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Chondrosarcoma: A 15 Year Review at a Tertiary Health Facility in North Central Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author POA conceptualized the study, carried out literature search and wrote the initial draft. Authors BVK, BKA and PCN gathered the data and analyzed it. Author BVK edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study is aimed at documenting the demographics and grade of all cases of chondrosarcoma at a tertiary health care facility in the north central part of Nigeria. The age, sex, anatomical site affected and grade was documented for all cases.
Study Design: This is a hospital-based retrospective and descriptive study from 1st January 2005 to 31st December 2019
Place and Duration of Study: Department of Histopathology, Jos University Teaching Hospital, Jos, Plateau State in North-Central Nigeria between 1st January 2005 to 31st December 2019.
Materials and Methods: All 12 cases of chondrosarcoma diagnosed during the period of review were included in the study. A total of 165 cases (103 benign and 62 malignant) of primary bone tumours diagnosed within the period were also reviewed to enable the calculation of the appropriate percentages for chondrosarcoma. The age, sex and anatomical site affected was obtained by accessing the patient surgical pathology reports, case files and cancer registry entries. The histological grade was determined for each case of chondrosarcoma.
Results: The 12 cases of chondrosarcoma diagnosed during the period of review accounted for

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7.3% and 19.3% of the 165 primary bone tumours and 62 primary malignant bone tumours diagnosed respectively during the period of review. Chondrosarcoma showed a male predominance with the peak period of diagnosis in the 4th decade. Common anatomical sites affected were the femur, humerus and tibia. Four cases (33.3%) out of the total of 12 were grade I, 6 cases (50.0%) were grade II and 2 cases (16.6%) were grade III chondrosarcomas.

Conclusion: Chondrosarcoma is a relatively rare tumour in our environment with an average of less than 1 case diagnosed per year in our tertiary health care facility. It has a male predominance and a tendency to occur in relatively younger patients in our study in comparison to the age of occurrence in other parts of the world.

Keywords: Chondrosarcoma; primary malignant; Bone tumour; grade; Jos; Nigeria.

1. INTRODUCTION

Chondrosarcomas are malignant mesenchymal tumours in which the tumour cells produce a cartilaginous matrix. Primary chondrosarcomas arise *de novo*, while secondary chondrosarcomas arise from a pre-existing benign chondrogenic tumour such as osteochondroma. The commonest variant of this tumour is the conventional type which is identified by its production of a hyaline chondroid matrix. Other variants include mesenchymal, clear cell and dedifferentiated variants [1-3]. Chondrosarcomas can arise from any bone but most commonly affect the pelvic bones, femur, humerus and ribs [1,3,4]. This tumour tends to occur more commonly in males [4,5]. A majority of cases are diagnosed after the age of 50 years, however chondrosarcoma can occur at any age [6]. There is scanty published literature on chondrosarcoma in Nigeria, with most Nigerian authors discussing it briefly along with other primary bone tumours. The incidence of chondrosarcoma in Nigeria is unknown, its estimated incidence worldwide is 1:200,000 per year [7]. This report is being carried out for documentation of chondrosarcoma demographics and grade in our tertiary health care facility, with the aim of increasing interest in research of this tumour.

2. MATERIALS AND METHODS

This is a retrospective review of all cases of chondrosarcoma diagnosed at the Jos university Teaching Hospital (JUTH) department of Histopathology between 1st January 2005 to 31st December 2019. Materials utilized for this research consisted of Archival histology glass slides, paraffin wax tissue blocks (in cases of missing or poor quality histology glass slides), cancer registry entries, surgical pathology reports and case files of all cases of chondrosarcoma diagnosed during the period of review. The patient age at diagnosis, sex, site affected by the tumour and other relevant clinical information were searched for and documented for each case using both digital cancer registry entries and hard copy records of patient information. All cases of primary bone tumour diagnosed during the period were reviewed for the purpose of this study and relevant percentages were calculated for chondrosarcoma. All cases were reviewed by the authors of this article and histological grade was determined. The data was analyzed utilizing Epi info 7 (version 3.5.4) and presented in tables.

3. RESULTS

A total 165 primary bone tumours were documented in the period of review of which 103 were benign and 62 malignant. There were 12 cases of chondrosarcoma (which accounted for 7.3% of primary bone tumours and 19.3% of primary malignant bone tumours). Chondrosarcoma was the second most common primary malignant bone tumour diagnosed after osteosarcoma. Chondrosarcoma had a male predominance with a male to female ratio 5:1 (10 male patients and 2 females). The peak age range of diagnosis was in the fourth decade with a mean age of 39 ±14years (Table 1). The commonest sites of chondrosarcoma diagnosis were the humerus, femur and tibia (Table 2). Four of the 12 cases (33.3%) in our study were grade I tumours, 6 (50.0%) were grade II and 2 (16.6%) were grade III. A photomicrograph of a grade II chondrosarcoma is shown below (Fig. 1).

4. DISCUSSION

Chondrosarcoma is the third most common primary malignant bone tumour worldwide after osteosarcoma and plasmacytoma [1,7,8]. The reported frequency of chondrosarcoma varies from place to place; a world health organization survey estimates it to account for about 20.0% of

Table 1. Table showing distribution of chondrosarcoma cases according to age (stratified into decades)

S/N	Age range	Frequency	Percentage
1	0-10	0	0
2	11-20	1	8.3
3	21-30	2	16.6
4	31-40	5	41.6
5	41-50	2	16.6
6	51-60	1	8.3
7	>60	1	8.3
TOTAL		12	100

Table 2. Table showing distribution of chondrosarcoma according to anatomical site of diagnosis

S/N	Site of tumour	Frequency	Percentage
1	Femur	3	25.0
2	Ilium	2	16.6
3	Foot	1	8.3
5	Humerus	3	25.0
9	Tibia	3	25.0
	TOTAL	12	100

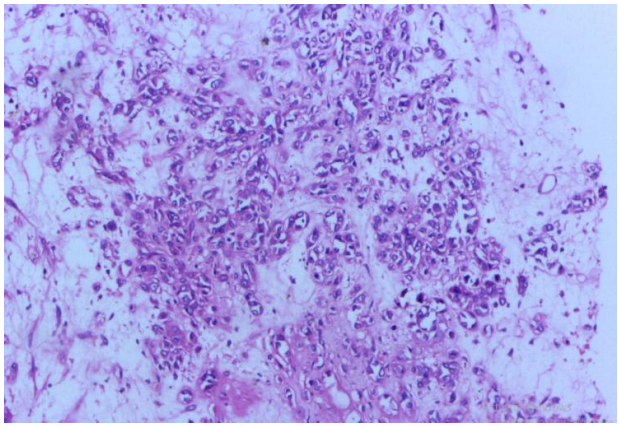

Fig. 1. Photomicrograph (Haematoxylin and eosin x 100) Chondrosarcoma (grade II) of the femur in a 34 year-old male. Slide shows multinucleation, hypercellularity, pleomorphism and a chondromyxoid matrix

primary malignant bone tumours [1]. Chondrosarcoma accounted for 19% of primary malignant bone tumours in our study and was the second most common after osteosarcoma. The percentages documented in similar tertiary health facilities in other geographical parts of Nigeria are 6.0%,14.0%,14.3% and 21.4% in Zaria (north-west Nigeria), Ibadan (south-west Nigeria), Enugu (south-east Nigeria) and Lagos (south-western Nigeria) respectively [9-12]. The differences in frequency of occurrence of chondrosarcoma amongst primary malignant bone tumours in the different geographical locations in Nigeria is most likely coincidental. However, the possibility of environmental risk factors being responsible for this differences have not been studied. The reported frequencies of chondrosarcoma amongst primary malignant bone tumours from other racially and geographically diverse locations such as Cameroon, China, India, United States of America and England were 8.5%,15.1%,19.0%, 20.7% and 27.2% respectively [13-16]. Chondrosarcoma showed a male predominance in our study, with a male to female ratio of (M:F) 5:1. A male predominance of chondrosarcoma

occurrence is widely reported by other authors from within and outside Nigeria [1,9,10,15].

Most cases of chondrosarcoma occur in patients over the age of 50 years, with the peak incidence occurring within the 5th to 7th decade [1]. The peak incidence of diagnosis of chondrosarcoma in our study occurred in the 4th decade which appears to be relatively early when compared to the global trends. Studies from other geographical parts of Nigeria also showed an early peak, with the peak occurring through the 2nd to 5th decade in studies from Zaria, Enugu and Ibadan [9-11]. The relatively younger peak age of diagnosis of chondrosarcoma in Nigeria may be attributed to its younger population. Some variants of chondrosarcoma such as the clear cell type occur more commonly in adolescents and young adults [17]. All cases diagnosed in our study were of the conventional variant. An estimated 80-90% of all chondrosarcomas are of the conventional type [7,17]. The femur (25.0%), tibia (25.0%), humerus (25.0%) and iliac bone (16.6%) together accounted for 91.6% of the anatomical sites of chondrosarcoma diagnosis in our study. These findings correlate with the findings of other authors in Nigeria and from other parts of the world [1,10,11].

The clinical behavior and outcome of chondrosarcoma correlates with its histologic grade, higher grade tumours are more likely to recur and metastasize [1,6,18]. Grading of chondrosarcoma is done by assessing the degree of cellularity, nuclear size, nuclear staining, mitotic activity and atypia. Clinical and radiologic findings are necessary for diagnosing some grade I tumours because of their resemblance to benign cartilage [1,5,19,20]. Grade I chondrosarcomas have an abundant chondroid matrix and are moderately cellular. They have slightly enlarged hyperchromatic but uniform nuclei, occasional nucleoli and binucleation but with absent mitosis [1,4,5,18]. Grade I tumours have been renamed atypical cartilaginous tumours which better describes their clinical behavior as intermediate tumours [1]. Grade I tumours are more likely to arise from a pre-existing benign cartilaginous lesion than grades II and III [4]. Grade II chondrosarcomas have less chondroid matrix compared to grade I, they are more cellular, have larger more atypical nuclei with multinucleation and occasionally have mitosis and necrosis [1,5,6,18]. Grade III tumours exhibit increased cellularity, more nuclear pleomorphism, increased mitosis compared to grade II tumours and necrosis. These tumours frequently have a myxoid matrix with sparse hyaline chondroid matrix [1,5,6,18]. The Grade I tumours are slow growing while Grade II and III tumours are fast growing, more invasive and can metastasize. The designation of the most anaplastic tumours as grade IV is not generally practiced [4]. Grade I tumours occur more frequently than grade II and grade III tumours which only account for a small percentage. A large series of 338 chondrosarcoma cases highlighted by the WHO classification of tumours of soft tissue and bone had 61.0% of its cases being grade I, 36.0% grade II and 3.0% grade III tumours [1]. Four(33.3%) of the 12 cases in our study were grade I tumours, 6 (50.0%) were grade II and 2 (16.6%) were grade III.

Treatment modalities employed in our facility includes surgery alone in low grade localized disease and surgery plus chemotherapy using Ifosfamide and Adriamycin in high grade lesions or lesions in which complete resection is not possible. Nine (9) out of the 12 patients diagnosed with chondrosarcoma in our institution within the period of review either declined treatment or have been lost to follow up. Two (2) of the remaining 3 are currently on follow up with no tumour recurrence 2 and 4 years respectively after treatment, 1 patient however died 2 days post-operatively from complications of surgery. The 2 surviving patients had a diagnosis of grade I ocalized chondrosarcoma and were treated with surgery alone. Surgical excision is the most effective modality of treatment for chondrosarcoma as these tumours are usually resistant to radiotherapy and chemotherapy [4,5,19]. Metastasis is rare in low grade chondrosarcomas, however recurrences commonly occur if resection is not complete [19]. The prognosis for chondrosarcoma is dependent on the grade of tumour and completeness of surgical resection. The risk of local recurrence and distant metastasis increases with higher grade tumours [8,18]. The 5-year survival rates for grade I, II and III chondrosarcomas are 90-94%, 61-81% and 43-44% respectively [6].

5. CONCLUSION

Chondrosarcoma is a rare tumour in our environment and its demographics at the Jos University Teaching Hospital is similar to findings of other authors in others parts of the world.

CONSENT

Is not applicable (no patient identifiers).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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