

**Histopathological Correlation with Clinico-Radiological Diagnosis of Bone Tumours****Md. Akil Azher Siddique<sup>1</sup>, Arundhati<sup>2</sup>, Rashmi Singh<sup>3</sup>**<sup>1</sup>Medical Officer, Sub Divisional Hospital, Rajgir, Bihar, India<sup>2</sup>Assistant Professor, Department of Pathology, Patna Medical College and Hospital, Patna, Bihar, India<sup>3</sup>Assistant Professor, Department of Pathology, Patna Medical College and Hospital, Patna, Bihar, India

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**Abstract**

Histological examination of bone tumors is considered to be a challenging field in pathology. Bone tumors and tumor – like lesions are very rare. The low incidence of these tumors and the resulting limited experience in dealing with them adds to the diagnostic difficulties.

Clinico–radiological evaluation of bone tumors and tumor – like lesions is an essential part of patient management. Histopathological diagnosis should be given after proper review of clinical and radiological findings.

There is very good correlation between clinico – radiological and histopathological diagnosis in bone tumors. However, many benign bone tumors and tumor - like lesions mimic malignant lesions radiologically. Hence, histopathological confirmation of radiological diagnosis should be always done before definitive treatment.

A close co – ordination between the orthopaedician, radiologist and pathologist is the best approach to treat a patient with bone tumor.

**Key words:** bone tumors, histopathology, tumor like lesion.

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**Introduction**

Bone is a strong connective tissue, which supports the body structure and also plays an important role in mineral homeostasis and hematopoiesis. [1]

The spectrum of bone pathology ranges from inflammatory to neoplastic lesions. Benign and malignant lesions can deceptively mimic each other clinically and radiologically, thus posing challenges, in making conclusive diagnosis by clinical and radiological means alone. Histopathological study therefore becomes imperative in overcoming the diagnostic challenges thus posed.

Bone lesions are also diverse in their history from innocuous to rapidly fatal and also varied in gross and microscopic morphology thus resolving the diagnostic dilemmas require thorough histopathological study.

WHO committee, AJCC and CAP protocols are commonly used for histological definition and classification of bone tumors by surgical pathologists worldwide. This helps in maintaining uniform and reproducible reporting standards, helping clinicians in deciding treatment regimes.

Bone tumors are relatively uncommon, constituting only 0.5% of the total world cancer incidence.[2]

**Aims & Objective**

1. To discuss the spectrum of bone tumors and tumor-like lesions.
2. To establish histopathological correlation with clinico-radiological diagnosis of bone tumors and tumor-like lesions

**Materials and Methods**

Bone lesion biopsies, curetting and excised specimen were collected from patients and were received in Department of Pathology, Patna Medical College Hospital, Patna.

The biopsies, curetting and excised specimen were included in the study for histopathological feature after noting down the clinical history and radiological findings. It is Prospective observational study conducted with the cases received in between February 2021 to January 2023

**Inclusion criteria:**

Patients of all ages and both sexes with biopsy-proven primary or metastatic bone tumor

**Exclusion criteria:**

Patients with hematological malignancies with bone marrow involved.

Patient's information were noted from patient record including Name, Age, Gender, Address, Occupation, Socio-economic status. Chief presenting complain with duration, History of present illness, Past history, Personal history including diet, smoking, alcohol, drug history and Family History . General examination, Systemic examination, Lymph node findings were noted. Routine hematological findings including Hb, TC, DC, ESR was noted. Radiological findings like MRI images, CT scan, X-ray were obtained from medical records. Clinico-radiological diagnosis was correlated with histopathological findings.

Histopathological examination included Macroscopy, Microscopy and Special stains. Other investigations related to disease was also considered. Finally Pathological diagnosis was concluded.

#### Data Analysis:

All the data was initially presented in the form of frequency distribution tables. Respective percentages were calculated for each of the groups based on the total number of patients studied. To understand the clinico-radiologic and histopathologic diagnosis, the data was presented in the form of bivariate tables. Further to understand the extent of association between the various

diagnostic entities, kappa statistics was estimated and interpreted. All the analysis was carried out on SPSS 18.0 version.

#### Observations and Results:

This prospective study included 50 specimens of various benign and malignant bone tumors and tumor – like lesions. The total number of neoplasms diagnosed during the same study period in the Department of Pathology of our college was 4855. Thus, bone tumors and tumor – like lesions constituted only 1.02 % of all neoplasms.

The various benign tumors diagnosed were osteochondroma, enchondroma, chondromyxoid fibroma, osteoid osteoma, osteblastoma and giant cell tumors with local invasion GCT, chondroma.

The malignant tumors diagnosed were chondrosarcoma, osteosarcoma, Ewing sarcoma, Plasma cell myeloma, malignant lymphoma, malignancy in giant cell tumor, chordoma and metastatic deposits.

Only 2 cases of tumor – like lesions were received and included aneurysmal bone cyst and osteofibrous dysplasia.

The distribution of bone lesions in our study is shown in Table 1.

**Table 1: Distribution of bone lesions**

Category	Frequency	Percentage
Benign	15	30%
Malignant	19	%
Tumour – like lesions	4	08 %
Total	50	100%

**Table 2: Gender distribution of the cases**

Gender	Frequency	Percentage
Female	22	44
Male	28	56
Total	50	100

Male to female ratio:1.27:1

The greater majority of patients were males constituting 56% of the total cases whereas 44% were females. The age distribution of cases received has been shown in Table 3.

**Table 3: Age distribution of cases**

Age in years	Frequency	Percentage
< 10	5	10
10-19	23	45.6
20-29	6	12.2
30-39	7	14.5
40-49	1	2.2
50-59	4	7.8
60-69	3	6.6
70-79	1	1.1
Total	50	100

Majority of the patients were in their second decade (45.6%).

The gender distribution of bone tumors and tumor like lesions has been shown in Table 4.

**Table 4: Gender distribution of bone tumors and tumor - like lesions**

Categories	Gender		Total	
	Male	Female		
Osteochondroma	4	3	7	14%
Enchondroma	1	1	2	4%
chondroblastoma	1	0	1	2%
Chondromyxoid fibroma	0	1	1	2%
Chondrosarcoma	2	1	3	6%
Osteoid osteoma	1	1	2	4%
Osteoblastoma	1	0	1	2%
Osteosarcoma	3	2	5	10%
Ewing sarcoma	2	1	3	6%
Plasma cell myeloma	4	2	6	12%
Malignant lymphoma	1	0	1	2%
GCT	3	2	5	10 %
Malignancy in GCT	1	0	1	2 %
Chordoma	0	1	1	2%
Metastatic malignancy	3	4	7	14%
ABC	1	1	2	4%
Simple bone cyst	1	0	1	2%
Osteofibrous dysplasia	0	1	1	2%
<b>Total</b>	<b>32</b>	<b>18</b>	<b>50</b>	<b>100%</b>

The most common tumor in males and females is osteochondroma constituting 10 % of cases together in males and females.

Metastatic deposits showed a predilection for females in this study.

Benign tumors were nearly equally distributed in the first few decades of life. Metastatic malignancy was commonest in the fifth, sixth and seventh decades of life.

**Table 5: Distribution of presenting symptoms**

Symptoms	Frequency	Percentage
Pain	6	11.1%
Swelling	31	63.3%
Pain and swelling	6	13.4%
Fracture	5	10%
Pain and difficulty in walking	1	1.1%
Constipation	1	1.1%
<b>Total</b>	<b>50</b>	<b>100%</b>

63% of the patients presented with swelling as their chief complaint. Pain along with swelling was the next common complaint (14%).

### Discussion

Histological examination of bone tumors is considered to be a challenging field in pathology. Bone tumors and tumor – like lesions are very rare. The low incidence of these tumors and the resulting limited experience in dealing with them adds to the diagnostic difficulties. It is difficult to evaluate the precise incidence of bone tumors as many benign lesions may not be biopsied.

This present study had 50 bone tumors and tumor – like lesions. An attempt has been made to categories the cases and study their histopathology. Age distribution and gender distribution of the cases have been studied. An attempt has also been made to

evaluate the level of correlation between clinico - radiological and histopathological diagnosis of bone tumors and tumor – like lesions.

In the present study, malignant tumors were most commonly encountered constituting 54% of all lesions. These findings were dissimilar to Rao V.S.<sup>3</sup> (44.9%). Benign tumors were second most common (46%) unlike to the observations by Rao V.S.<sup>3</sup> (39.4%).

The most common benign tumor encountered in the present study was osteochondroma and metastatic malignancies. This result not matched with those of Nayar M.<sup>4</sup> (54.3%) and Rao V.S.<sup>3</sup> (40.7%). Giant cell tumor was the second most common benign tumor in the present study (10%). Metastatic malignancies are the most common malignancy encountered in the present study (14%).

**Table 7: Comparison of age distribution of bone lesions**

Age Group	Nayar M. <sup>40</sup> (1979)		Present study	
	Number	%	Number	%
1 <sup>st</sup> decade	58	14.1	5	10
2 <sup>nd</sup> decade	155	37.7	22	45.6
3 <sup>rd</sup> decade	94	22.9	7	12.2
4 <sup>th</sup> decade	59	14.3	7	14.5
5 <sup>th</sup> decade	23	5.6	1	2.2
6 <sup>th</sup> decade	15	3.6	4	7.8
7 <sup>th</sup> decade	7	1.8	3	6.6
8 <sup>th</sup> decade	0	0	1	1.1
<b>Total</b>	<b>411</b>	<b>100</b>	<b>50</b>	<b>100</b>

Majority of patients in the present study were in their second decade of life (45.6%). This finding is similar to Nayar M.[4] (1979) who reported 37.7% patients in the second decade.

The occurrence of bone tumors more commonly in the second decade of life probably suggests that adolescents and young adults are more susceptible to bone tumors due to local changes related to rapid growth of bones during adolescent growth spurt[5]. The age group commonly involved in osteosarcoma was second decade of life. In the present study, the average age of patients with metastatic bone tumour deposits was 53 years. This finding correlates well with Rhutso[6] et al and Sirikulchayanonta[7] et al who reported an average age of 50 years.

The most common benign tumour in the paediatric age group in the present study was osteochondroma (60.9%) which is similar to the findings by Hendrikvan den Berg[8] (2005).

Osteosarcoma was the most frequently occurring primary malignancy in the paediatric age group in the present study. This is consistent with the findings of Hendrik van den Berg[8] (2005).

#### I. Gender distribution of bone tumours

- 1) In the present study, the ratio of male to female patients with bone tumors and tumor – like lesions was 1.27:1. This male preponderance observed is similar to that reported by Baena – Ocampo Ldel C[9].
- 2) Nearly 60% of all osteosarcomas in the present study occurred in males. This finding correlated well with the findings of Shah[10] S.H. et al.
- 3) Cases of osteoid osteoma in the present study were seen equally distributed in males and females. Male preponderance seen for the tumour is reported by Panagotis[11] et al (2:1 ratio).

#### II. Distribution of bone tumours by site of involvement

- 1) The most common site of occurrence of bone tumors in the present study was the femur (28.9%) followed by tibia (21.1%).

Thus, the majority of bone tumors occurred around the knee joint. Rhustof[6] et al had similar findings

with 30.6% tumors in femur and 29% in tibia.

- 2) Osteosarcoma showed a predilection for femur with 3 out of 5 cases occurring there. Tibia was the next common site. The findings are in concordance with Rhusto[6] et al.
- 3). 40% of all giant cell tumors occurred in the tibia in the present study. Similar preponderance for tibia was noted by Karun Jain[12] et al. There was one cases of recurrent giant cell tumors in this study.
- 4). Small bone (metacarpal and phalanx) were involved in 4.4% cases. There was a case of GCT of 4<sup>th</sup> metacarpal of left hand in a 17 year male treated with ray amputation. Another case was of an enchondroma of third metacarpal of the left hand in a 21 year old female.
- 5). Flat bones clavicle was involved in one of the cases. There was one case of osteochondroma in the scapula and one case of chondrosarcoma.
- 6). Out of the 7 cases of metastatic deposits, 3 were found in the femur, humerus was involved in 2 cases, sternum in 1 and skull and spine in one case each. Thus, femur was the most common bone with metastatic deposits in the present study. This result is in agreement with Karun Jain<sup>12</sup>.

#### III. Clinicoradiological and histopathological correlation in diagnosis of bone tumours and tumour – like lesions

Considering all bone lesions together, clinico - radiological diagnosis was confirmed by similar histopathological diagnosis in 47 out of the 50 cases (94%).

The histopathological diagnosis was not in agreement with clinico – radiological diagnosis in 3 out of the total of 50 cases.

The corresponding Cohen's Kappa value calculated was 0.94. This showed excellent agreement between clinico – radiological and histopathological diagnosis of bone tumors and tumor – like lesions in this study.

Comparison of Cohen's Kappa value has been shown in Table 33.

**Table 8 - Comparison of Cohen's Kappa value**

Study	No. of cases	of cases with disagreement	Agreement percentage	Cohen's kappa value	Interpretation of Kappa value
Negash <sup>3</sup> et al (2009)	205	33	83.50%	0.82	Excellent agreement
Present study(2022)	47	3	94%	0.94	Excellent agreement

Thus, the agreement between clinico – radiological and histopathological diagnosis was similar to the study by Negash et al[13].

The 3 cases in the present study where clinico – radiological diagnosis and histopathological diagnosis were not in agreement were

- 1) A 60 year male presented with swelling and pain in the proximal part of left upper limb for one year. MRI revealed a large expansile lesion over the left humerus in the meta– diaphysis extending to epiphysis. Cortical destruction and pathological fracture were noted. A clinico – radiological diagnosis of lymphoma was offered. The biopsy received in our department showed sheets of plasma cells with many binucleate forms. A diagnosis of plasma cell myeloma was offered and further biochemical investigations were suggested.

A similar case was reported by Ajit Mahale[14] et al where a lytic lesion of skull base with radiological differential diagnoses of lymphoma and plasmacytoma was finally reported as plasmacytoma by histopathological examination.

Ly JQ[15] et al also reported a case of plasmacytoma of proximal humerus in 2005.

- 2) A 45 year male presented with swelling and pain in the right side of hip for past 6 months. MRI pelvis showed an expansile bone lesion in the right iliac blade with bone destruction.

A clinico – radiological diagnosis of plasmacytoma was offered. Histopathological examination of the biopsy revealed polymorphic tumour cells with vesicular nucleus arranged in sheets. As the patient had no evidence of disease elsewhere in the body, a final diagnosis of primary lymphoma of bone was made.

- 3) A 14 year old male presented with pain and swelling in left side of hip for past 3 months. MRI revealed a permeative lytic lesion of left iliac wing and a clinico – radiological diagnosis of Ewing sarcoma was made. However histopathology showed malignant sarcoma cells producing osteoid. A diagnosis of Osteosarcoma was made. Unni[16] K.K. reported that radiating spicules from the cortex of an affected bone may cause difficulty in differentiation of Ewing sarcoma from

osteosarcoma especially in a flat bone like ilium. The incidence of giant cell tumours in small bones is very less. Unni[16] et al reported an incidence of 1% and Averill[17] et al reported an incidence of 1.5% in their studies.

There is very good correlation between clinico – radiological and histopathological diagnosis in bone tumours and tumour – like lesions. However, discrepancies do exist and an integrated approach involving clinical, radiological and histopathological examination is the gold standard to diagnose bone lesions.

#### conclusion

In the present prospective study of 50 bone tumors and tumor – like lesions evaluated by histopathological examination, the following results were obtained. Out of the 50 cases, 48 cases (95.6%) were bone tumors and only 2 cases (4.4%) were tumor-like lesions. 23 cases (46%) were benign tumors and 27 cases (54%) were malignant tumors. Amongst the malignant tumors, most common were metastatic malignancies of the bone and plasma cell myeloma. Osteochondroma is the most frequently encountered benign tumor followed by Giant cell tumor. Amongst the primary malignant tumors of bone, osteosarcoma and Plasma cell myeloma were the most common followed by Ewing sarcoma and chondrosarcoma.

Commonest presenting symptom was swelling (63.3%) followed by pain and swelling (13.4%). The incidence of bone tumors was maximum in second decade of life (45.6%). Osteochondroma is the most common benign bone tumor in paediatric age group .

Osteosarcoma is the most common malignant tumor in the paediatric age group (17.4%) followed by Ewing sarcoma (8.7%). Osteochondromas occurred in the humerus most commonly .

Osteosarcomas occurred commonly in the distal femur (36.4%) followed by proximal tibia (27.3%) . Tibia was the bone most commonly involved by giant cell tumour (63.6). Femur and humerus is the common site of metastatic deposits. Flat bones including sacrum and spine are also the site of metastatic deposits .

Aneurysmal bone cyst was the commonest tumour – like lesion (75%).

- Osteosarcomas showed male preponderance in the study conducted. Metaphysis was the commonest site involved by bone tumours (48.9%) in our study.

The commonest radiological picture of bone tumours among lytic lesions was of a lytic and poorly defined lesion (20%) in our study.

- 47 out of 50 cases showed agreement between clinico – radiological and histopathological diagnosis in our study. Only 3 cases were in disagreement. The corresponding Cohen's Kappa value was 0.94 which showed excellent agreement between clinico – radiological and histopathological diagnosis.

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