

(RESEARCH ARTICLE)



## Spontaneous fractures in healthy postmenopausal women aged 55+ years in two health centers: Laquintinie Hospital and General Hospital, Douala, Cameroon

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### Abstract

**Background:** Women in their old age are facing some health issues due to physiological changes. It was observed many cases of osteoporosis during menopause. At that stage of their life, women undergo ovaries atrophy caused by hormonal imbalance. Estrogen deficiency is a leading cause of osteoporosis in postmenopausal women. That is why at menopause when its level drops women have fragile bones and are prone to fractures of many kinds. Fractures are associated with a high risk of morbidity which is why we aimed to identify and characterize the state of fractures in older women during menopause in our country.

**Method:** A survey was performed at the orthopedic-traumatology and rheumatology unit of 2 different health centers: Laquintinie Hospital of Douala and Douala General Hospital (DGH). Files of postmenopausal women admitted for fracture were screened. The data were analyzed by SPSS and statistical significance was considered when P-value < 0.05.

**Results:** 643 files of postmenopausal women admitted for fractures were analyzed. Results showed that 29% (186/643) of women at menopause aged above 55 years old had spontaneous fractures. The mean age was 71.89 years, ranging from 55 to 119 years. Falls and domestic accidents were the top two most represented causes (38.2 and 31.7 % respectively). Among those fractures, 70% happened after minimal trauma. The wrist was the favorite anatomical site for patients aged ranged between 55-64 years. As for UEF (Upper end of the femur) fracture, it increased in an age-related manner. Absence of trauma was observed the less in population aged between 55 and 64 years (11.5% ; P<0.001); and it was highest in women aged 85+ years (64%).

**Conclusion:** Postmenopausal women in our population have disabilities due to spontaneous fractures which impact negatively their quality of life. We should spread awareness among women before they reach menopause to take suitable measures to reduce the incidence of fractures and related morbidity at a certain age.

**Keywords:** Postmenopausal women; Spontaneous fracture; Simple fractures; Minimal trauma; Morbidity

### 1. Introduction

Advanced age is a stage of life where some skeletal structure and function are affected. This touch both men and women above 50 years. Bone structure turnover specifically the balance between resorption and formation is altered, with bone resorption exceeding bone formation (1). This is responsible for bone mineral density loss and subsequently the occurrence of osteoporosis. Women are the most affected gender (2). From the age of 65 years, women are at high risk of developing osteoporosis (3). In European countries, approximately 21% of women aged 50–84 years have osteoporosis (4). However, the prevalences vary from one region to another but remain high in most cases. Osteoporosis

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is highlighted in women due to menopause, either surgical or non-surgical (5, 6). Female gender and age are risk factors for osteoporosis and fractures (7). Menopause is characterized by sexual hormone imbalance. Estrogen, which is one of them, is less secreted in that period of life. Estrogen is a hormone involved in bone formation and growth. It is important for bone health and protects it from osteoporosis (8). So lower secretion of that hormone is responsible for skeletal fragility. Besides calcium absorption decrease with age and its deficiency is observed in postmenopausal women (9-11). Bones lose their density, their strength decrease, and become weak, easily breakable, and prone to fractures due to mild or no trauma (1, 12, 13). Women at menopause (pre, post, or perimenopause) are at risk of any kind of fracture due to bone mass density loss (14, 15). And the earlier the onset of menopause the higher is the risk of fracture due to important bone mass density loss (16-18). So, many disabilities are caused by those fractures. Fractures-related morbidity can be pain, reduced mobility, loss of function, and associated loss of quality of life (19). It is thus important to raise awareness about this public health problem. Calcium/vitamin D and bisphosphonates supplementation lower bone mass density loss and it is used in European, American, and Asian countries to lower the rate of osteoporosis and menopause-related fractures (20-23). In our area, the state of knowledge about fracture in menopausal women is not known. That is why we carried out this survey to identify and characterize fractures after menopause, to improve population health, and lower the social and economic burdens associated with related disabilities.

## 2. Material and methods

A retrospective study was carried out at the orthopedic-traumatology and rheumatology unit of Laquintinie Hospital of Douala and Douala General Hospital (DGH). Data from 5 years (1st January 2009 to 31 December 2014) were collected. The studied population was women aged above 55 years who reached menopause. Their files were collected from different services and data were collected during the investigation period. were included in postmenopausal women aged beyond 55 years with various types of fractures confirmed by X-ray. Women with fractures due to other health conditions like tumor or those who were not hospitalized or those with incomplete file information were excluded from the study.

A form was filled with information from each included patient's file. Sociodemographic information like age, profession, location, ethnicity, educational level, and marital status were collected. Also, the fracture site and affected body side (left or right) were mentioned in the form. All these pieces of information were analyzed.

SPSS 17 was used for statistical analysis. The different file information was introduced into CS pro 6.0 software. The  $\text{Chi}^2$  test was used to establish an association between different variables. P-value < 0.05 was considered statistically significant. GraphPad Prism 5 was used to generate graphics.

Information about patient identities was kept confidential. Each file was coded. Ethic research committee on human health research of both the University and chosen health centers (Laquintinie Hospital of Douala and General Hospital of Douala) have agreed to carry out this study.

## 3. Results

### 3.1. Patient's features description

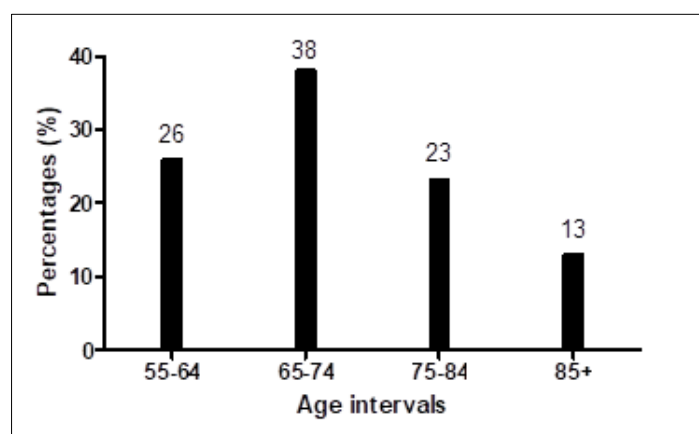


Figure 1 Patient distribution with age

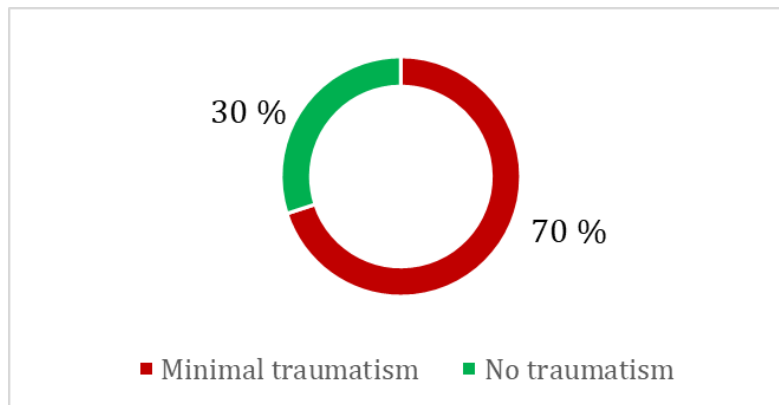
Six hundred and forty-three files were screened. Out of 643 screened files, 186 patients were postmenopausal women admitted for spontaneous fractures. Thus the prevalence was 29%. Some patients had 2 or more sites affected by the lesion. Overall 198 spontaneous fractures anatomical sites were reported for those 186 participants. This included 174 women with simple fractures (87.88%) and 12 of them who displayed multiple fractures (24 anatomical sites) (12.12%). Women's ages ranged from 55 to 119 years. The mean age was 71.89 years and the median age was 72 years (SD: 10.7). The most represented age range was 65-74 years (38%) (Figure 1). The majority of women with simple spontaneous fractures in our study were from west region 77/186 (41.4%).

### 3.2. Fracture origins and anatomical sites

We found several possible sources of fracture within the studied population. They varied from simple falls for some cases to non-specific identified cause for others. Falls and domestic accidents were the top two most represented causes with 38.2 and 31.7 % respectively (Table 1 ). Out of all these fractures from different origins, the majority, 70% happened after a minimal physical trauma. Thus none of the remaining patients (56) had their fracture due to physical trauma (30%) (Figure 2 ).

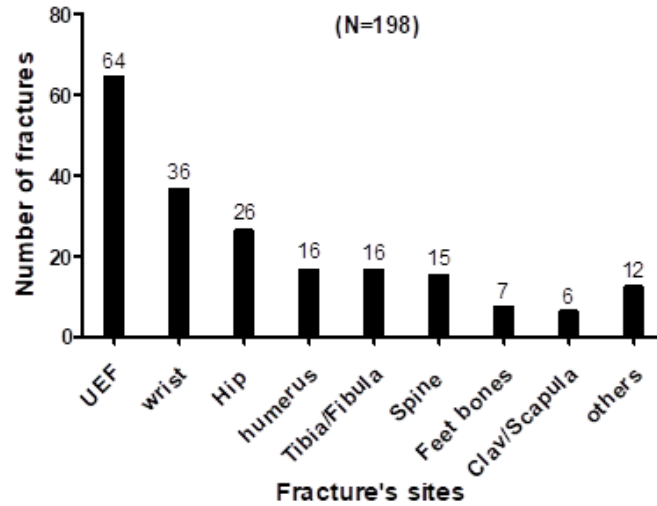
**Table 1** Fracture origins

Fracture origins	Counts (N)	%
Falls	71	38.2
Domestic accident	59	31.7
Old fracture	9	4.8
Unknown	47	25.3
Total	186	100



**Figure 2** Type of fractures

The lesions were located all over the body. Many anatomic sites were identified. That is why the total account of anatomical sites for the 186 files was 198 including simple and multiple fractures. The cases of multiple fractures per patient were distributed as 3 cases of humerus and wrist fractures, 3 cases of wrist and UEF (Upper end of the femur), 4 cases of UEF and hip, 1 case of humerus and hip, finally 1 case of hip and wrist. The most represented anatomical site was UEF (64/198) followed by wrist (36/198) and hip (26/198) (Figure 3). All these lesions were unequally present on both body sides. The right side was less represented than the left one with a rate of 42.7%. As for the left side, the rate of fracture was 57.3%.



UEF = Upper end of femur; Clav/Scapula = Clavicle/scapula; Others = sternum, ribs, mandible

**Figure 3** Numbers of fractures for each sites

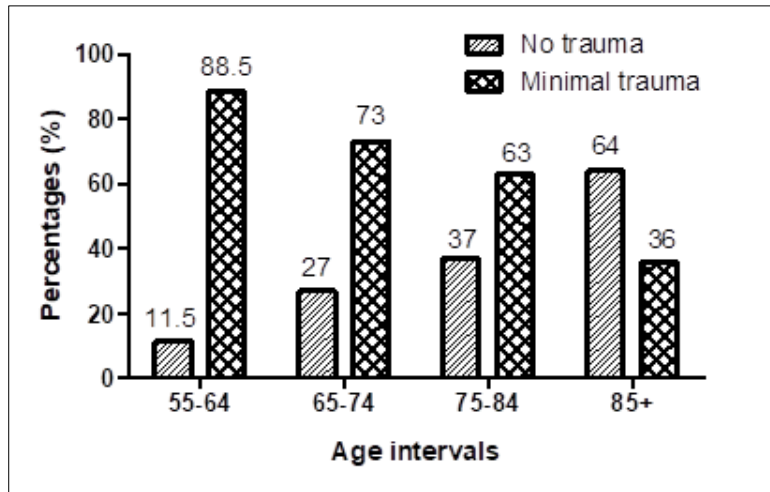
Age-related fracture distribution was assessed. Our results showed that the wrist was the favorite anatomical site for patients aged ranged between 55-64 years. UEF fracture increased in an age-related manner. More the patients were older more we observed an increased fracture rate. We found 34.9%; 50% and 56% for 65-74; 75-84 and 85+ years participant age intervals respectively (Table 2). Furthermore, the majority of women included in this study had fractures with minimal trauma. Fractures with minimal trauma, compared to the ones due to no physical trauma, decreased gradually in an age-related manner. It touched mostly patients from 55-64 (88.5%); 65-74 (73%) and 75-84 (63%) age ranges population respectively. Besides, the absence of trauma was observed the less in population aged between 55 and 64 (11.5% ;  $P < 0.001$ ); and it was highest in women aged 85+ years (64%). The pattern of fracture with no trauma rates raised in an age-related manner. The more the patient was old the more the frequency of fracture without trauma (figure 4).

**Table 2** Ages association distribution with anatomical sites

Ages (years)	The upper end of the femur (UEF)*	wrist	Hip	humerus	Tibia/Fibula	Spine	Foot bones*	Clavicle/Scapula	Others*
55-64	9.6	28.8	11.5	7.7	11.5	9.6	13.4	3.2	7.7
65-74	34.9	15.8	12.7	7.9	9.5	11.5	0.0	4.7	7.9
75-84	50	13	17.4	6.5	4.3	4.3	0.0	0.0	6.5
85+	56	20	16	12	8	4	0.0	4	0.0

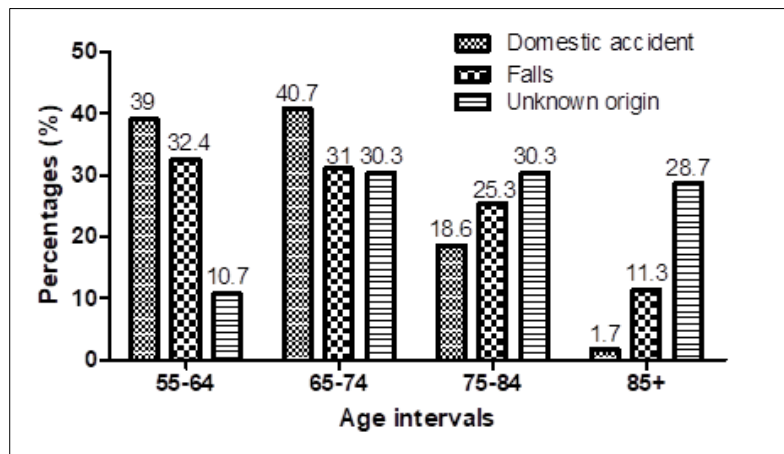
UEF: femur head, femur neck and trochanteric mass; Foot bones: astragal, phalanges ; Others: sternum, ribs, mandible

According to fracture origins, we reported no significant association between any of the causes and increasing age. More the patients were old more the causes of their fractures were not defined, from 55-64 to 65-74 (from 10.7% to 30.3% respectively). Above 65 years, the percentage of fractures from unknown origin remains almost the same (between 28.7 to 30.3%). Domestic accidents as the cause were reported nearly at the same frequencies in the population aged between 55-64 years and 65-74 years (39% and 40.7% respectively). The domestic accident causes ratio dropped with age at 75 years to 88+ years. It is the lowest at 85+ years (1.7%). Falls were described in the majority of the population of ages 55-64 and 65-74 years old (32.4% and 31% respectively). The frequency decreased gradually with age. At 85+ years few of the patients have had the fracture due to falls (11.2%) (Figure 5).



**Figure 4** Traumatic and nontraumatic fracture distributions with ages

Fractures distribution according to their anatomical location and origin showed that UEF fractures occurred half of the time during domestic accidents (21.9%) and falls (28.1%). The remaining 50% of cases were not due to specific causes. Besides, Clavicle/Scapula (83.3%) and humerus fractures (46.7%) were related to domestic accidents. While wrist (41.7%), tibia/Fibula (43.8%), hip (53.8%) and foot bones (71.4%), and others (sternum, ribs, mandible; 50%) were generally associated with falls (Table 3).



**Figure 5** Fracture distributions with ages and causes

**Table 3** Fracture distributions with anatomical sites and origins

	Domestic accidents (%)	Falls (%)	Unknown causes (%)
Clavicle/Scapula	83.3	16.7	0
humerus	46.7	40.0	13.3
wrist	38.9	41.7	19.4
Hip	26.9	53.8	19.2
The upper end of the femur (UEF)*	21.9	28.1	50
Tibia/Fibula	31.3	43.8	25
Foot bones*	28.6	71.4	0
Others*	41.7	50.0	8.3

#### 4. Discussion

Our analysis showed that 29% of postmenopausal women aged 55+ years had spontaneous fractures (186/643) at different sites, characterized mostly by simple fractures (87.88%). The prevalence of fractures in women at the menopause stage varies from one population to another. That is why it was reported in one study 29% of fractures in black people, 9% Chinese, 7% Hispanic, 11% Japanese, and 44% white (16). Calcium is a major mineral required for bone formation. It is known that calcium level decrease during menopause (10, 11, 24), and supplementation reduces bone loss and decreases fractures rate in individuals with low calcium level including postmenopausal women (21, 23). Calcium deficiency might be the major cause of fractures in our population. Besides, Women in our country use to carry many pregnancies in their lifetime. Pregnancies and breastfeeding disrupt the balance between calcium dietary intake and body needs (25). A local study highlighted a hypocalcemia rate of 59% in late pregnancy. This prevalence increase according to the number of pregnancy carried. It is the highest (62.82%) in women who declared 2 to 3 childbearing (26). Other investigations showed that multiparity increases the rate of hypocalcemia (27). These arguments could be the reason for hypocalcemia and thus the increased rate of spontaneous fracture in postmenopausal women in Douala town.

Our population is black women and the rate of fractures is similar to that of the study mentioned previously in the same race (16). It is known that the Black American population is deficient in vitamin D. In the black population low bone mineral density is closely related to vitamin D deficiency (28-31). A study carried out in South-West Cameroon showed a hypovitaminosis D prevalence of 25.8% in the adult population of  $53.7 \pm 0.6$  years mean age (32). This can explain the high rate of fracture in black postmenopausal women than in Chinese, Japanese, or Hispanic women. In our study vitamin D deficiency is less likely to be the cause of fractures. Because in Africa vitamin D deficiency varies from one side of the continent to another. Overall, hypovitaminosis D is less observed in Sub-Saharan Africa than in the north and south side of the continent (33, 34). None or less hypovitaminosis D cases were reported in Equatorial African countries, to which belong Cameroon (35).

Besides the majority of women with simple spontaneous fractures in our study were from the west region 77/186 (41.4%). Low dietary calcium intake might be more important there than in the remaining areas. Calcium deficiency leads to osteoporosis. In the literature, a result from Singapore showed that from age 65 to 99 years, women are at high risk of developing osteoporosis, and above 45 they are at medium risk (3). Estrogen deficiency is a major cause of osteoporosis in women at menopause and it leads to bone fragility (1). We found a mean age of 71.89 years and the most represented age range was 65-74 years in our study. It was demonstrated in Korean women that advanced age (56-60) and duration of menopause are associated with an elevated rate of osteoporosis (62.7%) (36). The more the postmenopausal period is high ( $\geq 10$  years) more is the risk of osteoporosis (64.1%) (36).

In our research, falls and domestic accidents were the most represented causes of fractures with rates of 38.2 and 31.7 % respectively. Domestic accidents were reported almost at the same frequencies in the population aged between 55-64 years and 65-74 years (39% and 40.7% respectively). The domestic accident causes ratio decreased with age. Falls were described in the majority of the population of ages 55-64 and 65-74 years old (32.4% and 31% respectively). Its frequency decreases in an age-related manner. At 85+ years few of the patients have had the fracture due to falls (11.2%). Osteoporotic fractures usually result from falls from a standing height or less in individuals with decreased bone strength (19). The majority, 70% of fractures happened after a minimal physical trauma. Approximately 50% of first or subsequent minimal trauma fractures occur in people who have T-scores in the normal or osteopenia range (19). This means that minimal trauma occurs when the bone health did not reach the stage of osteoporosis. It can happen when the bone is normal or if there is osteopenia, a stage before osteoporosis. There is evidence that 70% of minimal trauma fractures occur in women, with increasing incidence related to age in both men and women. And then the residual lifetime risk of minimal trauma fracture is approximately 44% for women older than 60 years of age (19). Non-traumatic fracture on the other hand is related to low bone mineral density and estrogen insufficiency (37).

The most represented anatomical site was UEF (64/198) followed by wrist (36/198) and hip (26/198), unequally distributed all over the body. The wrist was the favorite anatomical site for patients aged ranged between 55-64 years. In Rotterdam, a study showed a high incidence of wrist (7.3%) and hip (6.9%) fractures (38). A wrist fracture is responsible for clinical functional decline in women aged 65+ years (39). More the patients are older more we observed an increased fracture rate. It is the case of UEF fracture whose prevalence increased in an age-related manner. In a study carried out by Shieh *et al.*, it was shown that fractures occurred most frequently at distal appendicular sites, with ankle, wrist, and foot being the most common sites (16). Other findings showed that the most common fragility fractures occur at the hip, wrist, spine, humerus, or pelvis (2). The hip fracture rate is high in white women aged between 70-79 years (43.1%) and increases at age 80+ years (56.9%) (40). Between the ages of 50 and 69, non-hip, non-vertebral fractures (humerus, ankle, lower limb, rib, forearm, pelvis, forearm [not wrist], patella, foot, and hand) are the most common

minimal trauma fracture types in both men and women. Wrist fractures are also common in women in this age group. The hip-fracture rate increases substantially with age, constituting only 4% of fragility fractures in women 50–69 years of age, but 26% of fractures in women older than 70 years of age (19).

We observed that most of the UEF fractures (50% cases) were not due to specific causes. Besides, Clavicle/Scapula (83.3%) and humerus fractures (46.7%) were related to domestic accidents. While wrist (41.7%), tibia/Fibula (43.8%), hip (53.8%), and foot bones (71.4%) were generally caused by falls. Data from European countries showed that approximately 21% of women aged 50–84 years have osteoporosis. Their outcomes showed that common sites for osteoporotic fracture are the spine, hip, distal forearm, and proximal humerus (4). And also probability of osteoporosis at 50 in women (in EU) is hip (22.9), forearm (20.8), spine (15.1), and humerus (12.9). At 80 years the probability is hip (49.3), forearm (8.9), spine (8.7), humerus (17.7) (4). Our results showed that the more the patients were old more the causes of their fractures were not defined. At 85 years and above the rate of unknown origin fracture was the highest (64%).

Some authors highlighted the fact that from 50 years of age number of women with osteoporosis increase gradually in age depending manner. The prevalences vary from 6.3% for women aged between 50 and 54 to 47.2% at 80+ years (4). This observation can explain the origin of spontaneous fractures in our population at 85+ years, which may be caused by the high rate of osteoporosis observed at that stage of life.

We did not investigate the origins of fracture in the studied subjects. They could be mostly due to osteoporosis, calcium and/or vitamin D deficiency, or other underlying pathologies. It was proved that morbidity associated with fractures in women at menopause is significant and can be chronic kidney disease (CKD), parathyroid gland dysfunction (7, 28). Those hypothesis will be investigated in further studies.

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## 5. Conclusion

Results showed that 29% of postmenopausal women above age 55 were subject to spontaneous fractures either caused by minor or without any trauma. This can affect negatively their quality of life by constituting a familial, social, and financial burden. Falls and domestic accidents were the main causes of spontaneous fractures in our population. We should consider implementing awareness strategies and guidelines to improve health condition of postmenopausal women in our population, and thereby reduce morbidity associated with fractures. Supplementation in Calcium and bisphosphonates may be an option, to begin with.

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## Compliance with ethical standards

### *Acknowledgments*

We thank Laquintinie Hospital of Douala and Douala General Hospital clinical laboratories for their assistance during the period of study.

### *Disclosure of conflict of interest*

There is no conflict of interest.

### *Statement of ethical approval*

We received the authorization N°CEI-UD/155/02/2015/T of the Institutional ethic committee for research on human health at the University of Douala to perform this study. The institutional clearances N°3338/AR/MINSANTE/DHL/CM and N°074AR/MINSANTE/HGD/DM/02/15 were granted by the Directors of Laquintinie Hospital of Douala and Douala General Hospital respectively

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