Scientific Research Publishing

Open Journal of Orthopedics, 2025, 15(6), 232-242
https://www.scirp.org/journal/ojo
ISSN Online: 2164-3016
ISSN Print: 2164-3008

Prevalence, Aetiology, and Outcomes of Pathological Fractures in the Douala General Hospital: A 5-Year Retrospective Study

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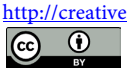
How to cite this paper: Laure, I., Nana, T.C., Martins, M.D., Marie-Ange, N.Y., Kikah, N.E., Ndom, A.D., Boukar, E., Mertens, B.F., Daudet, B. and Pius, F. (2025) Prevalence, Aetiology, and Outcomes of Pathological Fractures in the Douala General Hospital: A 5-Year Retrospective Study. *Open Journal of Orthopedics*, **15**, 232-242.
https://doi.org/10.4236/ojo.2025.156023

Received: March 23, 2025
Accepted: June 27, 2025
Published: June 30, 2025



Abstract

Introduction: Pathological fractures (PF) have a global prevalence of about 28%. Treatment requires a well-defined standardised plan, and a holistic approach of the cases while considering their somewhat poor prognosis especially in settings with limited diagnostic and therapeutic facilities. Our aim is therefore to describe the characteristics of pathological fractures diagnosed and treated in the Douala General Hospital, a level referral Hospital in Cameroon. **Methods:** This is a 5-year retrospective study carried out from 1st January 2018 to 31st December 2022. Files of patients with pathological fractures were included. Clinical data including the age, the occupation, and etiology of the pathological fractures, type of fracture, the treatment and the outcomes were recorded. Analysis was done using the Statistical Package for Social Sciences (SPSS) version 25 (P-value < 0.005; CI = 95%). **Results:** A total of 1320 cases of fractures were treated during the study period, amongst which 66 were pathological fractures, representing a prevalence of 5% in the DGH. However, 2 files of PF were excluded due to incomplete information. Hence, 64 files were considered for analysis; The mean age was 62.59 ± 16.34 years. Most cases were due to osteoporosis (51.6%), breast cancer metastasis (25%) and multiple myeloma (15.6%). Surgery was the most common treatment modality used (48.4%), including internal fixation, arthroplasty and external fixation. There was a significant association between the aetiologies of PF and management options. 84.4% of cases were discharged while 15.6% passed away. After discharge, 7.8% cases were reported dead, 45.3% of cases were loss of follow-up, 23.4% recovered with disability and 7.8% com-

pletely recovered. **Conclusion:** The occurrence of PF in the DGH is relatively low, with a higher incidence among females. Osteoporosis was the most common underlying aetiology. Available treatments, which include surgery, immobilization technics and adjuvant therapy unfortunately tend to result in poor outcomes and it was more pronounced on osteoporotic PF.

Keywords

Pathological Fractures, Malignancy, Bone Metastasis, Osteoporosis

1. Introduction

A pathological fracture occurs in a bone with an underlying medical or structural pathology; and is usually caused by a low energy injury mechanism [1]. The most commonly recorded pathologies include osteoporosis; metastatic bone disease, primary bone malignancies and bone infections [2]. The burden of pathological fracture has been on the rise amongst patients with bone malignancies, and it is a major and often devastating occurrence in the advancement of metastatic bone disease [3]. It detrimentally affects patient quality of life and often necessitates orthopaedic complex and well-defined treatment plan [4]. However, the management of pathological fractures is challenging to the orthopaedic team given the numerous factors to be considered in the decision tree of the treatment. Cases of primary and/or secondary bone malignancies will require a combination of surgery, chemotherapy and radiation therapy so as to improve outcomes [5]. However, survival rates after such fractures are as low as, about 3 months [3].

In Africa, research on pathological fractures is sparse. A study from Kenya in 2007 identified bone malignancy as the leading cause of pathological fracture [6]. Our objective is to present local data from the Douala General Hospital (DGH) to foster research on pathological fractures in our context, and factors affecting its prognostic. More specifically, we aim to determine the prevalence, to identify the aetiology, to describe the management methods employed at the DGH for pathological fractures.

2. Patients and Methods

2.1. Study Design

This was a hospital based retrospective study of files of patients with pathological fractures who were admitted and treated at the Douala General hospital within a period of 5 years from 1st January 2018 to 31st December 2022. The Douala General Hospital is a Category I referral hospital located in Douala, the economic capital of Cameroon. Files of patients were collected from the surgical and oncology as well as the oncology-radiotherapy department.

1) Study population and sampling: this study involved all patients admitted for a pathological fracture and treated in the Douala General hospital within the 5

years period. The sampling was done in a consecutive manner.

2) Selection criteria

Inclusion criteria: all patients with pathological fractures that were admitted and treated in the DGH within the study period were included in the study

Exclusion criteria: Files with incomplete relevant information and those who had initial surgical care from another health facility were excluded.

3) Study procedure

Ethical and administrative issues

Ethical approval was obtained from the institutional review board (IRB) of the Faculty of Health Sciences of the University of Buea, and administrative clearances were obtained from the Medical Directorate of the DGH.

2.2. Data Collection and Analyses

Files of patients with pathological fractures who were treated within the study period were retrieved from the record archives of the surgical and oncology departments of the DGH. Registers of the operating room, emergency department, and intensive care units were equally consulted to complement patients' information. Variables that were considered for analysis include:

- The Demographic information: Age, gender, marital status, occupation,
- Medical history: co-morbidity, drug history, aetiology and mechanism of the fractures, smoking and alcohol intake.
- Fracture characteristics: the type, the bone involved.
- Treatment options and outcome (discharged, referred, or dead). Data was entered in well-structured pre-tested data entry form and analysed using IBM SPSS Statistics 26 and Microsoft Excel.

3. Results

A total of 1320 cases of fractures were treated during the study period, amongst which 66 were pathological fractures, representing a prevalence of 5% in the DGH. However, 2 files of PF were excluded due to incomplete information. Hence 64 files were considered for analysis.

3.1. Sociodemographic Characteristics

As shown in Table 1, 27 (42.2%) were males and 37 (57.8%) were females. Their ages ranged from 13 to 90 years with a mean age of 62.59 $\pm$ 16.34 years. The age group of 70 - 79 years was the most represented (28.1%, n = 18). Majority of patients were unemployed and married.

3.2. Characteristics of the Fractures

1) Underlying bone pathology: the most common underlying bone pathologies were metabolic anomaly, ie osteoporosis in 37 cases (57.8%) cases, metastatic bone tumours in 16 (25%) cases primary bone tumours in 10 (15.6%) cases, and 1 (1.6%) case of osteomyelitis, as shown in Figure 1.

2) Aetiology according to the Age groups

Taking a look at the aetiologies and age groups; the one of less than 20 years old had primary bone tumours as only aetiology, the age group of 30-39 had metastatic bone tumour as the only aetiology. Metastatic bone tumours (n = 3, 50%) and primary bone tumours (n = 3, 50%) were the aetiologies found in the age group of 40 - 49. Then from 50 - 90 years, PF were due to metabolic aetiologies as seen on Table 2 below.

Table 1. Sociodemographic characteristics of the study population.

	Variables	Frequency	Proportion (%)
Gender	Male	27	42.2
	Female	37	57.8
	Total	64	100
Age groups	<20	3	4.6
	30 - 39	1	1.6
	40 - 49	6	9.4
	50 - 59	15	23.4
	60 - 69	12	18.7
	70 - 79	18	28.1
	80 - 90	9	14.1
	Total	64	100
Occupation	Private sector	2	3.1
	Civil servant	11	17.1
	Unemployed	26	40.6
	Student	3	4.6
	Retired	15	23.4
	Self-employed	6	9.3
	Unspecified	1	1.5
	Total	64	100
Marital status	Single	4	6.2
	Married	33	51.5
	Widow/widower	15	23.4
	Unspecified	12	18.7
	Total	64	100

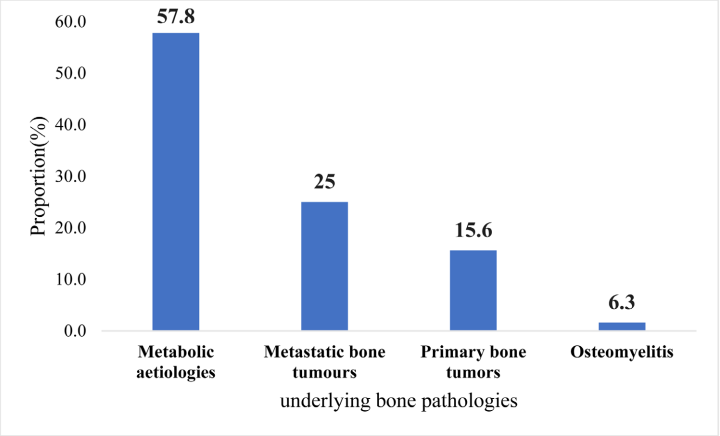


Figure 1. Aetiologies of pathological fractures.

Table 2. Aetiology according to the age groups.

Age groups	Frequency	Most Common Aetiology Percentage
<20	3	Primary bone tumours (100%)
30 - 39	1	Metastatic bone tumours (100%)
40 - 49	6	Metastatic bone tumours (50%) Primary bone tumours (50%)
50 - 59	15	Metabolic aetiologies (46.7%)
60 - 69	12	Metabolic aetiologies (75%)
70 - 79	18	Metabolic aetiologies (66.7%)
≥80	9	Metabolic aetiologies (100%)

3) Characteristics of the fractures

Out of the 64 cases, 61 (96.9%) were closed fractures while 2 (3.1%) were open fractures. The femur (n = 43, 61.4%) was the most common bone affected shown in Figure 2.

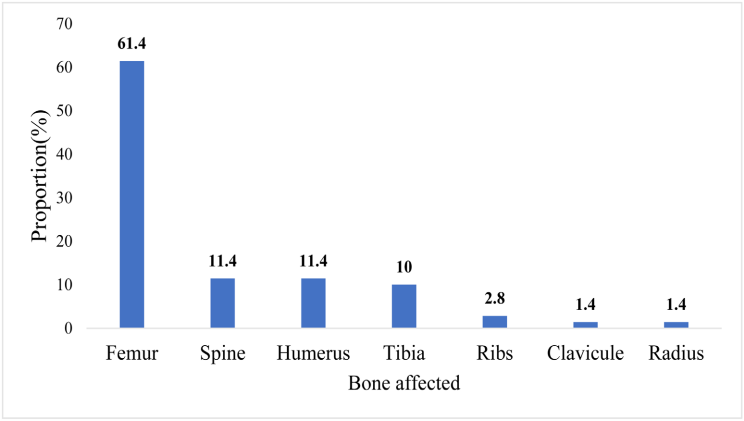


Figure 2. Bone affected by the pathological fractures.

3.3. Metabolic Aetiologies of Pathological Fractures

Pathological fractures due to osteoporosis occurred mostly in the proximal part of femur (22 cases); Similarly, PF related to renal osteodystrophy happened on the proximal part of the femur (3 cases out of 4), as shown in Table 3.

Table 3. Metabolic aetiologies of pathological fractures.

Metabolic aetiologies	Femur		Tibia		Distal Radius	Proximal Humerus
	Proximal Femur	Distal Femur	Distal Tibia	Proximal Tibia		
Osteoporosis	22	4	4	1	1	2
Renal osteodystrophy	3	0	0	0	0	1

3.4. Metastatic Bone Tumours Aetiologies

Metastatic bone tumour aetiologies included 10 (62.5%) cases from breast cancer, 4 (25%) cases from prostate cancer, 1 (6.2%) case from ovarian cancer and 1 (6.2%) case from bronchial cancer. With respect to the bone affected, majority of cases of PF due to breast cancer metastasis occurred in the proximal part of the femur. Pathological fracture related to prostate cancer metastasis occurred in the shaft and the proximal part of the femur, humeral shaft and the lumbar spine. Those due to ovarian and bronchial cancer metastasis occurred in the thoracic spine and the proximal part of the humerus respectively, as shown in Table 4.

Table 4. Metastatic bone tumours.

Metastatic bone tumours aetiologies	Femur		Humerus		Spine		Ribs	Clavicule
	Femoral shaft	Proximal Femur	Humeral shaft	Proximal Humerus	Thoracic Spine	Lumbar Spine		
Breast	0	7	1	0	0	1	1	1
Bronchial	0	0	0	1	0	0	0	0
Ovarian	0	0	0	0	1	0	0	0
Prostate	1	1	1	0	0	1	0	0

3.5. Primary Bone Tumours Aetiologies

There were 5 cases of multiple myeloma, 2 cases of osteosarcoma, 2 cases of bone cysts and 1 case of lymphoma. Pathological fracture caused by multiple myeloma occurred mostly in the proximal part of the femur (3cases) then the thoracic spine (2cases). PF due to osteosarcoma affected the thoracic spine and the proximal part of tibia. Those due to bone cysts occurred on the proximal part of the femur and the tibia, as represented in Table 5.

Table 5. Primary bone tumours.

Primary bone tumours aetiologies	Spine		Humerus	Femur	Tibia	Ribs
	Lumbar Spine	Thoracic Spine	Humeral shaft	Proximal Femur	Proximal Tibia	
Bone cyst	0	0	0	1	1	0
Lymphoma	1	0	0	0	0	0
Multiple myeloma	1	2	1	3	0	1
Osteosarcoma	0	1	0	0	1	0

4. Management Modalities of Pathological Fractures

A total of 31 (48.4%) cases underwent surgery while the rest had non-operative treatment. The operative modalities included external fixation, internal fixation, arthroplasty and amputation.

For cases of osteoporosis, operative treatment included internal fixation (n = 16; 64%), arthroplasty (n = 7, 28%) and external fixation (n = 2; 8%). While non-operative included immobilisation technics (n = 23; 69.6%).

For cases due to metastatic bone tumours, adjuvant therapy was done including radiotherapy (n = 12; 63.2%), chemotherapy (n = 8; 61.5%) and Bisphosphonates (n = 4; 80%). While PF due to primary bone tumours received radiotherapy (n = 7; 36.8%), chemotherapy (n = 5; 38.5%) and Bisphosphonates (n = 1; 20%). All cases due to renal osteodystrophy were on dialysis (n = 4; 100%).

On bivariate analysis using the Chi-square test and the Fisher exact test (with a CI = 95%, P-value = 0.05); there was a significant association between the osteoporosis status and the management of PF (P-value = 0.000). Moreover, significant association was found between PF from metastatic bone tumour and the management (P-value = 0.001), as represented in Table 6.

Table 6. Factors associated with the treatment modalities.

Variables	Non-operative treatment	Operative treatment	P-value
Renal osteodystrophy	2	2	1.000
Metastatic bone tumours	13	2	0.001
Osteoporosis	8	25	0.000
Primary bone tumours	8	2	0.172

5. Outcomes of Pathological Fractures

A total of 54 (84.4%) cases were discharged; while 10 (15.6%) cases died during hospitalisation.

On bivariate analysis using chi-square test and Fisher exact test (CI = 95%, P-value = 0.05); there was a significant association between PF due to osteoporosis

and the loss of follow-up (P-value = 0.045), as shown in Table 7.

Table 7. Aetiologies associated to the outcomes.

Aetiologies	Discharged	Deceased	Loss of follow-up	Complete recovery	Recovery with disability	P-value
Osteoporosis	27	9	11	4	9	0.045
Metastatic bone tumours	12	6	9	0	1	0.089
Primary bone tumours	10	0	5	1	4	0.100
Renal osteodystrophy	4	0	3	0	1	0.321
Osteomyelitis	1	0	1	0	0	1.000

No significant association were found between the treatment modality done and the outcomes.

6. Discussion

In this study, the prevalence of pathological fractures (PF) was 5%. This is close to the 8.95% reported by Wejdi *et al.* (2019) in Iraq [7]. However, this value contrasts with the 28% prevalence observed by Dutra de Resende *et al.* (2023) in Brazil [8]. This can be explained by the fact that their study was an observational retrospective cohort design and focused on PF due to metastatic bone tumors in a palliative care setting. This prevalence of PF in our study could be higher but it is not so because it is a condition that is often misdiagnosed or underdiagnosed in the field, contrary to traumatic causes of fractures. The female predominance of this study is because majority of them had osteoporosis as etiology, which predominates in the elderly. This gender discrepancy may be due to hormonal changes during the post-menopausal phase in women, which affect bone mineral density, thus increasing the predisposition to osteoporosis and subsequent PF. These demographics align with the findings of Angelini *et al.* (2018) in Italy [9], who noted a female prevalence of 72.50% and a mean age of 63.6 years on admission.

Osteoporosis was the leading cause of PF in our study (n = 33, 51.60%), similar to the findings of Wejdi *et al.* (2023) in Iraq [7], who found osteoporosis as the primary cause in 38.20% of cases. The prevalence of osteoporosis in the elderly and predominantly female population is related to decreased bone mineral density, thereby increasing the risk of osteoporotic fractures especially in the proximal femur which was the most frequently affected site (n = 20). These findings are comparable to those of Warriner *et al.* (2011) in Alabama, USA [10], who identified the femoral neck as a common site of osteoporotic fractures.

Metastatic bone tumours were the second most common aetiology of PF (n = 16, 25%), because majority of the primary cancers identified are osteophylic. This is similar to the studies done by Angelini *et al.* (2018) in Italy [9] and Dutra de Resende *et al.* (2023) in Brazil [8], who reported a prevalence of 50% and 40%, respectively. The differences in percentages may be due to their studies focusing solely on PF caused by metastasis bone tumours. In this research, PF caused by

breast cancer metastasis predominantly affected the proximal femur, corroborating findings by Axelrod *et al*. (2021) in Canada [11], who noted breast cancer metastasis tends to spread to the femur.

Multiple myeloma was the most common primary tumour causing PF, in contrast to the study by Godley *et al*. (2011) in Scotland, UK [12], who reported osteosarcoma as the principal cause of primary bone tumors in PF cases. This difference could be due to the younger population in their study, whereas multiple myeloma shows a higher predilection for black races [13]. Similar to the aforementioned PF etiologies, multiple myeloma predominantly affected the proximal femur. These findings are similar the reports by Wanman *et al*. (2023) in Sweden [14] and Wejdi *et al*. (2019) in Iraq [7], who indicated the lower extremities, specifically the femur, as frequent sites of PF. However, this differs from the work of Kuriakose *et al*. (2024) in India [15], in which the dorsal spine was the most common PF location. The discrepancy may be due to the fact that their main aetiology of PF was lung cancer metastasis, which tends to spread to the spine rather than the axial skeleton, contrary to our findings where osteoporosis and breast cancer metastasis predominantly affect the femur [16].

Surgical treatment was the commonest treatment modality in our study, this can be explained by the fact that majority of the patients were osteoporotic cases who had proximal femur PF, that warranted use of internal fixation (n = 16; 64%) and hip arthroplasty (n = 7, 28%). This parallels the findings of Wanman *et al*. (2023) in Sweden [14], whose treatments were primarily surgical (66%) with the remainder being non-operative. Yet, this differs from the study by Angelini *et al*. (2018) in Italy [9], where internal fixation surgery was the exclusive treatment in all PF cases, often in conjunction with radiotherapy, chemotherapy, or both.

Furthermore, we identified a significant association between operative treatment and osteoporotic PF, suggesting that patients with osteoporotic PF which tend to occur more on the proximal femur are more likely to receive surgical intervention compared to those without.

There was also a notable association between PF from metastatic tumors and the treatment approach, indicating that PF cases of metastatic origin are less likely to undergo surgery compared to non-metastatic cases. This could be due to the advanced stage of the tumor in metastatic PF cases, rendering patients less suitable for surgical intervention and more in need of palliative care through adjuvant therapy.

In this study, three-quarters of the osteoporotic cases treated surgically were discharged, reflecting the high level of care provided at DGH, a category I referral hospital. However, this was accompanied by a high rate of loss to follow-up. Furthermore, the majority of deaths in our study were attributable to osteoporotic PF. Given that our study was primarily elderly, these findings are in line with the research by Nazrun *et al*. (2014) in Malaysia [17], which indicated a strong association between osteoporotic PF and elevated mortality; thus, the majority of our loss to follow-up cases may be due to deceased patients.

Strengths: No published data have been found in the literature that assessed the prevalence, the aetiology, and the outcomes of PF in Cameroon. This finding will contribute to set initial data for future research on pathological fractures in Cameroon.

Limitations: This study was a retrospective, therefore files where useful relevant information couldn't be obtained were rejected. Moreover, the sample size was small because it wasn't a multicentric study.

7. Conclusion

We therefore conclude that the prevalence of pathological fracture in the DGH is relatively low. Osteoporosis was the most dominant metabolic aetiology of pathologic fractures, followed by metastatic breast cancer. Surgery by internal fixation and arthroplasty were the main management methods of pathological fractures in the DGH. After discharge, majority of patients had a loss of follow-up; and those who survived reported incomplete recovery of function. Osteoporotic pathological fractures were associated with high mortality.

Conflicts of Interest

The authors declare no conflict of interests regarding the publication of this paper.

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