DOI: 10.5958/2319-5886.2015.00106.X

International Journal of Medical Research & Health Sciences

www.ijmrhs.com Volume 4 Issue 3 Coden: IJMRHS Copyright @2015 ISSN: 2319-5886

Received: 19th Mar 2015 Revised: 20th Apr 2015 Accepted: 29th May 2015

Research article

DEMOGRAPHIC PROFILE OF PEDIATRIC OSTEOSARCOMA IN SOUTH INDIA: A SINGLE INSTITUTION EXPERIENCE

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ABSTRACT

INTRODUCTION: Osteosarcoma is the most common primary malignant bone tumor in children and adolescents, accounting for 4% of all childhood cancers worldwide. In India, the incidence varies from 4.7% to 11.6%, where this malignancy is associated with significant morbidity and mortality. There is paucity of demographic and clinical data for osteosarcoma in India. **Objective:** To retrospectively assess the demographic and clinical profile of pediatric osteosarcoma presenting at a tertiary cancer care centre of South India. **Materials and Methods:** From January 2010 to December 2013, all children under the age of 15 years diagnosed with osteosarcoma on histopathology were retrospectively analyzed for age, gender, rural or urban location, history, location of tumour, investigations, stage and histopathological subtype. The findings were formulated to chart the demographic and clinical profile. **Results:** A total of 37 cases of pediatric osteosarcoma were analyzed. The median age was 13 years with only three patients under the age of 10 years. There was a slight female preponderance with male: female ratio of 1:1.3. Most common mode of presentation was with pain and swelling of local site. Three patients had presented with a pathological fracture. The most common site involved was the distal femur. Over 90% of the cases were conventional osteosarcoma. Around 32% of patients had stage IV disease at presentation. Around 37% of patients from rural areas and 20% of patients from urban areas presented with metastatic disease. **Conclusions:** The aim of the study was the demographic and clinical description of osteosarcoma in the pediatric age group. A slight female preponderance was noted. The most common sites were consistent with western data except for an increased incidence in the fibula. There was an increased incidence of metastatic disease as compared to western population and a larger proportion of these patients seemed to come from rural areas.

Keywords: Pediatric Osteosarcoma, Rural population, South India

INTRODUCTION

Osteosarcoma is the most common primary malignant bone tumor in children and adolescents, accounting for 4% of all childhood cancers worldwide. In India, the incidence varies from 4.7% to 11.6%,[1] where this malignancy is associated with significant morbidity and mortality. The five year overall survival rate in India is around 44% as compared to 68% in the western countries.[1] The rates of limb salvage over amputation is also much lesser in India leading to significant morbidity.[2] There is paucity of demographic and clinical data for osteosarcoma in India, especially in the pediatric setting. Our

objective was to retrospectively assess the demographic and clinical profile of pediatric osteosarcoma presenting at a tertiary cancer care centre of South India.

MATERIALS AND METHODS

Study design: Retrospectively analysis study
Study duration: January 2010 to December 2013
Ethics clearance: The study was approved by the Institutional Ethics Committee
Inclusion criteria: The medical records of children under the age of 15 years admitted to Kidwai Memorial Institute of Oncology, Bangalore with a diagnosis of osteosarcoma.
Exclusion criteria: All patients more than or equal to the age of 15 years, Bone tumours other than osteosarcoma
Methodology: From the Medical record section the data was retrospectively analyzed for age, gender, rural or urban location, history, location of tumour, investigations, stage and histopathological subtype. The diagnosis was made with histopathological examination of biopsy specimens. The tumours were staged using the 7th edition AJCC TNM staging system.[3] The findings were formulated to chart the demographic and clinical profile.

RESULTS

From January 2010 to December 2013, a total of 37 cases of pediatric osteosarcoma were identified and analyzed. Most of the patients (73%) were from rural areas. The median age was 13 years with only three patients under the age of 10 years and none below the age of 5 years. There was a slight female preponderance with 57% girls and 43% boys and a male: female ratio of 1:1.3. The most common mode of presentation was with pain and swelling of local site (62%). There was no significant past or family history. The most common site for osteosarcoma in children was the distal femur (46%) followed by the proximal tibia (24%) and the fibula (11%). Among the histopathological subtypes, 92% were conventional osteosarcomas of which 76% were osteoblastic osteosarcoma, not otherwise specified. The other subtypes seen were, chondroblastic (14%) and Fibroblastic (2%). (Fig.2) Telangiectatic osteosarcoma comprised of 8% of the cases. (Table1). All patients had high grade osteosarcoma. There were no cases of parosteal or periosteal osteosarcoma. Twelve patients (35%) presented in stage 2B and 32% with stage IV disease. Six of the twelve had pulmonary metastasis, four had skeletal metastasis and two patients had metastases to both bone and lungs. More patients from the rural areas (37%) presented with stage IV disease as compared to those from urban areas (20%).

Table 1: Baseline Characteristics

PARAMETER	SUBSET	NUMBER
Age distribution	0-5 years	0
	5-10 years	3
	10-15 years	34
sex	Male	16
	Female	21
Rural/Urban	Rural	27
	Urban	10
Presenting complaint	Only pain	23
	Pain and Swelling	11
	Pathological Fracture	3
Type	Conventional OS	34
	Telangiectatic	8

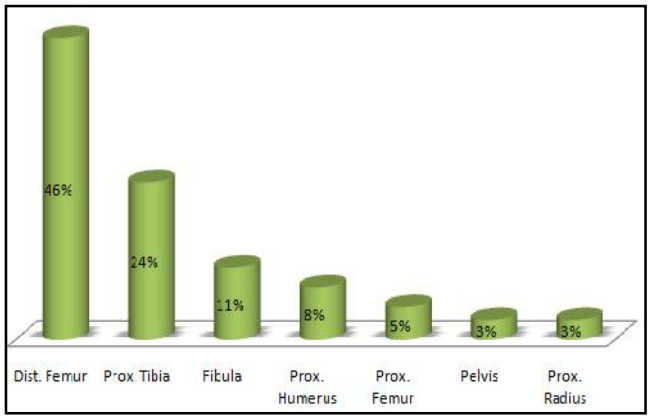

Fig 1: Site of Tumour

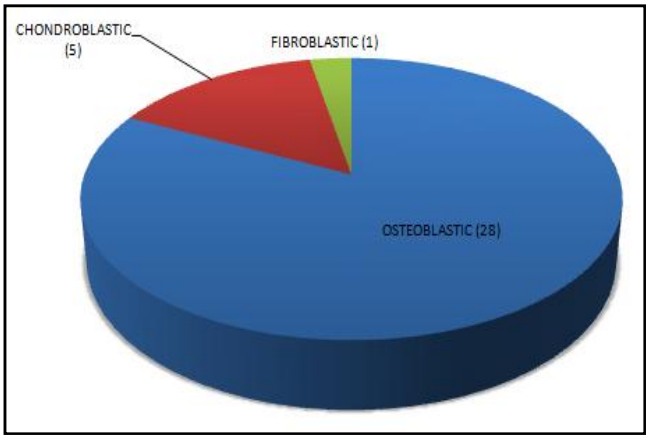

Fig 2: Subtypes of conventional Osteosarcoma

(total 34 cases)

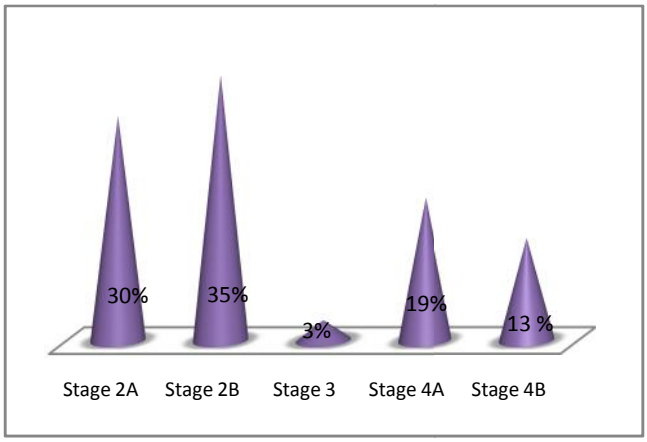

Fig 3: Stage at Presentation

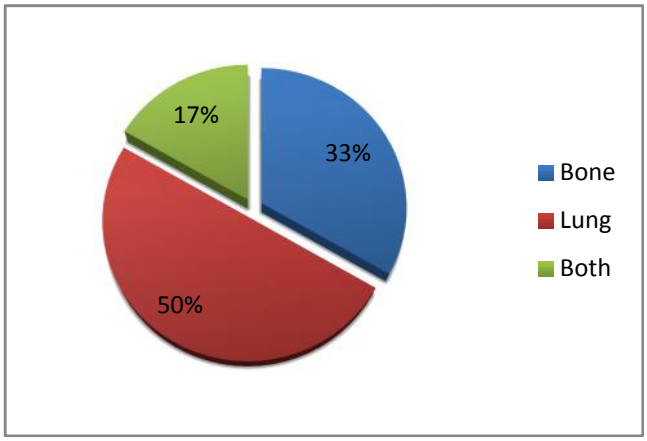

Fig 4: Sites of Metastasis

DISCUSSION

Osteosarcomas are primary malignant tumors of bone that are characterized by the production of osteoid or immature bone by the malignant cells.[4,5,6] Osteosarcomas are uncommon tumors and are thought to be derived from primitive bone-forming mesenchymal cells.[7] Mean annual age-standard incidence is around 3.8 per million in males and 2.8 per million in females.[8] In India, the incidence varies from 4.7% to 11.6% of all the childhood malignancies.[1]

Over a period of four years from January 2010 to December 2013, a total of 37 cases of pediatric osteosarcoma were identified and analyzed. Most of the patients (73%) were from rural areas. The median age was 13 years with only three patients under the age of 10 years and on patient less than 5 years of age {Table 1}. There was a slight female preponderance with 57% girls and 43% boys and a Male: Female ratio of 1:1.3(Table 1). Data from the National Cancer Registry Program of India has suggested that there is a slightly increased incidence females in osteosarcoma of the pediatric age group.[1] A similar sex ratio of 1:1.4 was seen in a Norwegian cohort of 473 osteosarcoma patients.[8] The most common mode of presentation was with pain and swelling of local site (62%). Three patients (8%) had presented with a pathological fracture.(Table-1) This is consistent with existing literature in which 5-10% of patients with osteosarcoma present with pathological fractures.[9,10] There was no patient with any past history of radiation or retinoblastoma or any significant family history of malignancy.

Routine laboratory investigations were mostly normal, except for elevation of alkaline phosphatase above upper limit of normal in 48% of patients. Elevation of alkaline phosphatase was seen in around 40% of patients in an American trial conducted to determine the significance of alkaline phosphatase as a prognostic marker.[11] The increased incidence in our series may be due to the higher percentage of patients presenting with advanced disease and multiple skeletal metastasis.

The most common site for osteosarcoma in children was the distal femur (46%) followed by the proximal tibia (24%) and the fibula (11%).(Fig.1) The first two most common sites were consistent with that of western data but incidence of fibular osteosarcoma was double of that seen in western literature.[8] Over 90% of the cases were conventional osteosarcoma. Telangiectatic osteosarcoma accounted for 8% of the cases.(Table 1), (Fig.2) Compared to the SEER database as well as Norwegian data, there was a higher incidence of telangiectatic variant of osteosarcoma and no cases of parosteal osteosarcoma in our set of patients.[8,12]

All patients had high grade osteosarcoma. The most common stage at presentation was stage 2B comprising of 35% of the patients. Only one patient had stage 3 disease with skip metastasis.(Fig.3) Twelve patients (32%) had stage IV disease at presentation out of which six (19%) had lung metastasis and four (13%) had bone metastasis.(Fig.3 and 4) Two patients out of the thirty-seven had both lung and bone metastasis.(Fig.4) Only four out of the seven patients with pulmonary metastasis had evidence of disease with chest X-ray and for the other three were evident only with contrast enhanced CT scan of the chest. This underlines the importance of

including a contrast enhanced CT scan of the thorax as part of the staging work-up of osteosarcoma rather than just a chest X-Ray.[13] According to the Children's Oncology Group guidelines, finding one or more pulmonary (or pleural) nodules of at least 1-cm diameter or three or more nodules of at least 0.5-cm diameter generally indicates definite pulmonary metastases and may not require a biopsy.[14] Compared to western data, there was a higher incidence of metastatic disease at presentation (32% vs. 20%).[15] A larger proportion of patients from rural areas(37%) presented with metastatic disease as compared to patients from urban areas (20%).(Table-1) This may be a reflection on the fact that, due to lack of facilities and proper referral centres, patients from rural areas tend to present at a later stage than those living in the cities with easier access to quality health care.

CONCLUSION

The aim of the study was the demographic and clinical description of osteosarcoma in the pediatric age group. A slight female preponderance was noted. The most common sites were comparable with western data except for an increased incidence in the fibula. There was an increased incidence of metastatic disease as compared to western population and a larger proportion of these patients seemed to come from rural areas.

ACKNOWLEDGEMENT: NONE

Conflict of Interest: Nil

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