

CLINICO-MORPHOLOGICAL PATTERN OF BONE LESIONS IN CHILDREN

GHAZALA HANIF, SAMINA ZAMAN, MAHVISH HUSSAIN
NASIR MAHMOOD, ANUM SHAHID AND AYESHA GHAZAL

Department of Pathology, Institute of Child Health and Children's Hospital, Lahore

ABSTRACT

The present study was performed to find the spectrum of bone diseases in children and to correlate with age, sex, and site of origin. This was a retrospective study and consists of 95 cases of bone biopsies which were diagnosed in the Department of Pathology at the Institute of Child Health and Children's Hospital, Lahore during a period of six years (Jan 2003-Dec 2008). These biopsies were evaluated on haematoxylin and eosin stained sections from paraffin embedded tissue blocks. Special stains were performed whenever required. Pyogenic osteomyelitis (OM) accounted for 35.78% of all bone pathologies followed by tuberculous osteomyelitis in 22.10%. Osteosarcoma (OS) was the most frequent (primary tumour of bone followed by Ewing's sarcoma (ES). One case of metastatic bone tumour was also recorded. Osteochondroma, osteoma, aneurysmal bone cyst, fibro-osseous dysplasia, chondroma and simple bone cyst were also found in children. The bone tumours are relatively more prevalent in males.

Keywords: *Childhood bone lesion, osteomyelitis, Osteosarcoma, Ewing sarcoma*

INTRODUCTION

Bone infections and neoplasms are relatively uncommon lesions and pathologists generally lack clinical experience with these lesions. Benign, malignant and a large number of non-neoplastic bone lesions occur at typical sites and in certain age groups. Nonspecific osteomyelitis in children and adolescent can be diagnosed in patients 2 to 16 year old and may clinically present as acute, subacute or chronic.¹ Although acute osteomyelitis seems to be less prevalent, the diagnosis and management is the major challenge. Staphylococcus aureus accounts for 40-80% of infections followed by group A β -haemolytic streptococcus.² In USA, the widespread use of Haemophilus Influenzae vaccine has virtually eliminated acute osteomyelitis caused by this organism.³

The World Health Organization has estimated that one-third of the global population is infected with Mycobacterium tuberculosis, and tuberculosis remains the most frequent cause of death and disability on a worldwide basis, accounting for close to three million deaths each year. Tuberculosis has been reported in all bones of the body and remains a major public health problem.⁴ The majority of primary bone tumours develop in childhood, late adolescent or early adulthood, coinciding with the growth spurt and time of maximum constructive activity of bone. They frequently affect long bones and tend to occur at the ends of bones where growth is maximum Osteosarcoma is the most common malignant bone tumour in children⁶ followed by Ewing's sarcoma and lym-

phoma.⁷ Tumour like bone lesions include various non-neoplastic conditions originating from or affecting the bone as solitary or sometimes multiple bone lesions. These include simple bone cyst, aneurysmal bone cyst (ABC), intra-osseous ganglion, epidermal cyst and sub-chondral cyst.⁸

MATERIALS AND METHODS

This was a retrospective study and consists of 95 cases of bone biopsies which were diagnosed in the Department of Histopathology at the Children Hospital and Institute of Child Health, Lahore during the period of six years (Jan 2003-Dec 2008). The clinical parameters including the age, sex, site and the radiological impression were recorded. The specimens were initially decalcified in HNO₃ followed by routine processing in an automatic processor in ascending grades of alcohol, cleared in xylene and embedded in paraffin wax. Sections 3-5 μ m thick were cut using a rotary microtome. The slides were stained with haematoxylin and eosin (H&E) for the morphological diagnosis. Special stains were performed whenever required.

RESULTS

We report 95 cases of bony lesions in children which have been diagnosed within the period of six years in the Histopathology Department at The Children Hospital and Institute of Child Health, Lahore.

A total of 34 cases (35.78%) of pyogenic osteomyelitis were diagnosed. Out of these 22 (64.7%)

were males and 12(35.29%) were females with male to female ratio of 1.8: 1. These cases were seen in infants as young as 6 months to children upto 13 years of age (Table 1). Twenty cases were diagnosed in the lower limb, and 9 cases in the upper limb. In the rest of the 5 cases, site was not known (Table 2).

In this study 21 cases (22.10%) of tuberculous osteomyelitis were seen, these 13 (61.9%) were males and 8 (38.09%) were females having the age range of 4 months to 12 years (Table 1). The most common site involved was upper limb followed by lower limb and spine (Table 2). Bone tumours were diagnosed in 39 cases. Benign tumours and tumour like lesions were diagnosed in 12 patients. These included 3 (3.15%) cases each of osteochondroma and osteoma, 2 (2.10%) cases each of aneurysmal bone cyst and fibro-osseous lesions and 1 (1.05%) each of chondroma and solitary bone cyst (Table 1). Lower limb was the commonest site involved (Table 2).

Among the three 2 cases of osteochondroma were found in 1 ½ and 12 yr old females while one case was seen in a male whose age was not known. All cases of osteoma were seen in females. Two cases of fibro-osseous lesions were diagnosed in 10 and 14 year old males (Table 1). Both cases were located in the upper end of left tibia. Two cases of aneurysmal bone cyst were seen in 10 and 18 year old females. One case each of bone cyst and

chondroma was seen in males (Table 2).

There were 20 cases of malignant bone tumours. The commonest among them was osteogenic sarcoma in 11 cases (11.57%) (Fig. 2), followed by

Table 1: Age and sex of the cases under study (n = 95)

	Age	Males n (%)	Females n (%)	Total
Acute osteomyelitis	6m – 13 yrs	22 (64.7)	12 (35.29)	34
TB osteomyelitis	4m – 12 yrs	13 (61.9)	08 (38.09)	21
Osteochondroma	1.5 yrs – 12 yrs	1 (33.33)	2 (66.67)	3
Osteoma	5 – 11 yrs	0	3 (100)	3
Aneurysmal bone cyst	10 – 19 yrs	0	2 (100)	2
Fibro-osseous	10 – 14 yrs	2 (100)	0	2
Solitary bone cyst	10 yrs	1 (100)	0	1
Chondroma	12 yrs	1 (100)	0	1
Osteogenic sarcoma	7 – 14 yrs	7 (63.63)	4 (36.36)	11
Ewing sarcoma	5m – 12 yrs	4 (50)	4 (50)	8
Metastatic tumour	11 yrs	1 (100)	0	1
Unremarkable	-	6	2	8
Total		52	35	95

Table 2: Incidence of (n -95) bony lesions under study according to site.

	U L	L L	Sc alp	Spi ne	U N K	To tal
OM	9	20	-	-	5	34
TB	8	8	-	1	4	21
Osteochondroma	-	3	-	-	-	3
Osteoma	1	2	-	-	-	3
ABC	-	-	-	2	-	2
Fibro-osseous	-	2	-	-	-	2
Sol. Bone cyst	-	1	-	-	-	1
Chondroma	-	-	-	-	1	1
Osteosarcoma	-	11	-	-	-	11
Ewing sarcoma	2	5	1	-	-	8
Met. Tumour	-	1	-	-	-	1
Unremarkable						8

Ewing sarcoma seen in 8 cases (8.42%) and a single case of metastatic tumour from hepatoblastoma was reported. Among 11 cases of Osteosarcoma, 7 (63.63%) were males and 4 (36.36%) were

females with male to female ratio of 1.75:1. The age range was 7-14 years (Table 1). All of them had a tumour diagnosed in legs with 7 cases arising from upper end of tibia whereas lower end of femur was involved in the remaining 4 cases (Tab. 2). Eight (8.4%) cases of Ewing's sarcoma were seen. They were equally distributed in both sexes with age range of 5 months to 12 years. Two cases were seen in upper limb and 5 in lower limbs and only one had originating scalp. There was a single case of metastatic bone tumour in an 11 year old male child in tibia having history of biopsy proven hepatoblastoma (Table 1).

In 8 cases no diagnosis was rendered as biopsy revealed unremarkable bony spicules (the only inadequate one biopsy).

DISCUSSION

Osteomyelitis in children is a relatively uncommon but potentially serious disease. Although osteomyelitis seems to become less common prevalent in Industrialized countries, it still constitutes most of bone pathology seen in developing countries similar to the present study. Majority of pyogenic osteomyelitis cases were located in lower limbs followed by upper limb bones (Table 2). The results were in accordance with those of Rasool, who also found the higher incidence of osteomyelitis in lower limbs.⁹

Tuberculous osteomyelitis has been reported in all bones of the body. In addition the spine is the most frequently involved site in adults whereas is rare in children.¹⁰ This is in accordance with our finding in which tuberculous osteomyelitis was observed mainly in bones of upper and lower extremities. In only one case spine was found to be involved in a 5 yr old boy.

Data on childhood bone tumours is mainly confined to reports on malignant tumours or in institutional registries. Incidence figures on both benign and malignant bone tumours in childhood are lacking. As a result incidence of biopsy proven bone tumours in childhood is low. In contrast to other paediatric malignancies which are seen predominantly in pre-school children, many cases of bone tumours are seen in the older children and adolescents.¹¹

Osteosarcoma is the second common cause of death due to cancer in children. It is most frequently seen in young people in the second and early third decades of life as over 60% of diagnoses are made between the ages of 10-20 years. It usually occurs in metaphyses of long bones most frequently in distal femur, proximal tibia, proximal humerus, and proximal femur in that order.¹² We also found that osteosarcoma is the most common primary malignant bone tumour in children.

All cases were seen in children older than 7 years and located around the knee joint.

In contrast to osteosarcoma, Ewing's sarcoma tends to occur at much younger age. Ewing's sarcoma is a rare but highly malignant neoplasm¹³ that not only affects the long bones but also spine, pelvis and ribs.¹⁴ This is in contrast to our findings; as in our study only one case was seen in scalp where majority were located in the limbs. Ewing's sarcoma was equally distributed in both sexes in the present study which is in contrast to Cotterill et al, who analysed 975 cases of Ewing's sarcoma and found age range of 8 months to 47 years with a higher incidence in males under 15 yr of age.¹⁴ Muzaffar et al carried out a study on frequency of bone cancer at Agha Khan University Hospital, and found that osteosarcoma was the most common primary malignant bone tumour followed by Ewing's sarcoma. They also found that bone tumours are relatively more prevalent in males.¹⁵ These findings are similar to those in the present study.

The metastatic lesions were found to be rare, in fact it was found in only one case. This is similar to Tsukushi et al, who observed that metastatic bone tumours are rare in children.¹⁶

Tumour like bone lesions include various non-neoplastic conditions originating from or affecting the bone as solitary or sometimes multiple bone lesions. ABC is a locally recurrent non neoplastic bone lesion. We found 2 cases of ABC one each in both sexes, they were in their second decade similar to Spence et al who also found a higher incidence of the lesion in the second decade. In both the cases, spine was involved whereas Spence et al observed that limbs were more frequently involved in ABC.¹⁷

We **conclude** that pyogenic Osteomyelitis is the most frequent bone pathology seen in children followed by tuberculous Osteomyelitis. Among the malignant bone tumours Osteosarcoma is the most common bone tumour followed by Ewing's sarcoma. Bony lesions are more prevalent in males than females. In the majority of benign as well as malignant conditions, lower extremity is the most frequent site of involvement.

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