

Demographic Profile and Management Challenges of Osteosarcoma: Insights from a Limited Resource Setting

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Abstract: Introduction: Osteosarcoma is one of the most common pediatric bone tumors with bimodal age distribution. Indian data about osteosarcoma is rare. So this retrospective analysis aims to find out the demographic profile and management of osteosarcoma cases reported in this tertiary care hospital. Materials and Methods: The demographic profile and treatment details of all the osteosarcoma cases registered in the department from 1st January 2022 to 31st March 2026 was entered in a structured proforma for analysis. Results: A total of 13 cases were available. Median age of diagnosis was 19 years. Males were predominant. Most common site was distal femur with pain as the most common symptom. Osteoblastic subtype was higher with stage I being the most common presenting stage. Around 15% defaulted without any treatment. A total of 82% underwent curative intent treatment, but in that only 67% completed fully planned treatment course. Around 50% of those who completed full course planned treatment progressed. Most common site of progression was lung. Disease free interval ranged from 4 to 10 months. Conclusion: This study shows that osteosarcoma incidence is rare in our setting with the majority reported in AYA. Regimens without high dose methotrexate are a feasible option in low resource setting. Disease progression rate is high after treatment. Drop out is a major problem in this setting which should be addressed by various methods and importance of treatment adherence should be educated.

Keywords: Osteosarcoma, bone tumor, Osteoblastic, adolescents and young adults

1. Introduction

Osteosarcoma is the most common pediatric bone tumor. It accounts for less than 4% among all the pediatric tumors worldwide and around 10% in India(1).

It has a bimodal age distribution with primary peak between 10 to 20 years and secondary in older adults after 65 years (2). It is more common in males.

It basically arises from the osteoid forming mesenchymal cells. Most commonly arise from the growth plates or metaphysis of long bones. Distal end of femur, proximal tibia, proximal humerus are the most common sites(3).

It can be divided into low grade, intermediate grade and high- grade types. Low-grade osteosarcomas include low-grade central osteosarcoma (LGOS) and parosteal osteosarcoma. Intermediate-grade includes periosteal osteosarcoma. High grade osteosarcoma includes conventional osteosarcoma, telangiectatic osteosarcoma, small cell osteosarcoma, and high-grade surface osteosarcoma. Conventional osteosarcoma is further divided based on the predominant matrix into osteoblastic, chondroblastic and fibroblastic (10%) types(4). Among this osteoblastic is the most common one.

Most common presenting symptoms include bone pain, swelling, difficulty in walking, pathological fractures etc.

It is diagnosed by the identification of the osteoid matrix in the biopsy. Core needle biopsy is usually preferred to open biopsy. Laboratory values like alkaline phosphatase will be

elevated due to increased bone turn over, LDH level will be raised in especially metastatic disease. Diagnostic imaging includes conventional Xray. Xray shows mixed osteoblastic and lytic lesion with codman triangle and sunburst appearance. MRI local part to include one joint above and below to rule out skip metastasis and intramedullary extension and soft tissue involvement is recommended. CT chest is mandatory to rule out lung metastasis.

Management includes neoadjuvant chemotherapy (NACT) followed by surgery and adjuvant chemotherapy. Surgery can include surgery of primary site and metastasectomy also. Either limb salvage surgery (LSS) or amputation is done if LSS is not feasible. It is highly resistant to radiation. So, the scope of RT is limited in osteosarcoma.

The 5- year survival rate in India is around 44% while it is around 65% across western literature(5). There is scarcity of Indian data about this tumor. This study aims to find out the demographic profile of osteosarcoma cases registered in our tertiary care centre

Aims and objectives

To find out the demographic profile and management of osteosarcoma treated in our tertiary care center

2. Materials and methods

Study design-Retrospective analysis

Study setting- Medical Oncology department

Study duration-January 1st 2022 to 31st March 2026

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Methodology

The demographic profile and treatment details of all the osteosarcoma cases registered in the department from 1st January 2022 to 31st March 2026 was entered in a structured proforma. AJCC 8th edition is used for staging. Categorical data entered as frequencies and percentages.

3. Results

A total of 13 cases were registered. Median age of presentation was 19 years. Age ranges from 11 - 42 years. Only one patient was aged 42 years, rest all belong to Adolescents and young adults (AYA) group. Majority were males (69%). The most common presentation was pain followed by swelling, pathological fracture. Most common histology was conventional osteoblastic type (69%) followed by chondroblastic type (23 %). Most common site was distal femur (46%) followed by fibula (23%). One each case was present in maxilla, humerus, tibia and medial malleolus. Majority of them initially presented in stage I (85 %). Two patients presented in de novo stage IV. One of them presented with extensive bone metastasis alone and the other with bilateral lung metastasis. Table 1 explains the demographic profile of cases.

Table 1: Demographic profile

Demographic feature	Number	Percentage
Age	Median =19 years	Range 11- 42 yrs
Sex		
Males	9	69
Females	4	31
Symptoms		
Pain	8	62
Swelling	6	46
Pathological fracture	1	8
Histological types		
Osteoblastic	9	69
Chondroblastic	3	23
Giant cell variant	1	8
Site		
Distal femur	6	46
Fibula	3	39
Maxilla	1	8
Humerus	1	8
Tibia	1	8
Medial malleolus	1	8

In the total population of 13, 15% defaulted without receiving any treatment. Among those who presented in early stages and received curative treatment, 89% received NACT. IAP (Ifosfamide Adriamycin, Cisplatin) was the most common regimen used. A total of 82% underwent curative intent treatment, but in that only 67 % completed fully planned treatment course. Four (44%) of them underwent LSS and 33% had amputation. One patient had complete response, one had 5% viable tumor tissue and others had viable tissue ranging from 51 to 97%. around 50% of those who completed full course planned treatment progressed. Most common site of progression was lung. Disease free interval (DFI) ranged from 4 to 10 months. (Table 2 showing treatment details)

Table 2: Treatment details

Treatment	Number	Percentage
Treatment received	11	85
Defaulted without treatment	2	15
Curative intent treatment received	9	82
Completed full course curative intent treatment	6	67
Progression	3	50

4. Discussion

Osteoblastoma is a mesenchymal tumor common in the AYA population. The peak age in AYA is 10- 20 years which is the same in our population and other real- world data available(6,7). Most of our cases were between 10 to 20 years. The hypothesis behind this bimodal age distribution is that the peak in childhood is due to the adolescent growth spurt causing imbalance in supply and demand of progenitor cells but the second peak in older patients is associated with increased bone turnover and remodeling(8).

Usually it is more common in males, but certain Indian data suggest that bone tumors are more common in females(1,9).Our data majority of cases were males. None of our patients had any comorbidity or any family or personal history of malignancy. Most common presentation of osteosarcoma reported in literature is pain and swelling which is the most common presentation in our setting also(1,3). Most common histology was osteoblastic followed by chondroblastic type which also resonated with the available literature(6,10).Low grade tumors and other histology was absent may be due to less number of patients.

Most common site was distal femur as in other studies. One of the cases presented with primary in maxilla. Cases of osteosarcoma are also reported from other appendicular skeleton. Rare cases reports of extra osteosarcoma are also available in literature(11).

Majority presented in T1 stage followed by T2 stage. Most common site of metastasis and disease progression was in lungs followed by bones as in other reported data.

NACT followed by surgery is the treatment of newly diagnosed osteosarcoma. High dose methotrexate containing regimens are the new standard approach. But the prolonged hospitalisation, pharmacodynamic monitoring and toxicity profile precludes its utility in low resource setting(6,12).Hence IAP regimen was most commonly used in our setting. LSS was offered in the majority possible. Percentage of necrosis varied in our study from 3% to 100%.

NACT type, Percentage of necrosis, ALP level. LDH level, performance status were found to be predictors of outcome in various studies(12,13).Palliative regimens used include Ifosfamide adriamycin combination, Gemcitabine docetaxel, sorafenib etc.

The dropout rate and default rate was high in our low resource setting.

5. Conclusion

This study shows that osteosarcoma incidence is rare in our setting with the majority reported in AYA. Males have higher incidence and distal femur being the most common site. Regimens without high dose methotrexate is a feasible option in low resource setting. Disease progression even after full course curative treatment is higher. The drop out is a major problem in this setting which should be addressed by various methods and importance of treatment adherence should be educated.

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