Research Article:
Epidemiology of Primary Malignant Bone Tumors in Isfahan Province, Iran

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ABSTRACT

Background: Primary malignant tumors, including rare tumors of the skeleton, are of concern. However, the unpredictable prognosis, morbidity, and mortality of these tumors have raised them as one of the health problems.

Objectives: This study was designed to evaluate the epidemiological characteristics of these tumors in Isfahan province, Iran.

Methods: In this cross-sectional study, 489 patients with malignant bone and soft tissue tumors were enrolled from 2006 to 2016. Their data were available in Isfahan medical centers, and their diagnostic biopsies from their hospitals' records were examined. The data were statistically analyzed using SPSS.

Results: The most common tumors were in the descending order: Osteosarcoma (15.1%), Ewing sarcoma (13.7%), chondrosarcoma (13.1%), fibrosarcoma and neurofibrosarcoma (10.8%), malignant fibrous histiocytoma (7.8%), synovial sarcoma (6.7%), liposarcoma (6.5%), dermatofibrosarcoma (3.3%), rhabdomyosarcoma (3.1%), and leiomyosarcoma (3.1%). Other sarcomas comprised 16.8%. The highest prevalence of tumors was in Isfahan city.

Conclusion: This study was conducted for the first time in Isfahan Province to evaluate the epidemiological characteristics of malignant bone and soft tissue tumors. Our study results were similar to most studies conducted in different regions of the world. Considering the relatively high prevalence of malignant bone and soft tissue tumors in lower age groups, we recommend further studies in this area to manage this problem.

1. Introduction

Primary bone tumors originate from the bone, but secondary tumors are bone metastases from other cancers [1]. Primary bone tumors are rare, but their bad prognosis ends in high mortality and morbidity [2, 3]. Currently, bone tumors are classified according to the origin of the differentiation of neoplastic cells, i.e. bones, cartilage, and indistinguishable tumors [4]. Despite the important advances in the field of orthopedic diseases, early diagnosis, prognostic factors, and the treatment of

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bone tumors are still controversial issues [5]. The primary malignant tumors of the bone comprise 0.2% to 0.5% of all malignancies of all ages. Although a small percentage of malignant tumors of the entire body is for malignant bone tumors, the morbidity and mortality of these tumors are still high [6].

The primary malignant tumor of the bone is the third leading cause of death among malignant tumors in the developed countries in young people after leukemia and central nervous system tumors [7]. In young people, the most common primary malignant tumor is osteosarcoma, which is more seen in the metaphysis, but diaphysis and epiphysis may also be involved [8]. However, the exact diagnosis of malignant tumors is based on biopsy and pathological testing [9]. The accurate medical diagnosis of these tumors depends on appropriate hospital facilities and equipment. The shortage of specialized staff and equipment, as well as the lack of proper collaboration between orthopedic surgeons, radiologists, and pathologists, can result in to various problems in diagnosing and treating these tumors [10].

Managers and planners of health systems in different countries need to know the prevalence and incidence of diseases to minimize their morbidity and mortality and control their economic costs. Also, to achieve a faster and more accurate medical diagnosis of these tumors, it is necessary to know the common types of tumors in each geographic region, commonly affected anatomical sites in the body, and common age groups involved [11]. In developing countries, there are no accurate statistics on the incidence and prevalence of primary malignant tumors of the bone [12]. Moreover, patients with these tumors usually first refer to general practitioners and general orthopedists, which may delay the diagnosis and worsen the prognosis [1].

Therefore, concerning the uncertainty about the epidemiological characteristics of these tumors in most regions of Iran, especially in Isfahan Province, we decided to determine the prevalence of various primary malignant tumors in Isfahan Province in the last 10 years (2006-2016). In this study, we evaluated the incidence of tumors based on pathologic diagnosis, the most common age groups affected, and common anatomical sites involved.

2. Methods

In this cross-sectional study, the data of 489 patients with malignant tumors of bone and soft tissue from 2006 to 2016 were extracted; their files were available in Isfahan healthcare center. The inclusion criteria in-

cluded all patients at any age group, whose diseases were diagnosed in hospitals affiliated to the Isfahan healthcare centers and their medical information was complete for extraction. The data were extracted as an Excel file from the Isfahan Healthcare Network and their tumors were identified based on the International Classification of Diseases for Oncology. This information included age, sex, type of tumor, anatomical location, and the city in which tumor biopsy was done. After collecting the information, the data were analyzed by SPSS V. 24. The quantitative data were presented as Mean±SD and qualitative data were expressed as abundance or percentage. One-way analysis of variance and independent t-test were used to compare quantitative and qualitative data and the Chi-square test was used to analyze qualitative data. The P<0.05 was considered as significance level.

3. Results

In this study, 489 patients (300 males and 189 females) with bone and soft tissue tumors were investigated. The most common tumors were osteosarcoma (15.1%), Ewing sarcoma (13.7%), chondrosarcoma (13.1%), fibrosarcoma and neurofibrosarcoma (10.8%), Malignant Fibrous Histiocytoma (MFH) (7.8%), synovial sarcoma (6.7%), liposarcoma (6.5%), dermatofibrosarcoma (3.3%), rhabdomyosarcoma (3.1%), and leiomyosarcoma (3.1%) and other sarcomas (16.8%). The Mean±SD age of the patients was 40.05±20.97 years, and the highest prevalence of tumors was seen in 10-20 and then 40-50 years old groups (chondrosarcoma, fibrosarcoma, neurofibrosarcoma, and leiomyosarcoma) (Figure 1).

There was a significant relationship between the type of tumor with age (P<0.001). Osteosarcoma, Ewing sarcoma, synovial sarcoma, dermatofibrosarcoma, rhabdomyosarcoma are common in people younger than 40 years and other sarcomas are more common in people older than 40 years, but there was no significant relationship between sex and type of tumor (P=0.45). The highest incidence of tumors in the anatomical location was in lower limbs (40.7%), other soft tissues (23.1%), upper limbs (17.8%), pelvis (8.5%), head and neck (4.9%), thorax (4.1%), and spine (1.4%). There was a significant relationship between the type of tumor and its anatomical location (P<0.001) (Table 1). Besides, the highest prevalence of tumors was in Isfahan City (64.6%) and there was a significant relationship between the type of tumor and the city (P=0.006) (Table 2). There was no significant relationship between sex and tumor location (P=0.30), age (P=0.14), and place of residence (P=0.58). Also, there was no significant relationship between tu-

Table 1. Demographic data of the patients and anatomical location of the tumor based on tumor type

Variable	Mean±SD	No. (%)								
		Sex		Anatomical Location						
Type of Tumor	Age (y)	Male	Female	Lower Limb	Upper Limb	Pelvis	Thorax	Spine	Face, Scalp, and Head	Other Locations
Osteosarcoma	20.01±10.12	52 (70.3)	22 (29.7)	54 (73)	10 (13.5)	5 (6.8)	0	0	0	5 (6.8)
Chondrosarcoma	49.76±19.03	40 (62.5)	24 (37.5)	27 (42.2)	19 (29.7)	7 (10.9)	4 (6.3)	0	0	7 (10.9)
Ewing sarcoma	21.64±10.91	41 (61.2)	26 (38.8)	24 (35.8)	15 (22.4)	7 (10.4)	3(4.5)	2 (3)	1 (1.5)	15 (22.4)
Liposarcoma	57.46±16.70	24 (75)	8 (25)	7 (21.9)	6 (18.8)	2 (6.3)	2 (6.3)	0	0	15 (46.9)
Synovial sarcoma	38.84±21.86	20 (60.6)	13 (39.4)	19 (57.6)	3 (9.1)	5 (15.2)	0	0	1(3)	5 (15.2)
Fibrosarcoma and neurofibrosarcoma	41.67±17.54	31 (58.5)	22 (41.5)	24 (45.3)	10 (18.9)	3 (5.7)	0	2 (3.8)	4 (7.5)	10 (18.9)
Rhabdomyosarcoma	37.80±25.33	10 (66.7)	5 (33.3)	3 (20)	0	0	0	0	0	12 (80)
Leiomyosarcoma	46.53±12.04	10 (66.7)	5 (33.3)	3 (20)	2 (13.3)	9 (60)	0	0	0	0
MFH	55.31±16.53	21 (55.3)	17 (44.7)	15 (39.5)	6 (15.8)	2 (5.3)	3 (7.9)	2 (5.3)	1 (2.6)	9 (23.7)
Dermatofibrosarcoma	32.87±12.14	8 (50)	8 (50)	4 (25)	6 (37.5)	0	0	0	4 (25)	2 (12.5)
Other sarcomas	51.80±16.84	43 (52.4)	39 (47.6)	19 (23.2)	10 (12.2)	7 (8.5)	8 (9.8)	1 (1.2)	13 (15.9)	24 (29.3)
Total	40.05±20.97	300 (61.3)	189 (38.7)	199 (40.7)	87 (17.8)	39 (8)	20 (4.1)	7 (1.4)	24 (4.9)	113 (23.1)

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mor location and place of residence (P=0.29) and age (P=0.35).

The most prevalent primary malignant bone tumor in the Isfahan Province (2006-2016) was osteosarcoma (with an outbreak of 15.1%), which was seen mostly in the age Mean±SD range of 20.01±10.12 years with the highest prevalence in the lower limbs (73% of cases) and the highest spread in Isfahan County (62.2%).

4. Discussion

According to previous studies, the distribution of primary bone tumors differs significantly in various parts of the world. For example, the incidence of this tumor in Europe and the United States is higher than in Asia [6]. According to the results of this study, the most common tumors in Isfahan were osteosarcoma, Ewing sarcoma, and chondrosarcoma. Regarding epithelial cell sarcoma, hemangiosarcoma, rhabdomyosarcoma, and giant cell
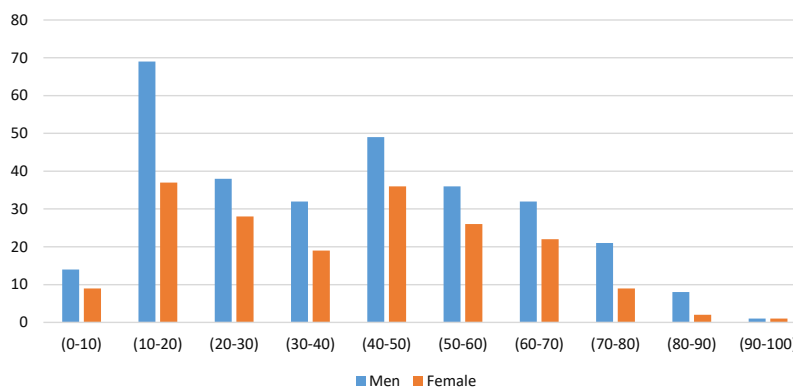

Figure 1. Frequency distribution of different age groups in patients by sex

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Table 2. Frequency distribution of sarcoma occurrence based on the patient's city of residence

Type of Tumor / City	No. (%)								
	Isfahan	Lenjan	Fereydun Shahr	Mobarakeh	Gaz Va Borkhar	Najafabad	Falavarjan	Shahreza	Other Cities
Osteosarcoma	46 (62.2)	3 (4.1)	1 (1.4)	4 (5.4)	1 (1.4)	1 (1.4)	1 (1.4)	4 (5.4)	13 (17.6)
Chondrosarcoma	36 (56.3)	10 (15.6)	1 (1.6)	3 (4.7)	3 (4.7)	1 (1.6)	2 (3.1)	3 (4.7)	5 (5.8)
Ewing sarcoma	44 (65.7)	6 (9)	2 (3)	2 (3)	0	3 (4.5)	4 (6)	1 (1.5)	5 (7.5)
Liposarcoma	22 (68.8)	0	0	0	3 (9.4)	1 (3.1)	0	1 (3.1)	5 (15.6)
Synovial sarcoma	18 (54.5)	1 (3)	0	1 (3)	1 (3)	4 (12.1)	4 (12.1)	1 (3)	3 (9.1)
Fibrosarcoma and neuro-fibrosarcoma	36 (67.9)	2 (3.8)	0	1 (1.9)	0	7 (13.2)	3 (5.7)	1 (1.9)	3 (9.1)
Rhabdomyosarcoma	10 (66.7)	3 (20)	0	0	0	1 (6.7)	0	0	1 (6.7)
Leiomyosarcoma	9 (60)	4 (26.7)	1 (6.7)	0	0	0	0	0	1 (6.7)
MFH	22 (57.9)	0	3 (7.9)	1 (2.6)	2 (5.3)	1 (2.6)	1 (2.6)	4 (10.5)	1 (6.7)
Dermatofibrosarcoma	12 (75)	1 (6.3)	0	1 (6.3)	0	1 (6.3)	0	1 (6.3)	0
Other sarcomas	61 (74.4)	3 (3.7)	2 (2.4)	1 (1.2)	0	2 (2.4)	2 (2.4)	4 (4.9)	7 (8.5)
Total	316 (64.6)	33 (6.7)	10 (2)	14 (2.9)	10 (2)	22 (4.5)	17 (3.5)	20 (4.1)	47 (9.6)
P	0.006								

tumor, there was a significant relationship between the type of tumor and age. The mean age of most patients with osteosarcoma, Ewing sarcoma, rhabdomyosarcoma, giant cell tumor, dermatofibrosarcoma, synovial sarcoma, fibrosarcoma, neurofibrosarcoma, and leiomyosarcoma was under 40 years, and those with other tumors had a mean age of over 40 years.

The tumors were mostly seen in lower extremities and upper extremities. Furthermore, the prevalence of soft tissue and the bone tumor is remarkable in Isfahan because of the higher population and better diagnostic facilities. Osteosarcoma is the most prevalent reported primary malignant tumor of the bone that is commonly seen in children and adolescents [13]. In this study, osteosarcoma was also the most common tumor that comprised 15.1% of soft tissue and bone tumors. On the other hand, this tumor mostly affects patients with a lower age of about 20 years. In the study of Frank et al. on the primary bone marrow tumors in the hand, the most common types of tumors were chondrosarcoma, hemangioendothelioma sarcoma, osteosarcoma, fibrosarcoma, and Ewing sarcoma. This finding indicated the relationship between the tumor site and the pathological type of the tumor, which was also proved in this study [14].

In Mirabello et al. study, osteosarcoma has a different prognosis at different ages, and mortality and tumor lo-

cation are varied and can also be associated with Paget's disease in the elderly [15]. The incidence of tumors among the age and sex groups in this study showed a higher prevalence among males in all age groups, which was consistent with the findings of Narinder et al. study [12].

A review study in 2012 states that primary bone tumors are uncommon and limited information is available about them and their risk factors. In a review study, bone sarcoma contains about 0.2% of all malignancies, and the incidence for all bone and joint malignancies is about 0.9 per 100000 people per year, while the 5-year survival rate for these patients is about 67.9%. Age also contributes specifically to the incidence of bone sarcoma so that two age-old picks occur in the second decade and over 60. In our study, because of the incomplete information, the prognostic features of patients were not measurable, but it was found that these tumors are rare diseases [16].

Another study in Turkey states that malignant bone tumors account for 50.2% of total sarcomas, and malignant tumors of soft tissue make up 49.8% of them. Among the most common types of malignant bone tumors, osteosarcoma prevalence was 33.6%. The prevalence rate of Ewing sarcoma, chondrosarcoma, and hematopoietic tumors was 25.5%, 19.4%, and 17.6%, respectively. Also, pleomorphic sarcoma (24.5%), liposarcoma (16.4%),

synovial sarcoma (13%), and undifferentiated sarcoma (8.8%) were the most common soft tissue tumors. The prevalence rates of benign soft tissue tumors, benign cartilage tumors, and giant cell tumors were 48%, 28%, and 15%, respectively [17].

In the present study, osteosarcoma (14.7%), Ewing sarcoma (13.3%) and chondrosarcoma (12.7%) were among bone tissue and soft tissue tumors. In Reshadi study on the malignant tumors of soft tissue in the extremities, 308 patients with musculoskeletal tumors were studied and their malignant tumors were divided into ten groups; malignant histiocytoma (23%), liposarcoma (22%), rhabdomyosarcoma (9%), leiomyosarcoma (8%), malignant schwannoma (5%), dermatofibrosarcoma (5%), synovial sarcoma (10%), fibrosarcoma (13%), chondrosarcoma (1%), and Ewing sarcoma (4%) [18].

In this study, contrary to the above study, the incidence rates of chondrosarcoma and Ewing sarcoma was higher, which could be the result of the climatic conditions of the area and the different tumor outbreaks in different locations. A study in 1470 patients with sarcoma in Tehran concluded that the mean age of patients was 30 years and 61% were male. The prevalence of bone sarcoma was more in adults, while soft tissue sarcomas was more seen in patients younger than 16 years. Also, the 5-year survival rate was 28% [19].

5. Conclousion

Based on the findings of this study the most common sarcomas in children were osteosarcoma, Ewing sarcoma, and rhabdomyosarcoma. In adults, osteosarcoma was the most common bone sarcoma and synovial sarcoma and MFH were the most common soft tissue tumor.

One of the limitations of the current study was ignoring other contributing factors for malignant bone and soft tissue tumors. Besides, the lack of access to the detailed data of patients like the exact anatomical location of the tumors in the organs was another limitation. This study was first conducted in Isfahan to evaluate the frequency of malignant tumors of bone and soft tissue, which was found to be close to the results of most studies conducted in other region. In the end, because of the relatively high prevalence of malignant tumors of bone and soft tissue in lower age groups, it seems that more studies are needed to manage this problem.

Epidemiological information is the first step to control and isease. Therefore, we suggest that these studies are more conducted in our country, and include other tumors such as secondary malignant and primary benign tumors of bone.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the department of Medical Ethics and Human Resources of Isfahan University of Medical Sciences, Isfahan.

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Authors' contributions

Conceptualization: Hossein Akbari Aghdam, Mohsen Heidari; Drafting of manuscript: Hamed Zandi-Esfahani; Data collection: Azin Mohammad-Salehi; Statistical analysis and interpretation of results: Azin Mohammad-Salehi, Hossein Akbari Aghdam.

Conflict of interest

The authors declared no conflict of interests.

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