ORIGINAL ARTICLE

Primary Malignant Bone Tumours at the University Teaching Hospital in Lusaka Zambia

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ABSTRACT

***Introduction**:* Primary malignant bone tumours include malignancies arising primarily from bone tissue. This is opposed to secondary bone tumours in which case the neoplastic elements arise primarily from other sites within the body and secondarily spread to bone. Primary malignant bone tumours are generally considered rare. Wherever primary malignant bone tumours occur they tend to pose serious challenges in terms of diagnosis, management and morbidity and mortality. However there is a lack of organised local information demonstrating the burden of disease resulting from these tumours.

***Objectives*:** The main objective of this study was to establish the pattern of primary malignant bone tumour distribution at the UTH. The specific objectives of the study included to: Outline of the socio-demographic characteristics of patients, determining the frequency of primary malignant bone tumours at UTH and the hospital prevalence of primary malignant bone tumours including their histological distribution and the clinical presentation.

***Materials and Methods*:** A retrospective cross-sectional survey of patients who presented to The University Teaching Hospital (UTH), Lusaka, Zambia with histologically confirmed primary malignant bone tumours was conducted for the period from the 1st of January 2008 to the 31st of December 2012.

***Results*:** There were a total of hundred and fifty three (153) patients seen in total. Sixty six (43%) were females while 87 (57%) were males. The age range was 3yrs to 78yrs. The mean age was 31.6 yrs. Sixty nine percent (69%) of the patients were aged 40 years and below. The age distribution of primary malignant bone tumours showed a bimodal pattern of distribution with peaks in the second and sixth decades of life. The majority (35%) of the patients reported Lusaka Province as their domicile, while the least (2.0%) hailed from North Western Province. The highest number of patients, 39 (25.5%) was recorded in 2012 and the lowest number 20 (13%) was recorded in 2011. Based on National Cancer Registry data, from 2008 to 2011, the overall proportion of patients with primary malignant bone tumours compared to all the other cancers recorded at UTH ranged between 1.7 to 2.8%. The majority, 84 (55.3%), of the patients had osteosarcoma, followed, in descending order, by multiple myeloma 42 (27.6%), chondrosarcoma 11 (7.2%), Ewing's sarcoma 8 (5.3%), fibrosarcoma 3 (2.0%) and lymphoma 2 (1.3%). The majority of patients (35.5%) reported pain and swelling alone as a presenting complaint while 19.8% of the patients presented with pathological fractures. The single and most commonly reported anatomical site was from multiple myeloma which has a general skeletal involvement (27%); the second most commonly involved site was the femur 23.7%, followed by the tibia 17.1%, and the humerus 7.5%.

Conclusion: Notwithstanding the inconclusive nature of the information on geographic distribution of tumours, the findings in the study paralleled those reported in literature.

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INTRODUCTION

Historically the largest contributor to Zambia's disease burden has been infectious diseases, however the burden of disease from malignancy has seen an upward trend.(1). Retrospective studies conducted at the University Teaching Hospital have demonstrated an increase in malignancies, especially the HIV related malignancies (1,2). Despite demonstrating a rise in HIV related childhood malignancies, the relative proportion of primary malignant bone tumours at UTH was low [2].

Globally, primary malignant bone tumours are relatively rare (3–8). Wherever primary malignant bone tumours occur they tend to pose serious challenges in terms of diagnosis, morbidity and mortality, and therein lies their importance (4,5,9).

By and large malignant bone neoplasms have not been well characterized in Zambia and this has been due in part to the under-utilization of the national cancer registry in terms of cancer reporting (1).

The World Health Organisation has classified bone tumours based on the histological character of the neoplastic cells (6, 10). These tumours are classified on the basis of their histological picture; therefore primary bone cancers are named on the basis of their resemblance to the parent tissue or type of stroma that the tumour produces[3]. The aetiology of primary malignant bone tumours has not been well established but these tumours have been observed to show variations in incidence, site and age distributions within and outside national geographic boundaries (7,11). Consideration has been given to the possible role of the environment in the causation of these tumours but this has not yet been proven using epidemiological means (7,11). Patients often present with variable and vague symptoms including pain, swelling, and fracture, sometimes with reports of incidental antecedent traumatic events. Due to the, sometimes vague, symptoms, it's not uncommon for physicians to miss the diagnosis (3). Neoplasms affecting the skeleton are being observed more often in orthopaedic practice (12).

This study reviewed the pattern of primary bone cancer as observed at the University Teaching Hospital from the 1st of January 2008 to the 31st of December 2012.

METHODOLOGY

Study Design

This was a retrospective cross-sectional survey of patients who presented with primary malignant bone tumours to the University Teaching Hospital (UTH) from January 1 2008 to December 31st 2012. All records of patients with histologically confirmed primary malignant bone tumours that presented to UTH during the study period were reviewed for completeness prior to inclusion in this survey. The following details were considered, the age of the patient in years, sex, and geographical origin of the patient, anatomical site affected by the tumour, histological diagnosis and date of the histology report. All the files that did not have this information were excluded from the study. One hundred and fifty-three files had the requisite information and were included in the study.

Data Analysis

Univariate analysis of socio-demographic factors was done. A Chi square test was used to study association between categorical variables. A P-Value of less than 0.05 was considered significant.

Ethical Considerations

The study did not involve any interaction with human participants; therefore a waiver for patient informed consent was applied for and approved by the University of Zambia Biomedical Research Ethics Committee.

RESULTS

Socio-demographic characteristics of the patients

There were a hundred and fifty-three (153) patients. Sixty six (43%) were females while 87 (57%) were males. The youngest patient was 3 years while the oldest patient was 78 years old. The average age of the patients was 31.6 years. Table 3 below, shows that 35.1% were aged 11-20 years, 10.6% were aged 51-60 years.

Age range (in decades)	Frequency	Percent	Valid Percent	Cumulative Percent
10 years and below	15	9.8	9.9	9.9
11-20 years	53	34.6	35.1	45.0
21-30 years	19	12.4	12.6	57.6
31-40 years	17	11.1	11.3	68.9
41-50 years	11	7.2	7.3	76.2
51-60 years	16	10.5	10.6	86.8
61-70 years	15	9.8	9.9	96.7
71-80 years	5	3.3	3.3	100.0
Total	151	98.7	100.0	
Not stated	2	1.3		
Total 153	100.0			

Table 1: Bone tumour frequency by age of patients

Sex stratified age distribution of patients with primary bone cancers

It was noted in the study, as is demonstrated in figure 1 below, that there was more male patients than females. A Chi Square test was conducted to establish whether there was any association between gender and the occurrence of bone tumours at a significance level of 0.05. The results were; Chi Square = 2.882; df=1; p=0.09. Since p>0.05; there was no association.

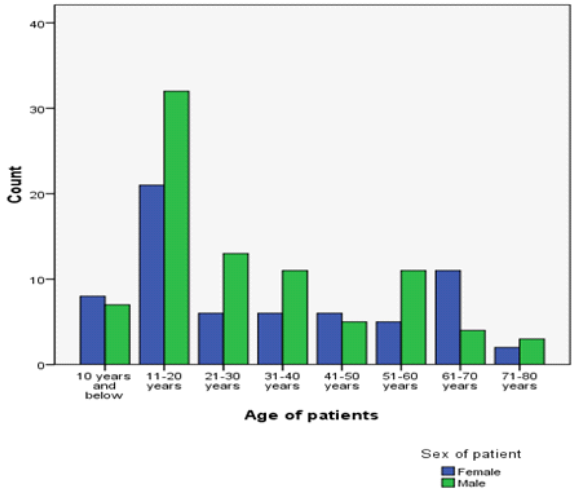

Figure 1: Sex stratified Age Distribution of patients

Geographic distribution

Table 3 below shows the domicile of the patients. The majority (35%) of the patients came from Lusaka Province.

Table 2: Patience's domicile

Geographic origin of patient (domicile)	Frequency	Percent	Cumulative Percent
Lusaka	54	35.3	35.3
Southern	26	17.0	52.3
Copperbelt	19	12.4	64.7
Eastern	16	10.5	75.2
Northern	12	7.8	83.0
Luapula	9	5.9	88.9
Central	7	4.6	93.5
North Western	5	3.3	96.7
Western	5	3.3	100.0
Total	**153**	**100.0**	

The frequency of primary malignant bone tumours by year of presentation

Figure 2 below shows the distribution of the patients by year of attendance. Twenty-seven (18.8%) of the patients attended treatment at the University Teaching Hospital (UTH) in 2008; and 39 (25.5%), the majority, in 2012.

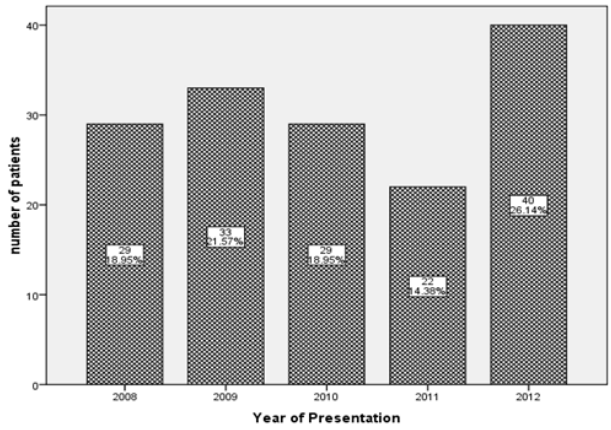

Figure 2: Year of attendance

Tumour frequency as an annualized relative proportion of the total cancer burden at UTH

Table 4 below shows the total number of cancer patients recorded at the University Teaching Hospital Cancer

registry from 2008 to 2011. The overall proportion of patients with primary malignant bone tumours compared to all the other cancers ranged between 1.7 to 2.8%.

Table 3: Total number of cancer patients seen annually from 2008 to 2011 at UTH

YEAR	TOTAL NUMBER OF PRIMARY BONE CANCER PATIENTS SEEN AT UTH	TOTAL NUMBER OF CANCER PATIENTS SEEN AT UTH	PROPORTION	%
2008	29	1034	0.028	2.8
2009	33	1548	0.021	2.1
2010	29	1736	0.017	1.7
2011	22	1108	0.020	2.0
2012	40	-	-	-[1]

Relative frequencies of different types of primary bone cancers

Table 5 below shows the common types of primary malignant bone tumours recorded at UTH during the period under review. The majority, Eighty four (55.3%) of the patients had osteosarcoma.

Table 4: Distribution by histological diagnosis

Histological type of tumour	Frequency	Percent	Cumulative Percent
Osteosarcoma	84	54.9	54.9
Multiple Myeloma	42	27.5	82.4
Chondrosarcoma	11	7.2	89.5
Ewing's sarcoma	8	5.2	94.8
Fibrosarcoma	3	2.0	96.7
Lymphoma	2	1.3	98.0
Malignant Giant Cell Tumour	1	.7	98.7
Osteoclastoma	1	.7	99.3
Sarcoma	1	.7	100.0
Total	**153**	100.0	

Clinical presentation of the primary malignant tumours

The findings in table 6 show that the majority of patients (35.5%) experienced pain and swelling only. Twenty-seven percent (27%) reported pain alone and 17% reported swelling.

Table 5: Clinical presentation

Clinical presentation	Frequency	Percent	Valid Percent	Cumulative Percent
Pain & Swelling	54	35.3	35.5	35.5
Pain	41	26.8	27.0	62.5
Swelling	27	17.6	17.8	80.3
Pain & Pathological Fracture	12	7.8	7.9	88.2
Pathological Fracture	8	5.2	5.3	93.4
Pain, Swelling & Pathological Fracture	7	4.6	4.6	98.0
Swelling & Pathological Fracture	3	2.0	2.0	100.0
Total	152	99.3	100.0	
Not stated	1	.7		
Total	153	100.0		

Anatomic site of involvement of primary malignant bone tumours

Table 7 shows that the single and most commonly reported anatomic site was as a result of multiple myeloma with systemic involvement (27%), the second most commonly involved site was the femur.

Table 7: Table of primary malignant bone tumour distribution by anatomic site

Anatomic site involved	Frequency	Percent	Valid Percent	Cumulative Percent
Systemic	41	26.8	27.0	27.0
Femur	36	23.5	23.7	50.7
Tibia	26	17.0	17.1	67.8
Limb bone-(not otherwise specified- NOS)	19	12.4	12.5	80.3
Humerus	12	7.8	7.9	88.2
Radius	6	3.9	3.9	92.1
Fibula	3	2.0	2.0	94.1
Pelvis	3	2.0	2.0	96.1
Spine	2	1.3	1.3	97.4
Calcaneum	1	.7	.7	98.0
Long bone of lower limb	1	.7	.7	98.7
Ribs	1	.7	.7	99.3
Scapula	1	.7	.7	100.0
Total	152	99.3	100.0	
System	1	.7		
153	100.0			

The commonest site was systemic involvement as a result of multiple myeloma. Multiple myeloma by nature has a generalized skeletal involvement. On the other hand, the majority of osteosarcoma (74) were located on the femur (29), tibia (19), limb bone NOS (16), and humerus (10).

Study limitations

The results presented in this study by and large are limited to describing the pattern of primary malignant bone tumours, within the parameters set at the University Teaching Hospital alone and cannot be said to be representative of the pattern of distribution of bone tumour in society at large. In addition, this being a retrospective study, it did not capture the details of the clinical findings aside from those documented in the patients' records. Sub-typing of the tumours e.g. osteosarcoma was not readily available in the records and was therefore not analysed.

DISCUSSION

Socio-demographic characteristics of the patients (age stratified frequency of primary bone malignancy)

The age distribution was similar to that cited in literature (5,6,7) including the bimodal age distribution, male preponderance of primary malignant bone tumours. The second peak is due mostly to multiple myeloma and chondrosarcoma and the first peak is due to the other bone tumours. Larger numbers of patients originated from Lusaka Province, followed by Southern province and Copperbelt province than from other provinces outside line of rail possibly due to accessibility; or may reflect under-diagnosis in other provinces or an over-reported Lusaka Domicile.

The annualized frequency showed an increase in cases that presented in 2012. The observed increase is likely to be multifactorial - Improved overall performance of the referral system, patient health seeking behavior, better access, a true increase in incidence and better record keeping**.**

The commonest clinical presentation was pain and swelling and commonest sites were the femur, tibia and humerus, these findings paralleled those in literature (5, 13). Similarly, as demonstrated in literature (5, 7, 13), gender variation with respect to clinical presentation was statistically insignificant. The proportion of primary malignant bone tumours in relation to other cancers at UTH ranged from 1.7% to 2.8% between 2008 and 2011. (At the time of the study the data for the year 2012 had not been recorded by the National Cancer Register.)

Osteogenic sarcoma accounted for the majority of the cases seen and this is in agreement with literature. Excluding Multiple Myeloma the commonest anatomic site was the femur

followed by the humerus. It was observed that pain swelling and pathological fracture were not reported in chondrosarcoma and Ewing's sarcoma. This finding needs to be taken with a lot of caution because it is probable that patients may have reported the complaints but they were not documented or it is possible that the clinicians did not ask for them at all.

CONCLUSION

Primary malignant bone tumours are rare globally and the same was true for patients presenting to UTH. The aetiology remains poorly characterized but the observed pattern of occurrence has been replicated at the University Teaching Hospital with respect to all the parameters investigated. The socio-demographic characteristics observed for patients with primary malignant bone tumours were similar as those reported in literature (5,7,9,13). The commonly observed tumours were mostly osteogenic sarcoma, multiple myeloma and chondrosarcoma. The bimodal distribution of primary malignant bone tumours was replicated in patients treated at UTH with almost equal gender distribution and a greater peak in the second decade of life.

RECOMMENDATIONS

In view of the study findings pertaining to the high frequency of multiple myeloma and osteosarcoma it is imperative that the UTH conducts a needs assessment of its bone tumour diagnostic and therapy capacity. This should inform the acquisition of appropriate currently unavailable resources. In order to optimally treat primary bone sarcomas it is important also that the Cancer Diseases Hospital streamlines its therapy modalities and capacity to reflect the disease spectrum as is highlighted by the study findings. It is also important that personnel at all levels of the health care system be familiar with the investigation and diagnosis of primary malignant bone tumours.

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