Study of the morphological pattern of non-neoplastic and neoplastic bone lesions- a 5 year study

Deepti Gupta[1,*], Ram Kumar Gupta[2], Rajesh Kumar Gupta[3]

[1]Demonstrator, Govt. Medical College, Jammu (J &K), [2,3]Professor, Acharya Shri Chander College of Medical Sciences & Hospital, Jammu (J & K)

Corresponding Author*
Email: drdeeptigupta21@gmail.com

Abstract

Morphological pattern, clinical presentation and distribution according to age, sex and site of 84 cases of non- neoplastic and neoplastic bone lesions were studied over a period of five years (Retrospective period of 4 years and prospective period of one year). Maximum number of patients were in the age group of 11-30 years. Males were more frequently affected than female, the male to female ratio being 1.9:1. Femur was the most common involved site followed by tibia. Pain/tenderness was the most common clinical feature. Chronic non-specific osteomyelitis was the most common bone lesion (19%) of all the bone pathologies. Osteochondroma was the most common benign bone tumour (14.2%). Metastatic bone tumour was the most common malignant bone lesion (7.1%), while osteosarcoma was the most common primary malignant bone tumour (3.6%). The ratio of benign to malignant bone tumours was 1.8:1. The percentage of tumour like lesions was 50%, while benign bone tumours were 32.1% and malignant bone tumours were 17.86%.

Key words: Bone tumours, Histopathology, Non neoplastic and neoplastic bone lesions.

Access this article online

Quick Response Code:

Website: www.innovativepublication.com

DOI: 10.5958/2394-6792.2016.00033.8

Introduction

Among all the various types of human neoplasms, bone tumours are relatively less common, but are diverse in their pathologic features and biological behaviour. The diversity makes it critical to accurately diagnose, stage and treat tumours appropriately, so that the patients can survive and maintain optimum function of the affected body part[1]. The precise incidence of bone tumours is not known as many benign lesions are not biopsied. In general, excluding myeloma and lymphoma, malignant primary bone tumours constitute only 0.2% of all malignancies in adults and approximately 5% of childhood malignancies[2].

Bone tumours could be benign, malignant or metastatic. Primary tumours are those which originate in the bone and secondary tumours which originate elsewhere and involve the bone secondarily. Benign bone lesions may be neoplastic, developmental, traumatic, infectious or inflammatory in etiology. Primary bone tumours are fairly rare. Non neoplastic conditions, metastatic disease and lymphoreticular malignancies, which may simulate primary bone tumours, by far outnumber genuine bone tumours. Haematological tumours including malignant myeloma were excluded from our study, as they are mainly diagnosed by bone marrow cytology.

Tumours of the bone are uncommon and histopathological examination is must for the exact diagnosis and management of the bone lesions. The study is aimed to evaluate the gross and microscopic features of various neoplastic and non-neoplastic bone lesions so as to find the pattern of these lesions in this geographical area. Jammu and Kashmir State differs in many respects from the rest of the country as the population density is the low, environment and climatic conditions vary greatly. Acharya Shri Chander College of Medical Sciences and Hospital, Sidhra, Jammu is one of the referral hospitals of the state. This institute is having satisfactory medical facilities for the diagnosis and treatment of the bone lesions. This will be reflective and representive of the region of Jammu And Kashmir State.

Aims & Objectives

1. To study the morphological pattern of non-neoplastic and neoplastic lesions of the skeletal system in a Jammu based population in Acharya Shri Chander College of Medical Sciences and Hospital, Jammu (J&K).
2. To correlate the clinical presentation with morphological pattern.
3. To study the distribution according to age, sex and site of various non-neoplastic and neoplastic bone lesions

Material and Methods

This study was done in the Department of Pathology in collaboration with the Department of Orthopaedics, Acharya Shri Chander College of Medical Sciences & Hospital over a period of 5 years (Retrospective period of 4 years and prospective period of one year). Ethical approval was taken from institute's ethics committee before initiating the study. All the histopathological reports maintained in the histopathological section were reviewed and haematoxylin and eosin (H & E) stained slides of every case was re-examined by two pathologist. Further sections were cut from paraffin blocks where ever required. Also the clinical information provided in the requisition forms was taken into consideration and recorded in the proforma. For the prospective study specimen were received in the histopathology wing of the Department of Pathology, clinical and radiological details were recorded and gross features of the specimen were assessed, Decalcification was advised wherever required. The tissue was subjected to routine histopathological processing followed by embedding in paraffin. 3-5 micron thick paraffin sections were cut on a rotator microtome, dewaxed and stained routinely with haematoxylin and eosin (H&E) by the method described by Bancroft and Gamble[3].

A detailed histopathological examination of H&E stained slides with respect to the benign and malignant nature of lesion was carried out.

Observations

84 cases of bone lesions were reported in the histopathology section of the Department of Pathology, Acharya Shri Chander College of Medical Sciences and Hospital, Sidhra, Jammu, over a period of five years the following observations were made:

Age distribution:

The age of the patients ranged from 3 to 85 years. The mean age was 34.2 years. Ref **(Fig. 1)**

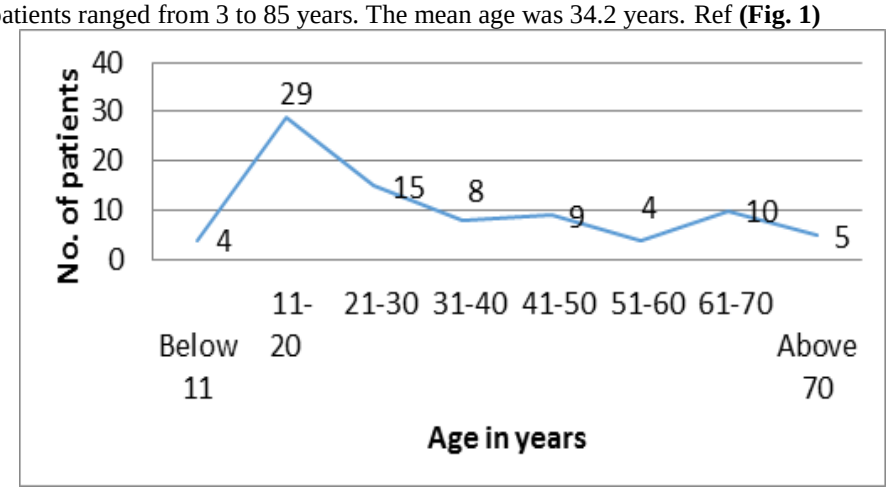

Fig. 1: Line chart showing age distribution in the study

Sex distribution

In the present study males outnumbered females with a male to female ratio of 1.9:1. There were 55 males (65.5%) and 29 females (34.5%) in our study. Ref (**Fig. 2)**

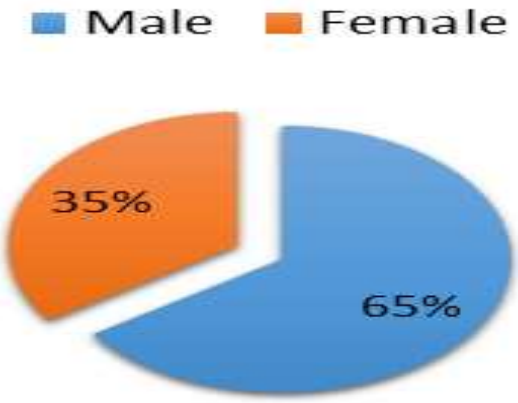

Fig. 2: Pie chart showing sex distribution

Site of bone lesions

In our study femur was most common involved site, with 32 cases (38.1%) followed by tibia with 15 cases (17.8%). Ref (**Table 1)**

Table 1: Showing site distribution

S. No	Site	No. of patients	Percentage (%)
1.	Femur	32	38.1
2.	Tibia	15	17.8
3.	Humerus	8	9.5
4.	Radius	2	2.4
5.	Calcaneum	3	3.6
6	Clavicle	2	2.4
7	Fibula	2	2.4
8	Vertebra	4	4.8
9	Mandible	2	2.4
10	Maxilla	1	1.2
11	Metacarpals	1	1.2
12	Metatarsals	1	1.2
13	Pelvis	4	4.8
14	Rib	1	1.2
15	Sacrum	2	2.4
16	Skull	1	1.2
17	Talus	3	3.6
	Total	84	100%

Clinical presentation

Pain/ tenderness was the most common clinical presentation seen in 72 out of 84 cases i.e. (85.71%) followed by swelling/mass seen in 63 out of 84 cases i.e. (75%), limitation of movement 17/84(20.23%), pathological fracture 12/84 (14.28%) and general symptoms like fever, malaise, weakness etc. were seen in 14 out of 84 cases i.e. (16.66%). Ref (**Table 2)**

Table 2: Showing distribution of clinical features

S. No	Clinical features	No. of patients	Percentage (%)
1.	Pain/tenderness	72	85.71
2.	Swelling/mass	63	75
3.	Limitation of movement	17	20.23
4.	Pathological fracture	12	14.28
5.	General symptoms	14	16.66

Histopathological diagnosis

In our study of non-neoplastic and neoplastic bone lesions, chronic non-specific osteomyelitis was the most common bone lesion i.e. 16/84(19%) cases followed by osteochondroma 12/84(14.2%), tubercular osteomyelitis 11/84 (13.1%), giant cell tumour 8/84 (9.5%), metastatic tumour 6/84 (7.1%), aneurysmal bone cyst 4/84 (4.8%), osteosarcoma 3/84 (3.6%), exuberant fracture callus 3/84 (3.6%), fibrous dysplasia 2/84 (2.4%), osteoid osteoma 2/84 (2.4%), simple bone cyst 2/84 (2.4%) and one case each of acute osteomyelitis, schwannoma of bone, squamous cell carcinoma of maxilla, malignant fibrous histiocytoma, primary lymphoma of bone, chondrosarcoma, chondroma, lipoma, osteoblastoma, ossifying fibroma, metaphyseal fibrous defect, hemangioma, adamantinoma, Ewing's sarcoma and avascular necrosis of head of femur i.e. 1/84 (1.2%) respectively. Ref (**Table 3)**. Histopathological diagnosis were made in collaboration with clinical details and radiological data recorded in requisition form. Ref (Fig. 3, 4, 5, 6, 7 and 8)

Table 3: Showing histopathological types of various bone lesions in the study

S. No	Histopathological Diagnosis	Male	Female	Total no. of patients	Percentage%
1.	Chronic non-specific osteomyelitis	12	4	16	19
2.	Tubercular osteomyelitis	7	4	11	13.1
3.	Acute osteomyelitis	1	0	1	1.2
4.	Osteochondroma	9	3	8	14.3
5.	Giant cell tumour	3	5	8	9.5
6.	Metastatic tumour	3	3	6	7.1
7.	Aneurysmal bone cyst	2	2	4	4.8
8.	Exuberant fracture callus	1	2	3	3.6
9.	Osteosarcoma	3	0	3	3.6
10.	Osteoid osteoma	2	0	2	2.4
11.	Fibrous dysplasia	1	1	2	2.4
12.	Simple bone cyst	1	1	2	2.4
13.	Avascular necrosis of head of femur	1	0	1	1.2
14.	Adamantinoma	1	0	1	1.2
15.	Lipoma	1	0	1	1.2
16.	Chondrosarcoma	1	0	1	1.2
17.	Malignant fibrous histiocytoma	1	0	1	1.2
18.	Schwannoma	0	1	1	1.2
19.	Ossifying fibroma	1	0	1	1.2
20.	Metaphyseal fibrous defect	1	0	1	1.2
21.	Hemangioma	0	1	1	1.2
22.	Primary lymphoma of bone	1	0	1	1.2
23.	Ewing's sarcoma	0	1	1	1.2
24.	Chondroma	0	1	1	1.2
25.	Osteoblastoma	1	0	1	1.2
26.	Squamous cell carcinoma	1	0	1	1.2
	Total	55	29	84	100%

The total 84 cases of non-neoplastic and neoplastic bone lesions were divided into 3 broad categories viz: benign, malignant and tumour like lesions. Tumour like lesions constituted the largest group with 50% cases followed by benign bone tumours with 32.1% cases and the malignant bone tumours with 17.86% cases. Ref (**Table 4)**. The ratio of benign to malignant bone tumours as 1.8:1.

Table 4: Showing various tumour like lesions, benign and malignant tumours

S. No	Tumour like lesions				Benign bone tumours				Malignant bone tumours			
	Bone lesion	**M**	**F**	**Total**	**Bone lesion**	**M**	**F**	**Total**	**Bone lesion**	**M**	**F**	**Total**
1.	Chronic non-specific osteomyelitis	12	4	16	Osteochondroma	9	3	12	Metastatic Tumour	3	3	6
2.	Tubercular osteomyelitis	7	4	11	Giant cell tumour	3	5	8	Osteosarcoma	3	0	3
3.	Aneurysmal bone cyst	2	2	4	Osteoid osteoma	2	0	2	Chondrosarcoma	1	0	1
4.	Fibrous dysplasia	1	1	2	Chondroma	0	1	1	Malignant fibrous histiocytoma	1	0	1
5.	Ossifying fibroma	1	0	1	Hemangioma	0	1	1	Adamantinoma	1	0	1
6.	Metaphyseal fibrous defect	1	0	1	Lipoma	1	0	1	Ewing's sarcoma	1	0	1
7.	Acute osteomyelitis	1	0	1	Schwannoma	0	1	1	Primary lymphoma of	1	0	1

									bone			
8.	Avascular necrosis of head of femur.	1	0	1	Osteoblastoma	1	0	1	Squamous cell carcinoma	1	0	1
9.	Exuberant fracture callus.	1	2	3								
10.	Simple bone cyst	1	1	2								
	Total	28	14	42		16	11	27		12	3	15

Osteochondroma was the most common benign tumour (14.3%) while metastatic tumour was the most common malignant tumour (9.5%), osteosarcoma (3.6%) was the most common primary malignant bone tumour while chronic non-specific osteomyelitis was the most common tumour like lesion (19%).

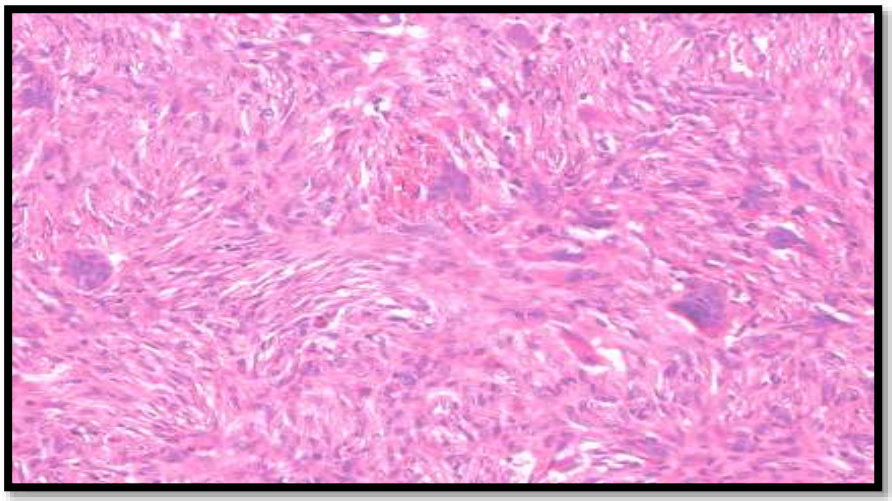

Fig. 3: Metaphysical fibrous defect, femur (H&E 400X)

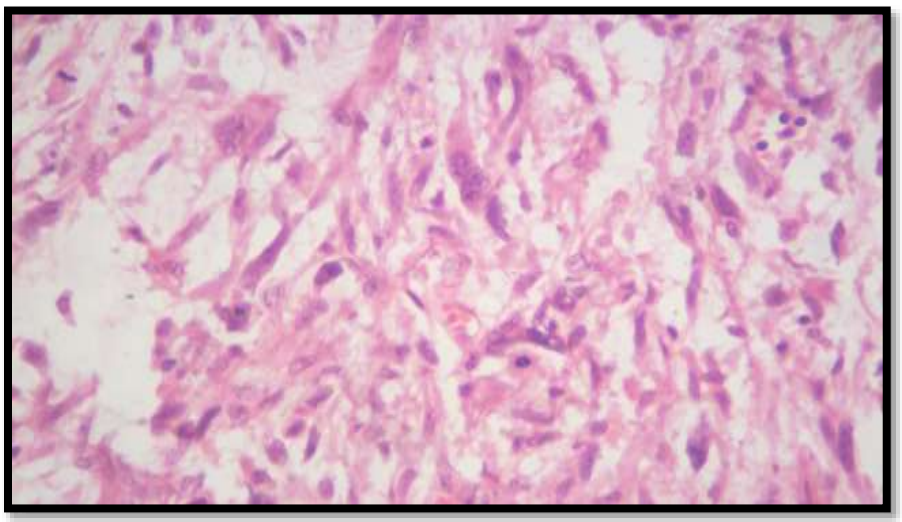

Fig. 4: Malignant fibrous histiocytoma showing bizarre tumor cells & atypical mitosis (H&E 400X)

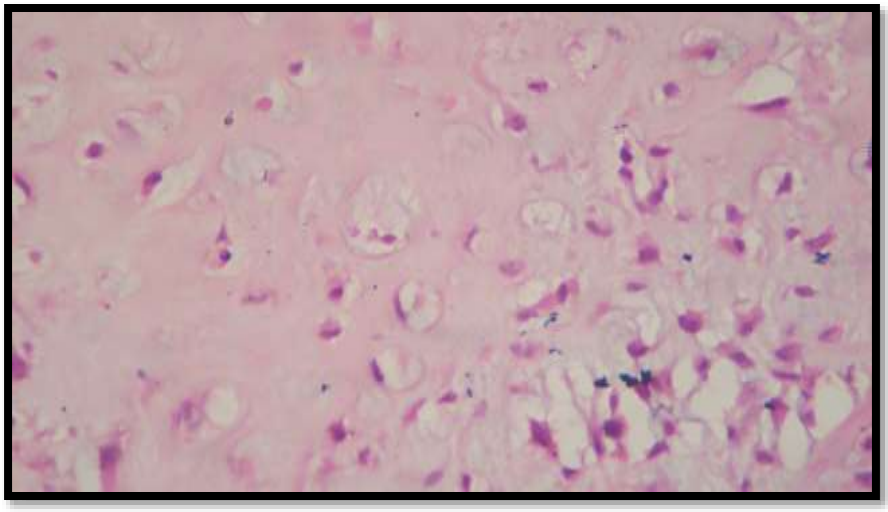

Fig. 5: Chondrosarcoma showing chondrocytes with atypia and mitosis (H&E 400X)

Fig. 6: Gross specimen osteogenic sarcoma calcaneum

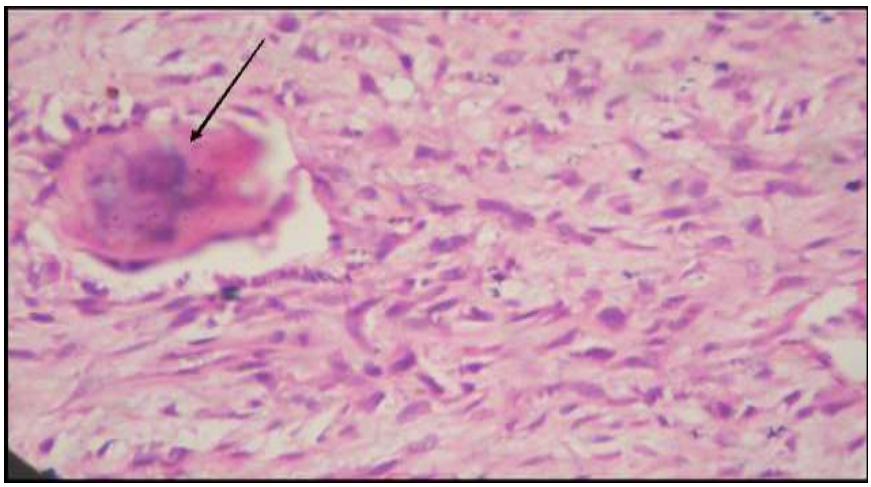

Fig. 7: Osteosarcoma showing bizarre tumour cells, atypical mitosis and osseous formation(H&E 400X)

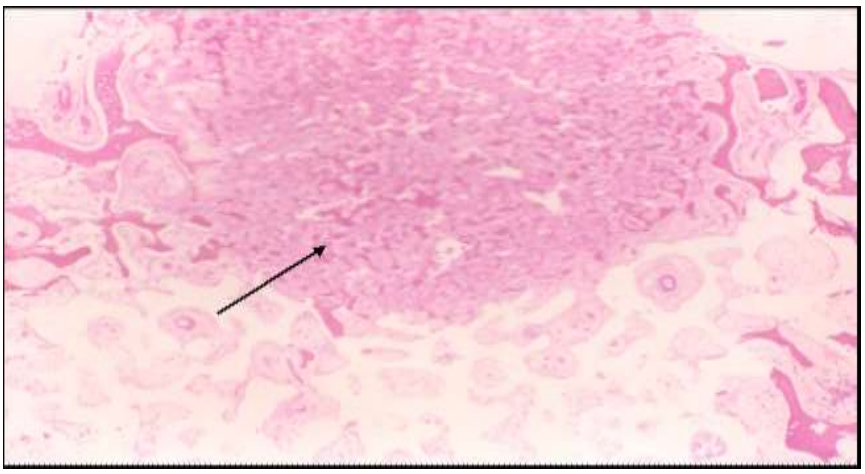

Fig. 8: Osteoid osteoma, femur- showing nidus formation (H&E 100X)

Discussion

The observation and analysis of the present study provide an insight into the clinical presentation and histological patterns of bone lesions.

Age Distribution

The age of the patients ranged from 3 to 85 years. The mean age was 34.2 years. The peak incidence was seen in the age group of 11-20 years with 29 cases (34.5%), followed by next group of 21-30 years with 15 cases (17.8%). Clubbing the two groups together, it was found that 44 cases were in the age group of 11-30 years. Omololu et al[4] concluded that about 45% of primary malignant bone tumours occurred among patients less than 20 years of age. Mohammed et al[5] reported that the peak age of occurrence of primary tumour and tumour like lesions of bone was in 2nd (37%) and 3rd (22%) decade. Obalum et al[6] reported that the peak age of occurrence of primary bone tumours was in the age group of 11-20 years.

Sex Distribution

In the present study males outnumbered females with a male to female ratio of 1.9:1. This is comparable to other authors who also reported male predominance in bone tumours viz: Vanderberg et al[7] reported a male preponderance in bone tumours in children, Baeno et al[8] reported a male to female ratio of 1.2:1, Nagesh et al[9] reported a male to female ratio of 1:1 in bone tumours, Obalum et al[6] reported a male to female ratio of 1.47:1 in primary bone tumours, Omololu et al[10] reported a male to female ratio of 1.5:1 in primary malignant bone tumours.

Site

In our study femur was the most common site involved with 32 cases (38.1%) followed by tibia with 15 cases (17.8%) and humerus with 8 cases (9.5%). This is comparable to study by Yang et al[11] which reported femur followed by tibia as the most common site involved in primary bone and joint tumour. Omololu et al[4] reported mandible as the most commonly affected bone in primary malignant bone tumours. Katchy et al[12] reported femur as the most common site for secondary tumours in study of malignant bone tumours. Mohammed et al[5] reported face as the most common site followed by femur in primary tumour and tumour like lesions of bone. Baeno et al[8] reported femur followed by vertebra and tibia as the most common involved sites in study of bone tumours.

Clinical Presentation

In our study the commonest clinical features in order of frequency were pain/tenderness (85.71%) followed by swelling/mass (75%), limitation of movement (20.23%), general symptoms (fever, malaise, weakness etc.) (16.66%) and pathological fracture (14.28%). This is similar to the findings of Ahmad et al[13] reported rapidly growing mass, pain and deformity as the main clinical presentation. Odetayo [14] reported mass/swelling with or without pain as the main clinical presentation. Katchy et al[12] reported pathological fracture as the presenting sign seen in 35% of the cases.

Histopathological Diagnosis

In our study of bone lesions chronic non-specific osteomyelitis formed the largest group (19%) followed by osteochondroma (14.2%), tubercular osteomyelitis (13.1%), giant cell tumour (9.5%), metastatic tumour (7.1%), aneurysmal bone cyst (4.8%), exuberant fracture callus(3.6%), osteosarcoma (3.6%), fibrous dysplasia (2.4%), osteoid osteoma (2.4%), simple bone cyst (2.4%) and (1.2%) each in cases of acute osteomyelitis, adamantinoma, avascular necrosis of head of femur, chondroma, chondrosarcoma, Ewing's sarcoma, hemangioma, lipoma, malignant fibrous histiocytoma, primary lymphoma of bone, metaphyseal fibrous defect, ossifying fibroma, osteoblastoma, schwannoma, squamous cell carcinoma respectively. This is in agreement with Hanif et al[15] who reported pyogenic osteomyelitis accounted for 35.78% of all

bone pathologies followed by tuberculous oseomyelitis in 22.10%.

The total 84 cases are divided into 3 broad categories viz: benign, malignant and tumour like lesions. Tumour like lesions constituted the largest group with 50% cases followed by benign bone tumours with 32.1% cases and the malignant bone tumours with 17.86% cases.

Settakorn et al[16] reported tumour like lesions (4.1%), benign bone tumours (10.6%) and malignant bone tumours (85.3%). Mohammed et al[5] reported tumour like lesions (22%), benign bone tumours (38.6%) and malignant bone tumours (39.4%). Haniff et al[15] reported tumour like lesions (63%), benign bone tumours (15.8%) and malignant bone tumours (21.2%). Negash et al[9] reported tumour like lesions (11%), benign bone tumours (36.1%) and malignant bone tumours (52.9%).

In our study tumour like lesions form the largest fraction of cases representing 50% of the bone pathologies, further more chronic non-specific osteomyelitis along with tubercular osteomyelitis form the largest group with 32.1% cases. This may be explained by the fact that osteomyelitis although less prevalent in developed countries, is still seen in developing countries like India, with a special mention to tubercular osteomyelitis, as tuberculosis still remains a frequent cause of death and disability in developing country like ours.

The ratio of benign bone tumours to malignant bone tumours in the present study is 1.8:1. This is in agreement with. Odetayo[14] reported the ratio of 2:1. Bahebeck et al[17] reported the ratio of 0.96:1. Settakorn et al[16] reported the ratio of 1:8. Such high percentage of malignant bone tumours compared to benign bone tumours may be due to the fact that this study includes tumours of hematologic origin along with non-hematologic origin which was not the case with other studies, also Chiang Mai University is a tertiary referral institute, so the differences may be due to local pattern of practice and referral. Mohammed et al[5] reported the ratio of 0.98:1. Baeno et al[8] reported the ratio of 2.5:1. Nagesh et al[9] reported the ratio of 1.2:1. Obalum et al[6] reported the ratio of 1.2:1.

Osteochondroma was the most common benign tumour (14.3%). This is in agreement with, Odetayo[14], Mohammed et al[5], Baeno et al[8], Obalum et al[6] who reported the same. Settahorn et al[16] reported giant cell tumour as the most common benign bone tumour.

While metastatic tumour was the most common malignant tumour (9.5%), osteosarcoma (3.6%) was the most common primary malignant bone tumour. This in agreement with Odetayo[14], Omololu et al[4], Bahebeck et al[17], Blackwell et al[18], Settakorn et al[16], Mohammed et al[5], Baeno et al[8], Negash et al[9], Obalum et al[6], Omololu et al[10]. Katchy et al[12] reported Ewing's sarcoma as the most common primary malignant bone tumour.

Summary and Conclusion

The significant findings and conclusions drawn there from are summarized as follows:

1. The age of the patients ranged from 3 to 85 years with a maximum number of patients in the age group of 11-30 years.
2. Males were more frequently affected than female, the male to female ratio being 1.9:1.
3. In our study femur was the most common involved site followed by tibia.
4. Pain/tenderness was the most common clinical feature in 85.71% patients followed by swelling/mass 75%, limitation of movement 20.23%, pathological fracture 17.85% and general symptoms like fever, malaise, weakness etc. 29.8%.
5. In the present study, chronic non-specific osteomyelitis was the most common bone lesion (19%) of all the bone pathologies.
6. Osteochondroma was the most common benign bone tumour (14.2%).
7. Metastatic bone tumour was the most common malignant bone lesion (7.1%), while osteosarcoma was the most common primary malignant bone tumour (3.6%).
8. The ratio of benign to malignant bone tumours was 1.8:1.
9. The percentage of tumour like lesions was 50%, while benign bone tumours were 32.1% and malignant bone tumours were 17.86%.

References

1. Rosenberg AE. Bones. In: Kumar V, Abbas AK, Fausto N, editors. Robbins and Cotran. Pathologic basis of disease. 7th ed. Philadelphia: Elsevier saunders; 2005:1273-324.
2. Dorfman HD, Czerniak B, Kotz R. WHO classification of tumours of bone: Introduction. In: Fletcher CDM, Unni KK, Mertens F, editors. WHO classification of tumour. Pathology and genetics of tumours of soft tissue and bone. Lyon: IARC Press. 2002: 227-32.
3. Bancroft JD and Gamble M. Theory and practice of histological techniques. 6th edition 2008, chapter 9 p126-7, chapter 10 p 156, chapter 11 p 171.
4. Omololu AB, Ogunbiyi JO, Ogunlade SO, Alonge TO, Adebisi A, Akang EE: Primary malignant bone tumour in a tropical African teaching hospital. West Afr J Med. 2002 Oct-Dec;21(4):291-3.
5. Mohammed A, Iss HA: Pattern of primary tumours and tumour-like lesions of bone in Zaria, northern Nigeria: a review of 127 cases. West Afr J Med. 2007 Jan-Mar;26(1):37-41.
6. Obalum DC, Giwa SO, Banjo AF, Akinsulire AT: Primary bone tumours in a tertiary hospital in Nigeria: 25 year review. Niger J Clin Pract. 2009 Jun;12(2):169-72.
7. Vanderberg H, Kroon HM, Slaar A, Hogendoorn P: Incidence of biopsy proven bone tumours in children: a report based on the dutch pathology registration "PAGLA". J Pediatric Orthop 2008 Jan-Feb;28(1):29-35.
8. Baeno-Ocampo LC, Ramirez-Perez E, Linares-Gonzalez LM, Delgado- Chavez R: Epidemiology of bone tumours in Mexico city: retrospective: Extramedullary

hematopoiesis, Thyroid gland, Hematopoietic elements, Fnac, Thyroid nodule. clinicopathological study of 566 patients at a referral institution. Ann Diagn Pathol. 2009Feb;13(1):16-21.
9. Negash BE, Adamasie D, Wamisho BL, Tinsay MW: Bone tumours at Addis Ababa University, Ethiopia: agreement between radiological and histopathological diagnosis, a 5 year analysis at Black- Lion Teaching Hospital. International Journal of Medicine and Medical sciences.2009 April;1(4):119-125.
10. Omololu AB, Okolo CA, Ogunlade SO, Oyebadejo TY, Adeoye AO, Ogunbiyi JO: Primary malignant bone tumours in Ibadan, Nigeria: an update. Afr J Med Sci. 2009 Mar;38(1):77-81.
11. Yang DZ, Wu X: Primary bone and joint tumour – statistical analysis of 571 cases: Zhonghua Zhong Liu Zhi. 1986 Jan;8(1):51-4.
12. Katchy KC, Ziad F, Alexander S, Gad H, Motaal MA: Malignant bone tumours in Kuwait: a 10 year clinicopathological study. Internaional orthopaedics (SCIOT) 2005;29:406-11.
13. Ahmad M, Ghani A, Mansoor A, Khan AH: Pattern of malignant bone tumour in northern areas of Pakistan. J Pak Med Assoc. 1994 Sep;44(9):203-5.
14. Odetayoo OO: Pattern of bone tumours at the national orthopaedic hospital, Lagos, Nigeria. West Afr J Med. 2001 Apr-Jun;20(2):161- 4.
15. Hanif G, Zaman S, Hussain M, Mahmood N, Shahid A, Ghazal A: clinicomorphological pattern of bone lesions in children. D: Biomedica. 2009Jan-Jun;25(18):59-62.
16. Settakorn J, Lekawanvijit S, Arpornchayanon O, Rangdaeng S, Vanitanakom P, Kongkarnka S et al: Spectrum of bone tumours in Chiang Mai University Hospital, Thailand, according to WHO classification 2002: study of 1,001 cases. J Med Assoc. Thai 2006;89(6):780-7.
17. Bahebeck J, Atangana R, Evenga V, Pisoh A, Sando Z, Hoffmeyer P: Bone tumours in Cameroon: incidence, demography and histopathology. Int Orthop. 2003;27(5):315-7.
18. Blackwell JB, Threlfall TJ, McCaul KA: Primary malignant bone tumours in Western Australia, 1972–1996. Pathology. 2005 Aug;37(4):278-83.