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Patterns and Distribution of Bone Tumors among Patients at Kumi Orthopaedic Center: A Retrospective Study

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Abstract

Introduction: Primary bone tumors, although rare, are an important rising cause of morbidity and mortality in Africa. Late presentation, delayed diagnosis, and failure to obtain proper management are important causes of loss of limbs and lives especially in Sub-Saharan Africa. Existing data on primary bone tumors in Uganda for the various regional levels is limited. This study aimed to determine the patterns and distributions of primary bone tumors especially in rural Uganda. **Methods:** This was a retrospective study carried out at Kumi Orthopaedic Center from 2012 to 2023. Patients' information regarding the histological type of bone tumor, age, sex, and tumor site was obtained from their files. **Results:** A total of 115 bone tumors were seen over the study period. The mean age of patients was 30 years ± 20.1 years (range: 1 to 80 years). The majority of the patients were males 67 (58.3%) and females were 48 (42.6%). Benign tumors accounted for 66 (57.4%) of the tumors while malignant tumors were 49 (42.6%). Most tumors (both benign and malignant) were found in patients between the ages of 11 to 20 years 46 (40.1%) followed by those between 21 to 30 years 15 (13.2%) and the least were in the elderly aged 71 to 80 years 4 (3.5%). The commonest benign tumors were osteochondroma 14 (21.2%), cysts 11 (16.7%), hemangiomas 9 (13.6%), and fibrous dysplasia of the bone 8 (12.1%). The commonest malignant tumors were plasmacytoma 10 (20.4%) followed by metastases 8 (16.3%), osteosarcomas 7 (14.3%), lymphoma 5 (10.2%), and fibrosarcoma 4 (8.2%). **Conclusion:** Uganda shares some similar epidemiological characteristics of primary bone tumors with other countries; however, this study identified some peculiar differences. Population-based studies are required to obtain more accurate epidemiological data to improve patient diagnosis and treatment.

Keywords

Bone, Tumors, Prevalence

1. Introduction

Bone neoplasms are uncommon tumors. Bone sarcomas account for less than 0.2% of overall tumors [1]. However, although bone tumors are rare, they are currently an important rising cause of morbidity and mortality in Africa [2]. Additionally, bone is considered the third most common metastasis site, just after the lung and liver, which mainly affect the spine [3] [4].

The most common primary bone sarcomas are osteosarcoma, chondrosarcoma, Ewing sarcoma, and undifferentiated pleomorphic sarcoma. However, particularly children and adolescents are most affected which makes these bone tumors have a major impact on the lives of the patients and their immediate surroundings. Patients with bone tumors in Africa generally usually present late as a result of poverty, ignorance, and cultural beliefs further affecting the management of these tumors [5] [6].

Bone tumors may be detected incidentally or may be presented after a pathological fracture. Pain and palpable lumps are common presenting features of bone tumors [7]. Bone pathology could be diagnosed based on clinical and radiological features. Nevertheless, a biopsy is a definitive test to confirm the diagnosis.

Estimating the annual incidence and prevalence of bone tumors is challenging since not all cases need investigation or treatment. Many tumors are diagnosed according to their radiological features and some of them are incidentally detected.

In Uganda, limited data about the epidemiology of bone tumors is available. As a result, orthopaedic surgeons have to rely on data from other countries when formulating differential diagnoses for bone lesions. Existing data, however, demonstrates variance in the incidence between different geographic regions. By analyzing the tumor epidemiology at our center and comparing it to published data from other parts of the world, we aim to better define the local patterns and distribution of bone tumors.

2. Methods

Ethical approval to conduct this study and waiver of consent to access the patients' records was granted by Mbale Regional Referral Hospital Research and Ethics Committee (Ref number MRRH-2024-412).

We retrospectively retrieved data from all patients diagnosed with a bone tumor at Kumi Orthopaedic Center from January 2014 to December 2023. Eligible patients were identified from histopathology reports that confirmed the presence or absence of a bone tumor. No local staging was done at the center.

A patient was included if they had a biopsy confirmed diagnosis of a bone

tumor. Patients' histopathology reports were reviewed and data extracted pertaining to patient demographics, tumor location, and histological diagnosis.

Statistical analysis was performed using Stata 14.0. Continuous variables were reported as mean (±SD) and categorical variables as numbers and percentages. Categorical data was compared using the Chi-square test with a level of significance set at $P < 0.05$.

3. Results

A total of 115 bone tumors were seen over the study period. The mean age of patients was 30 years (SD ± 20.1 years) with an age range of 1 to 80 years. The majority of the patients were males 67 (58.3%) and females were 48 (42.6%). Benign tumors accounted for 66 (57.4%) of the tumors while malignant tumors were 49 (42.6%) (Table 1).

Most tumors were found in patients between the ages of 11 to 20 years 46 (40.1%) followed by those between 21 to 30 years 15 (13.2%) and the least were in the elderly aged 71 to 80 years 4 (3.5%). The majority of the tumors (both benign and malignant tumors) were found in patients in their second decade of life (Figure 1).

The commonest benign tumors were osteochondroma 14 (21.2%), cysts 11 (16.7%), hemangiomas 9 (13.6%), and fibrous dysplasia of bone 8 (12.1%) (Table 2).

The commonest malignant tumors were plasmacytoma 10 (20.4%) followed by metastases 8 (16.3%), osteosarcomas 7 (14.3%), lymphoma 5 (10.2%), and fibrosarcoma 4 (8.2%) (Table 3).

The commonest site for the tumor location was the femur 40 (34.8%) followed by the tibia 30 (26.1%) and humerus 12 (10.4%) (Table 4).

When comparing the distribution of benign and malignant tumors across sexes and different age groups, the tumors were more prevalent in males compared to males. However, the prevalence was not significant with a P-value of 0.554. The distribution across the age groups was however significant with a p-value less than 0.05. The benign tumors were generally more prevalent in the ages from 0 to 40 years while the malignant tumors were more prevalent from ages 41 years and above (Table 5).

Table 1. Patient demographics.

Characteristic	Frequency	Percentage (%)
Age (years) (Mean, SD)	30 (20.1)	
Sex		
Male	67	58.3
Female	48	41.7
Tumor type		
Benign	66	57.4
Malignant	49	42.6

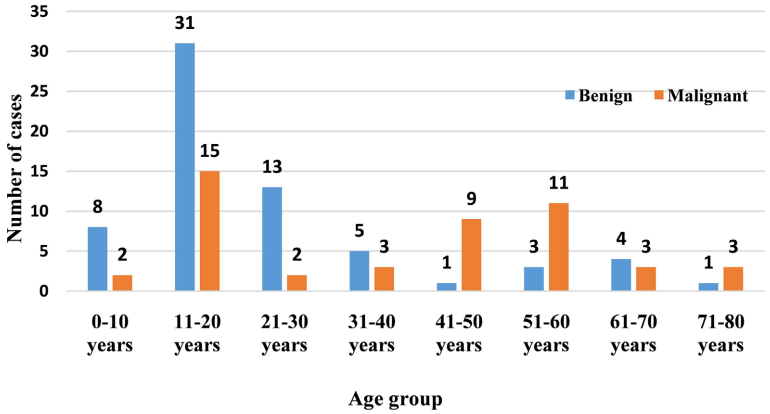

Figure 1. Distribution of the bone tumors across age groups.

Table 2. Benign tumors.

Histologic type	Number	Percentage (%)
Osteochondroma	14	21.2
Cyst	11	16.7
Hemangioma	9	13.6
Fibrous dysplasia	8	12.1
Giant cell tumor	4	6.1
Enchondroma	3	4.6
Non-ossifying fibroma	3	4.6
Fibromatosis	2	3
Lipoma	2	3
Neurilemoma	2	3
Osteoblastoma	2	3
Chondroma	1	1.5
Fibroma	1	1.5
Myxoma	1	1.5
Neuroma	1	1.5
Osteofibrous dysplasia	1	1.5
Plexiform neurofibroma	1	1.5

Table 3. Malignant tumors.

Histologic type	Number	Percentage (%)
Plasmacytoma	10	20.4
Metastases	8	16.3
Osteosarcoma	7	14.3
Large cell lymphoma	5	10.2
Fibrosarcoma	4	8.2

Continued

Chondrosarcoma	2	4.1
Ewing's sarcoma	2	4.1
Kaposi sarcoma	2	4.1
Squamous cell carcinoma	2	4.1
Chondroblastic osteosarcoma	1	2
Dermatofibrosarcoma protuberans	1	2
Fibromyxoid sarcoma	1	2
Myxoid liposarcoma	1	2
Spindle cell sarcoma	1	2
Undifferentiated carcinoma	1	2
Yolk sac tumor	1	2

Table 4. Distribution of tumors according to anatomic location.

Location	Frequency	Percentage (%)
Femur	40	34.8
Tibia	30	26.1
Humerus	12	10.4
Vertebrae	7	6.1
Pelvis	5	4.3
Phalanges	4	3.5
Metatarsals	4	3.5
Fibula	2	1.7
Radius	2	1.7
Ulna	2	1.7
Calcaneus	1	0.9
Clavicle	1	0.9
Maxilla	1	0.9
Metacarpal	1	0.9
Patella	1	0.9
Scapula	1	0.9
Talus	1	0.9

Table 5. Comparison of tumor type across sex and age groups.

Variable	Number of benign	Number of malignant	Chi-square	P-value
Sex			0.3503	**0.554**
Male	40	27		

Continued

Female	26	22		
Age group			27.6945	**<0.001**
0 - 10 years	8	2		
11 - 20 years	31	15		
21 - 30 years	13	2		
31 - 40 years	5	3		
41 - 50 years	1	9		
51 - 60 years	3	11		
61 - 70 years	4	3		
71 - 80 years	1	3		

4. Discussion

This study found that the majority of the tumors occurred in males 67 (58.3%) compared to women (41%). This is similar to findings from a systematic review in Nigeria that found male preponderance in a majority of the studies [2]. A similar study in Jordan also found that most cases were males (52.5%) [8]. In South India, a study on primary bone tumors in a tertiary Hospital also found a male preponderance with 64.96% of the patients being male [9].

Most of the tumors (both malignant and benign) occurred in individuals between the ages of 11 to 20 years. This is also similar to the findings of a retrospective study carried out on 242 patients at Lagos University Teaching Hospital over 25 years [10]. A similar study in South India also found that the peak age incidence for primary bone tumors was in the age group of 11 - 20 years [9]. Globally, the incidence of malignant primary bone tumors shows a bimodal distribution with 2 peaks at 10 - 20 years and a steady increase from 40 to 80 years [11]. The absence of the bimodal distribution in this study could be attributed to the life expectancy of 62 years hence fewer people are in the older age bracket. The pubertal growth spurt that occurs in adolescence has been linked to the increased incidence of bone tumors seen in the age group of 10 - 20 years [12].

Generally, benign tumors were the most common 66 (57.4%). This is similar to findings by a study done at Jos University Teaching Hospital on 128 cases that found that benign tumors accounted for 64.8% of the cases [13] and also a study at National Orthopaedic Hospital Igbobi on 78 cases which also recorded that 61 (79.2%) of the tumors were benign [14]. This was because the majority of the participants were young between 0 to 20 years and a majority of tumors in this age group are noncancerous.

Osteochondroma was identified as the most common benign tumor while plasmacytoma was the commonest malignant tumor. This is similar to findings in the majority of studies in Nigeria. A study in Ile-Ife Nigeria found Osteochondroma to be the predominant benign tumor. However, it found Osteosarcoma to be the most prevalent malignant tumor [15]. Similarly, a study in Turkey on 3133

patients found that the most common benign bone tumors were Osteochondroma (130.20%) [16]. In Ethiopia also a study in Addis Ababa found Osteochondroma to be the most common benign bone tumor with 32.3% [17]. However, in all the studies, osteosarcoma was the most prevalent malignant tumor which is contrary to the findings in this study which found plasmacytoma to be the commonest malignant tumor. This could be due to individual differences among participants in the different populations.

The most affected bones were the femur (31.8%) and tibia (25.4%). These findings are similar to those of a study on bone tumors in a Tertiary Care Hospital in Dhaka city which had bone tumors mainly occurring in the femur (36.6%) and tibia (21.1%) [18]. A study in Mexico City also found that the femur was the most common location of tumors (39.9%) followed by tibia (17.7%) [19]. In Beijing, a study on 9200 patients found that there was a predilection for tumors of the femur and tibia [20]. A study in Tanzania on 80 children and adolescents also found that the long bones of the lower extremity were most commonly affected, with 32 tumors (40%) in the femur and 7 (8.8%) in the tibia [21]. Similarly, a study in Jordan also reported that the femur (26.8) was the most common site of the biopsy-diagnosed tumor, followed by the tibia [22].

This is attributed to the fact that bone tumors develop during the period of maximal bone reconstruction, the majority of which occurs in the longest bones [23].

This study was limited due to the hospital-based nature of the study which may not reflect the true nature of the disease in the population. The study was a retrospective study which may have incomplete information due to missing records, poor documentation, and inaccurate data entry.

5. Conclusions

Kumi Othorpaedic Center shares similar characteristics in regard to patterns and distribution of bone tumors with most of the hospital-based studies done elsewhere. However, some peculiar differences have been identified. Population-based studies are required to obtain more accurate epidemiological data on bone tumors in Uganda.

This study can be used as a basis for studies to look into the survival rates for the affected individuals to enable better planning for rehabilitation and improve monitoring for potential recurrence.

However, as most bone tumors are seen to be prevalent in children and adolescents, there is a need for improved screening especially targeted to this high-risk population to enable early detection, and management and thus improve their treatment outcomes. This also calls for changes in budget allocation and insurance coverage to cater to improved treatment options for the most affected age groups.

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Conflicts of Interest

We do not have any conflict of interest to disclose.

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