaphysis	35 (12.5)
Distal	15 (5.4)
Patella	0
Tibia/fibula	
Proximal	3 (1.1)
Diaphysis	61 (21.8)
Distal	7 (2.5)
Foot	
Tarsal	0
Metatarsal	5 (1.7)
Phalanges	2 (0.7)
Total 2	146 (52.1)
Axial skeleton	
Head	
Frontal bone	6 (2.2)
Parietal bone	4 (1.4)
Occipital bone	4 (1.4)
Facial bone	2 (0.7)
Spine	1 (0.4)
Lumbar (L4)	
Thorax	3 (1.1)
Ribs	
Total 3	20 (7.2)
Totals	280 (100)

Accidents at home were dominated by accidents at games and falls from a height in 19.1% (49 cases) and 12.1% (31 cases), respectively. It was a slip in 7.4% (19 cases), and a misstep in 4.3% (11 cases).

With regard to sports accidents, football (1.6% or 4 cases), gymnastics (0.8% or 2 cases) and martial arts (0.8% or 2 cases) were the sources of fractures.

As for work accidents, they were 0.8% (2 cases) of heavy objects falling on the limb, 0.8% (2 cases) of falls from ladders and 0.4% (1 case) of electric saw trauma.

Finally, pathological fractures included 0.8% (2 cases) of giant cell tumors and 0.4% (1 case) of osteoid osteoma.

Tables 1 and 2 give the distribution of traumatic circumstances according to sex and age.

Clinical features

Children were admitted within 6 h of injury in 63.8% (164 cases), at 6–12 h in 7.4% (19 cases), at 12–24 h in 0.8% (2 cases), at 1–7 days in 19.5% (50 cases), at 8–30 days in 7.0% (18 cases) and after 30 days in 0.8% (2 cases).

Fractures were found mainly in the lower limbs with 146 (52.1%) cases and then in the upper limbs with 114 (40.7%) cases. The axial skeleton was affected in 20 (7.1%) cases [Table 3]. The leg was the most affected with 71 cases, or 48.6% of lower limb fractures, and 25.4% of all fractures. In 2 (0.7%) cases, there were multiple fractures of limbs: a floating knee involving ipsilateral femur and both tibia and fibula in the first case. The second patient sustained ipsilateral fractures of the humerus and femur and contralateral fracture of the tibia and fibula. For limb fractures, the left side was involved in 112 (40.0%) cases and the right side in 148 (52.9%) cases. For the long bones, the site was predominantly diaphyseal for the femur (12.5% or 35 cases) and leg (21.8% or 61 cases) and distal epiphyseal for the humerus (11.8% or 33 cases) and forearm (7.5% or 21 cases). All axial skeletal fractures were associated with limb fractures.

Fractures were open in 39 (13.9%) cases. According to Gustilo and Anderson classification, there were open fractures type I (4.3% or 12 cases), type II (6.8% or 19 cases) and type III (2.9% or 8 cases). Those of type III included 1.4% (4 cases) of open fractures of type IIIa, 0.7% (2 cases) of type IIIb and 0.7% (2 cases) of type IIIc.

Discussion

We carried out a descriptive study on hospital epidemiology and the characteristics of fractures in children in the largest city of Benin. This study has the merit of being the first of its kind in Benin. However, its monocentric nature does not allow for statistics of national scope. However, Cotonou having the largest road park in the country,[14] and the CNHU-HKM being the national reference hospital, the conclusions of this study can help to find adequate prevention measures in this city and, by extension, in all other urban areas of Benin. This study may be the foundation on which other similar studies can be built on.

Epidemiological characteristics

The monthly incidence of fractures in this study is similar to that of 6.28 cases reported by Mouafo Tambo *et al*.[15] in Cameroon. In Niigata (Japan), the frequency of these fractures in schools has more than doubled in 10 years.[4] Likewise, numerous western studies confirm the high frequency of childhood fractures with annual incidences of 205/10,000[3] and 137/10,000.[8] It is, therefore, a public health problem. However, these fractures, especially in the epiphyseal region,

are sometimes the cause of inequalities in limb length and growth disorders that disrupt quality of life.[16-18] In our context, the magnitude of the problem is underestimated. Indeed, some parents have their children consulted in outlying hospitals, others prefer to send them to bonesetters.[19]

The average age of children with fracture varies from one study to another.[7,11,15,20] In this study, school-age (6–10 years) children were most affected. In addition, there was a male predominance with a sex ratio of 2.3:1. The same observation was made by Naranje *et al*.[9] In general, the male predominance is constantly reported in the literature.[3,4,11,15,20] This observation is certainly linked to the petulance of boys, to their tendency to take risks. They engage in violent games compared to girls who are usually more careful, and often less available to games because they are used for household chores. Likewise, their young age mostly means that they also have a still immature sensory and psychomotor development which prevents them from having a good perception of danger, and promotes their lack of attention in traffic when going to school or at their place of learning.

Road traffic accidents were the main aetiological circumstance in our context. This same observation has been made by several African authors.[15,20] In the West and the East, domestic accidents with a fall represent the main aetiology.[5,7,11]

In fact, the aetiological traumatic circumstances vary from one environment to another, depending on the degree of urbanisation and the regulations in force in the countries. In our context, the prevalence of road traffic accidents is linked to the ignorance of the highway code by motorcycle drivers since a driver's licence is not required for these vehicles. In addition, the absence of pedestrian crossings on most of the roads in Benin, to facilitate the passage of children who are often pedestrians when they go to school, and the use of the streets as play areas are factors which expose more these children to road traffic accidents.

One case of a battered child was noted. Often neglected in aetiological research in our context, this situation should be considered; indeed, a study carried out by Gallaher *et al*.[12] in Malawi in sub-Saharan Africa found 8.1% of voluntary violence as a cause of trauma in children.

Clinical features

The three main fracture sites were the shaft of the leg, the femoral shaft and the distal humerus. The predominance of lower limb fractures in children was found by other authors in Africa;[15,20] this is easily understood given that the main aetiological circumstance was the road traffic accident where the lower limbs were more exposed because it was generally a pedestrian or a motorcycle passenger. In countries with better road safety, fractures in children mainly occur during a fall, and preferentially concern the upper limbs, with the distal radius in the lead.[9,11,16]

The fractures observed in the axial skeleton (6.1%) mainly concerned the skull and spine (5.4%). These can be serious because of the potential risk of damage to the nervous system. Open fractures were reported in 13.9% of cases. This increases morbidity by increasing the risk of infection.[13] This results in a lengthening of the duration of hospitalisation for children. It keeps one of the parents of the children in the hospital, preventing him from going about his activities and likely contributing to the impoverishment of our country.

Conclusion

Childhood fractures are common in our setting. They most often occur in the lower limbs, in older male children following road traffic accidents.

We recommend that the Benin Republic authorities fight against this scourge by adopting a policy that strengthens road safety. Moreover, raising children's awareness in schools and educating parents on the dangers of childhood fractures, both during traffic and domestic accidents, could reduce the frequency of these fractures.

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Conflicts of interest

There are no conflicts of interest.

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