

# Fracture of Limbs Bones in a Rural and Post Conflict Health Zone

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## Abstract

**Background:** Trauma is major public health problem in developing countries where they are associated with many factors, mainly such as lack of road safety, poverty and inadequate urban planning. We aim to highlight the epidemiology of the fractures limbs bones in a rural area where people live in a context of low economy, low education and insecurity. **Methods:** We conducted a cross-sectional, retrospective study involving all patients admitted for fracture in the surgical department of FOMULAC-KATANA General Reference Hospital from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2014. The patients whose medical records were not completed were excluded. **Results:** Among 136 patients included in our study, 140 bones limbs were registered. Most of them (60.1%) were aged between 15 - 44 years and the average age is 30, 1 year. Male predominance is noticed (72.8%) with a male/female ratio of 2.7/1, and informal professionals are the most found in our patients (67.6%). The main circumstances of fracture occurrence are, respectively, road traffic accidents (57.4%), falls (22.3%) and firearms (10.3%). The leg bones (33.6%) and forearm bones (20%) are the most concerned bones. Open fractures are recorded in 40.7% of patients. The supporting treatment is mainly orthopedic (64.5%) but also surgical (35.5). The mortality rate is 3.6%. **Conclusion:** The fractures of the limbs bones in Katana General Reference Hospital mainly affect young male which is informal professional. The road traffic accidents are the first circumstance leading to fractures followed by falls. The leg bones are the most fractured body part and fractures are commonly opened.

## Keywords

Conservative Treatment, Fracture, Rural Post-Conflict, Young Men

## 1. Introduction

Trauma is major public health problem in developing countries where they are associated with many factors such as the lack of road safety, poverty, inadequate urban planning, and lack of qualified and motivated human resources [1]. Fourteen to twenty-eight percent of emergency visits are made by trauma in primary health care in many countries and 60% of causes of disability are due to the problems related to the musculoskeletal system [2]. Like the West, Africa is attempting to limit the frequency of road traffic accidents occurrence by the Accra Declaration, which calls on countries to take action to address the growing problems of road accidents on the African continent [3].

At Kisangani, in Democratic Republic of the Congo (DRC), traumas due to road traffic accident (RTA) represented 17.8% of all emergencies admitted in Surgery Department [4]. In South Kivu Region, two studies have been conducted on the epidemiology of fractures and find that in urban areas, fractures due to firearms are frequent and concern young males civilian. Moreover, fractures on leg bones are the second most prevalent fractures of long bones in urban areas. Both of them are treated either by traditional medicine or modern medicine [5] [6].

Nothing to our knowledge was known about fractures of limbs bones in rural areas that is why we judged relevant to conduct this study in a rural area in the aim of highlighting epidemiological aspects of fracture of limbs in rural areas.

## 2. Methodology

### 2.1. Scope of Study

Our study was conducted in Katana General Reference Hospital (KGRH), in the province of South-Kivu, 45 km north of Bukavu in the territory of Kabare, in the Health Zone of Katana in DRC. The KGRH has been created in 1923 by the Medical Foundation of the University of Louvain in Central Africa.

This hospital serves about 310,000 inhabitants. It includes four departments: internal medicine, gynecology-obstetrics, pediatrics and surgery. It has a capacity of 130 beds and surgery department itself possesses 40 beds.

### 2.2. Type of Study

It is a cross-sectional and retrospective study. We descriptive and analyze the bone fractures limbs registered in the surgical department of the KGRH from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2014, either a period study of 4 years. For data collection, we use records of admissions to the emergency, hospital records and reports of the operating room. We took into account the following parameters: age, sex, occupation, causes of fractures, bone concerned, skin state, support management and evolution. The informal occupation include drivers of vehicles, traders, farmers, breeders, millers, unemployed etc., while the engaged professional concern all people with an employment contract.

## 2.3. Study Population and Data Collection

### 2.3.1. Data Collection

Data were collected from complete medical records of patients admitted to the department of surgery of the general and referral Hospital of Katana. We got from these medical records sociodemographic parameters (age, sex, profession, fracture causes) clinical parameters (type of fracture, broken bone, skin status) and therapeutic and follow up parameters (type of treatment, discharge status).

### 2.3.2. Inclusion Criteria

Every patient of each age admitted to the General and referral Hospital of Katana for fracture of limbs bones during the study period (2011-2013) was selected. Moreover, he should have a complete medical record.

### 2.3.3. Exclusion Criteria

All patients with fracture of limbs whose medical records were incomplete were excluded from our study.

## 2.4. Statistical Analysis

Data were entered and analyzed using the software Epi-Info version 3.5.4. The results are presented as a percentage or average as appropriate.

Ethical Approval was obtained from the institutional ethical committee of the concerned hospital.

## 3. Results

### 3.1. Main Features

In this study, we have recorded 136 patients with 140 long bones fractured. **Table 1** shows the main characteristics of fractured. The 15 - 29 age group is the most affected with 42 (30.9%) patients and 83 (61%) are in the range of 15 - 44 years, the median age was 30.1 (2 - 93) years. Males were the most concerned in all age groups with 99 (72.8%). The sex-ratio male/female ratio was 2.7/1. Ninety-two (67.6%) fractured are informal profession, followed by students with 35 (25.7%) cases.

### 3.2. Fracture's Causes

**Figure 1** illustrates fracture's causes. Of all the causes of fractures, RTA take the lead with 78 (57.4%) cases, followed by falls in 31 (22.8%) patients and firearms represent 14 (10.3%) fractured.

### 3.3. Affected Bones

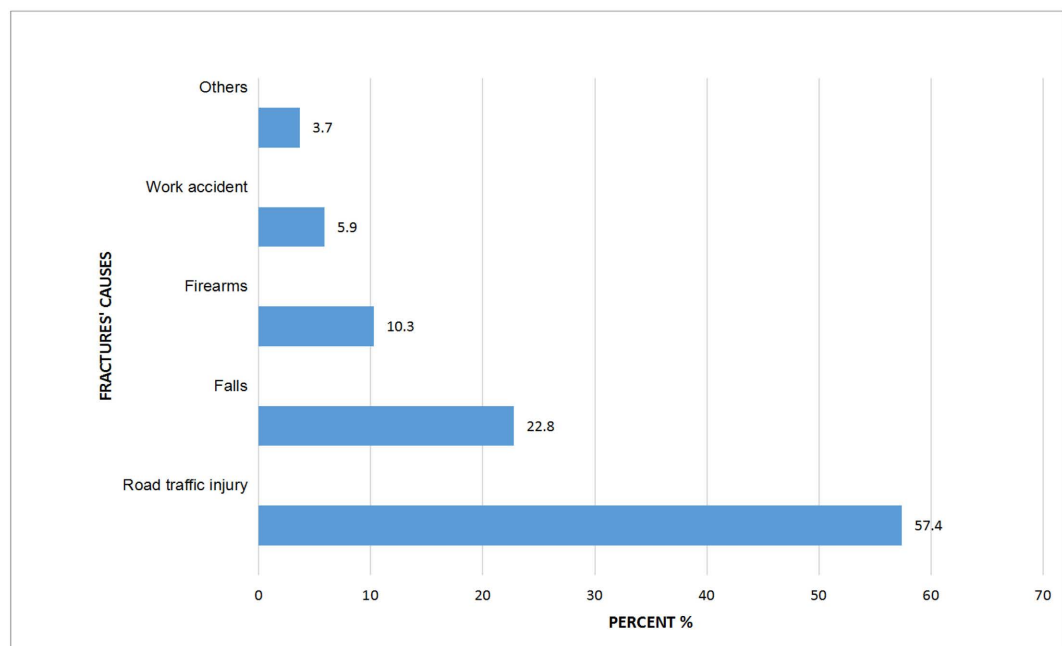
Affected bones are shown in **Figure 2**. Forty-seven (33.6%) fractures are localized to leg bones, 28 (20%) to the forearm bones and 24 (17.1%) to femur. Other locations are less than 10% each.

### 3.4. Broken Bones and Skin Status

The distribution of bone fractures and skin state is illustrated by **Figure 3**.

**Table 1.** Main features.

	n	%	Median (ends)
<b>Age (years)</b>			30.1 (2 - 93) years
0 - 14	28	20.6	
15 - 29	42	30.9	
30 - 44	41	30.1	
≥45	25	18.4	
<b>Sex</b>			
M	99	72.8	
F	37	27.2	
<b>Profession</b>			
Free professions	92	67.6	
Student	35	25.7	
Engaged professional	9	6.7	

**Figure 1.** Fracture causes.

Closed fractures are recorded in 83 (59.3%) patients. Fifty seven (40.7%) open fracture, leg bones rank first with 24 (42.1%) cases, followed the forearm and femur with respectively 10 (17.5%) and 6 (10.5%). Looking solely the 47 cases of fractures of the leg bones fractures, 24 (51.1%) are open whereas 10 (35.7%) of 24 broken forearm bones were opened.

### 3.5. Treatment and Evolution

The **Table 2** mentions the treatment and evolution. In total of 136 patients, 18

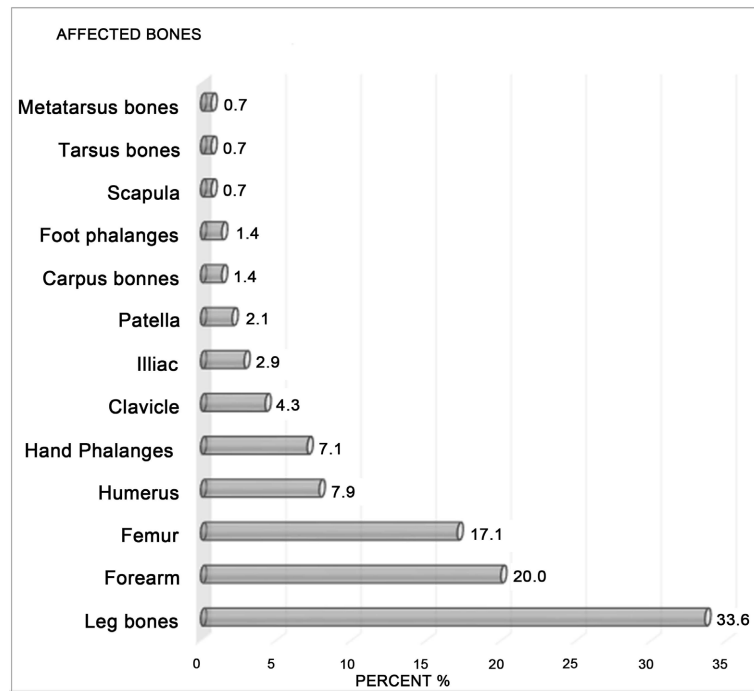
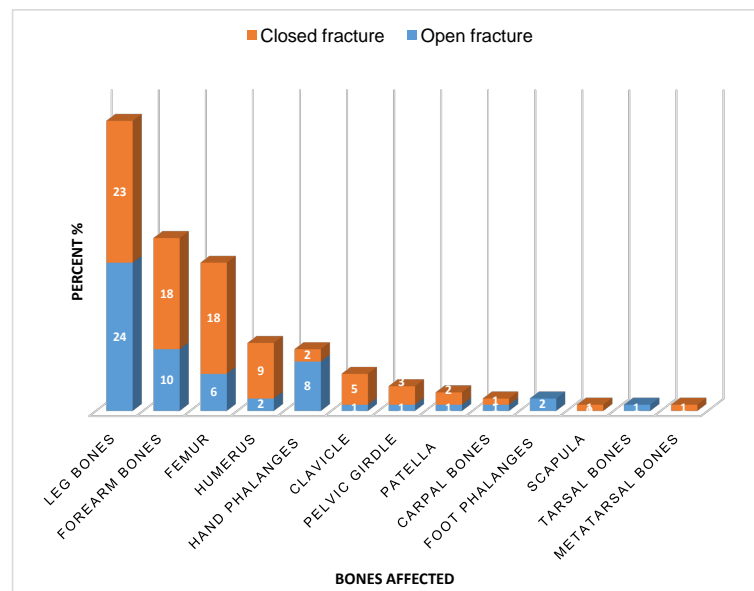


Figure 2. Affected bones (%).



Open fracture: 57 (40.7%)      Closed fracture: 83 (59.3%)

Figure 3. Broken bones and skin state (n).

Table 2. Support treatment and evolution.

	N	%
<b>Treatment</b>		
<i>Orthopedic</i>	71	64.5
<i>Surgical</i>	39	35.5

**Continued**

External fixator	14	35.9
Intramedullarynailing	8	20.5
Screw-plate	4	10.3
Plugging	4	10.3
Strapping	3	7.7
<i>Amputation</i>	<b>6</b>	<b>15.4</b>
<b>Evolution</b>		
Cured	106	96.4
Died	4	3.6

(13.2%) signed a refusal of treatment, 8 (7.2%) were transferred to a tertiary hospital and were treated at Katana. We considered that last group in the treatment and evolution section. We basically resorted to conservative treatment in 71 (64.5%) patients. Surgical treatment was performed 29 (35.5%) allocated as follows: external fixator 14 (12.7%), intramedullary nailing 8 (7.3%), screw-plate 4 (3.6%), plug 4 (13.6%), strapping 3 (2.7%) and amputation 6 (5.5%). One hundred six (95.4%) patients were discharged healed and we recorded 4 deaths (3.6 %).

#### 4. Discussion

Our work aimed at describing sociodemographic characteristics and clinical aspects, management and evolution of bone fractures limbs to KGRH, in Katana Health Zone in DRC.

It appears from our study that the age bracket 15 - 44 years is the most concerned (61%) and the median age is 30.1 (2 - 93) years. The age of our population is lower than other authors [7]. But our age results are close to those reported by some papers [5] [8] [9] [10]. The age of our study population is too young in contrast to high-income countries where age is bimodal due to the aging of the population, and particularly among those females because of induced osteoporosis by menopause [11] [12]. The young age in our study could be explained by the fact that this part of the population is very active and very exposed to violent accidents [5].

We recorded a clear predominance of the male sex, the sex ratio male/female being 2.7/1. Other authors have reached the same conclusion [1] [2] [4] [5] [8] [9] [10] [12] [13] [14]. The male carries the highest number of people in RTA and occupations involving a high risk of trauma [4] [5].

The informal occupation is the most affected (67.6%), followed by the students (23%). Our results agree with other authors [4] [15] [16]. This distribution involves several factors. First, in view of the insecurity in eastern DRC, the rural exodus is full swing and led to the spill of potentially displaced unemployed wars in the Bukavu town and surrounding territories. This occupational category,

generally uneducated wandering around in search of livelihood, is prone to injuries of any kind [5]. Indeed, the low socioeconomic level is an essential factor in the incidence of the road traffic fracture [17] [19]. Secondly, because of the abnormal movement of firearms, traders are subject to attacks by not further identified armed persons in order to extort goods [5].

The circumstances of fractures are mainly represented by the RTA, falls and firearms. The place of the different circumstances of trauma varies from one author to another and from one area to another. Conventionally, RTA are at the forefront [7] [8] [14] [18] [19]. The second place occupied by the falls is justified by configuration of the relief of this country side and the nature of its soil. Indeed Katana is a mountainous area with clay soil too slippery. Our results confirm those many authors [13] [20] [21]. As for fractures firearms, their rate is related to the context of insecurity in the eastern part of DRC. This unsafe context that has taken place in the eastern of DRC during the two last decades has been impacted the whole health system of the region as detailed by local researchers [6] [22] [23] [24]. In terms of the causes of trauma, Elachi IC *et al.* in Nigeria reported the accidents of traffic road followed by the firearms [9], while Woldemichael K and Berhanu N in Ethiopia recorded in descending order, bullets followed by the road traffic accidents [25]. Like us, they justify this distribution by the emergence of conflict zones in Africa. The results of this work differ somewhat from another study at Bukavu, county town of the province of South Kivu.

This study found that falls, firearms and road traffic accidents accounted respectively for 31.8%, 22.3% and 21.9% [5]. This reversal in the order in two closed area stems from several factors. First, compared to Katana, Bukavu is more mountainous with a highly rugged and lawless constructions are mushrooming, explaining the falls are the first cause of fractures. Secondly the high rate of road traffic accidents in Katana, rural area, is relative to the deterioration of road infrastructure, the poor condition of rolling machines, the low level of driver's education, the emergence of the use of motorcycles as means of transport in common and the lack of enforcement of road traffic rules. In order to meet the daily amount required by the owner's motorcycles, bikers use to charge two passengers at the same time each paying for his race. The on bus and truck loading is also a very common practice. Passengers laying on goods (baked bricks, boards, cassava) and oil cans, bags of embers, bundles of sugar cane spill off the bodies of trucks. Under these conditions, drivers can not appreciate the real wide of their car more than their real vehicles tonnage. The conjunction of this constellation of factors justifies the predominance of road traffic accidents as a cause of fractures in this rural study.

Of all the broken bones, those occurring at the tibia's segment rank first (33.3%), followed by the forearm (30%). Other authors have found similar results [7] [19]. Road traffic accidents being the most frequent in this work justifies the predilection of fractures of the tibia and or fibula because the leg is the height of a shock and wheel rolling machines [5]. However, other authors rec-

orded a predominance of fractures to the forearm bones [5] [15] [20] [26]. The falls as second causes reflects the broken bones in the forearm that victims are using the hands to cushion the impact which will be transmitted to the radius and ulna thereby causing a fracture of these bones [2] [5] [20]. However, Ibrahim *et al.* [2] and Bhaskara *et al.* [10] placed in the foreground femur fractures.

As for the skin condition, we noticed a predominance of closed fractures (59.3%) against open ones (40.7%). This distribution in our study is different from results of Da S. C. *et al.* in Burkina Faso who recorded a fairly high rate of closed fractures with 71.9% [7]. The reason may be the high proportion relatively open fractures in our study related to firearms. All open fracture, leg bones rank first (41.2%). The open fracture of leg bones is common because of subcutaneous bone and less soft tissue coverage of the tibia [27].

The management of fractures in this study is represented by orthopedic treatment (64.5%) and surgical support (35.5%). The use of orthopedic treatment is a reality in resource-limited countries due to the lack of technical equipment [6] [7]. Our amputation rate is 5.5%. The place occupied by trauma as cause of limbs amputations is a bite different from others authors such Talona *et al.* who incriminate first metabolic, infectious and vascular caused followed by trauma [28] [29].

One hundred and four (96.4%) of 110 patients treated were healed at discharge. However we noted a treatment refusal rate of 13.2% justified by the belief in traditional medicine, but also to poverty [5], the poverty rate being of 75.6% in South-Kivu [30]. The using of traditional medicine is commonly noticed by other authors [31]. We recorded a mortality rate of 3.6%. Our rate is high comparing to the one of Da S C *et al.* in Ouagadougou who reported 1% mortality [7].

### Limitations

This study has some limitations firstly linked to its retrospective design and all biais linked to that type of the study. It took only into account all patients admitted to that rural hospital without reflecting the real epidemiology of limbs fractures in the rural community where most of fractured patients are treated traditionally and by the fat do not arrive to the hospital.

### 5. Conclusion

Fractures of bones limbs occur in the young male. RTA falls and firearms are the mainly causes. The leg bones are the most relevant and frequently opened. The treatment is commonly orthopedic. The reduction of fracture rate in eastern DRC involves necessarily the development of road infrastructure, strict rules enforcement on the straight application of rolling machines and improving population security.

### Authors' Contributions

Kuyigwa T. Gconceptualized the study, designed the methodology, collected da-



ta and wrote the first manuscript. Musho C was involved in data collection and the writing of the first version of the paper. Mubenga M. L, Cikomola G. F, Budema M. P and Murhula B. G were involved in the edition and review of the first manuscript and Ahuka O L. for the revision of the final text before submission. All authors agreed with the actual version of the submitted manuscript.

## Conflicts of Interest

The authors declare that they have no competing interests.

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