**Frequency of Benign Bone Tumor Referred to a Teaching Hospital in Northern Iran**

**Abstract**

**Introduction:** A delay in diagnosis and inadequate treatment of Benign bone tumors may lead to malignant transformation or damage to other internal organs with time. We decided to Survey the frequency of benign bone tumors and its related factors in patients in a ten-year period referred to Orthopaedic ward of Poursina Hospital, Rasht.

**Materials and Methods:** A descriptive retrospective study was designed on bone tumors collected from medical records of 2007 – 2017 patients referred to Guilan university of medical sciences. All the demographic data were collected and analyzed.

**Results:** The mean age of patients with benign tumors of bone in this investigation was the 43.5 ± 12.93 years. The highest percentage of patients with benign tumors of bone were males (63.9%). The highest percentage of benign tumor of bone was multiple exostosis 25% followed by osteochondroma 22.2% and then osteoid stoma by 16.7%. Using Fisher’s exact test showed a statistically significant relationship between gender, age, educational level and location of the benign tumors of bone seen in this study (P=0.001).

**Conclusion:** Exostosis and osteochondroma are the most common benign bone tumors, and are more in the lower limb in the male gender - Blood pressure and higher education level were the common associated findings.

**Keywords:** Benign Bone Tumors, Multiple Exostoses, Osteochondroma, Orthopedic Ward

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**Introduction**

Cancer is the second leading cause of death worldwide following cardiovascular disease, accounting for 23% of deaths\(^1\). Currently, nearly 80% of deaths caused by noncommunicable diseases (NCD) occur in low- and middle-income countries\(^2\). New studies on cancer incidence and mortality in the world show that over 15.2 million new cancer cases were identified, the mortality rate of which was 8.8 million\(^3\). Cancer has a considerable economic burden in all societies. While it is impossible to accurately estimate the costs of NCD, the United States has estimated the annual productivity costs due to cancer-related mortality to be $115.8 billion in 2000, which will reach $147.6 billion in 2012\(^4\). Bone tumors are the oldest type of neoplasm in pathology and occur in all countries of all races\(^5\).

A sarcoma may be presented at various ages, from infancy to adulthood, and might lead to paralysis of the involved organ or even mortality\(^6\). Sarcoma occurs in approximately one person per million per year worldwide\(^5\), encompassing 75% of all bone tumors, with the exception of metastasized cases\(^5\). In the United States, these types of tumors are diagnosed in more than 2,000 people each year\(^7\). The highest prevalence of these types of tumors is observed within the age range 10-25 years and mostly in men.
The most common locations are the long bones of hands and feet, around the knees and shoulders (8). Benign tumors can be divided into eight types: osteochondroma, osteoma, osteoid osteoma, osteoblastoma, giant cell tumor, aneurysmal bone cyst, fibrous dysplasia, and enchondroma. These tumors can also be divided into three categories of bone, cartilage and vascular according to the cell type (9).

Notably, despite the very slow growth of benign tumors (12), their prevalence rate is higher than acute tumors (10, 11). In addition, these tumors remain indistinguishable since they are overlooked and rarely sampled (10, 11). Moreover, they are often diagnosed during the evaluation of other situations (12). There is still debate on the actual occurrence of these tumors (13). Over time, the symptoms of bone cancer will worsen (14). When symptomatic, benign lesions may have local pain, swelling, deformity, or pathological fractures. In most cases, differential diagnosis of the lesions may be difficult depending on the age of the patient, the bone involved, the location of the lesion in the bone, the degree of pain and response to analgesia, and basic physical examinations. In total, 90% of benign bone tumors have radiographic features that are sufficiently characteristic to allow a radiologic diagnosis (15-17). However, some benign tumors such as osteochondroma and giant cell tumor, have the potential to become malignant tumors. As such, quick detection of the type of tumor (benign or malignant) can prevent their negative effects (6). With this background in mind, this study aimed to evaluate the frequency of benign bone tumors in patients referred to Poursina Hospital in Rasht, Iran in the last ten years.

Method

This descriptive, cross-sectional research was performed using the medical files of all patients with a primary and secondary diagnosis of benign tumors (selected by census sampling) hospitalized in orthopedics ward of Poursina hospital over a ten-year period (2007-2017). In total, 108 medical files of patients with benign tumors were assessed. The inclusion criterion was medical files of patients with primary or secondary diagnosis of tumoral and semi-tumoral lesions during the mentioned period. On the other hand, exclusion criterion was incomplete medical files. Data were collected using a checklist encompassing demographic characteristics (age, gender), clinical findings (tumor type, site of involvement and clinical signs) and paraclinical findings (calcium and hemoglobin). Furthermore, data analysis was performed in SPSS version 21 using Chi-square, Mann-Whitney U, and t-test to express qualitative variables as percentage and quantitative variables as mean and standard deviation. In it worth noting that P-value of 0.05 was considered statistically significant.

Results

In this study, 63.9% of men and 36.1% of women had benign bone tumors. Patients often referred to the hospital due to pain, pathological fractures, lumps, or trauma. In terms of type of tumor, the most prevalent type in the subjects was multiple exostoses (25%), followed by osteochondroma (22.2%) and osteoid osteoma (16.7%). Regarding gender, tumors were most prevalent in male patients, compared to female individuals, with the exception of aneurysmal bone cysts (Table 1). According to Fisher’s exact test, there was a significant relationship between gender and types of benign bone tumors in the participants.
In the present research, the mean age of the subjects with benign bone tumors was 43.5±12.93 years. In this regard, the minimum and maximum ages of the subjects were 17 and 69 years, respectively. The highest prevalence rate of benign bone tumors was related to the age ranges of 41-50 years (29.6%) and 31-40 years (27.8%) (Table 2). According to Fisher’s exact test, there was a significant relationship between age range and type of benign bone tumors in patients. Lower extremity tumors (69.4%) had the highest frequency in terms of location of involvement, whereas upper extremity tumors comprised 30.6% of the cases. Notably, no patient had a history of tumors in other organs (Table 3). According to Fisher’s exact test, there was a significant relationship between location of tumor and type of benign bone tumors in the participants.

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**Table 1. Frequency distribution of types of benign bone tumors in patients referred to orthopedics ward in Poursina Hospital in Rasht over a 10-year period based on gender**

<table>
<thead>
<tr>
<th>Gender Type of tumor</th>
<th>Male N</th>
<th>%</th>
<th>Female N</th>
<th>%</th>
<th>Total N</th>
<th>%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoid osteoma</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>15.4</td>
<td>0.004 *</td>
</tr>
<tr>
<td>Chondroblastoma</td>
<td>3</td>
<td>4.3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Multiple exostoses</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>Simple bone cyst</td>
<td>6</td>
<td>8.7</td>
<td>3</td>
<td>7.7</td>
<td>9</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Fibrous dysplasia</td>
<td>3</td>
<td>4.3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Osteochondroma</td>
<td>1</td>
<td>8</td>
<td>6</td>
<td>15.4</td>
<td>24</td>
<td>22.2</td>
<td></td>
</tr>
<tr>
<td>Aneurysmal bone cyst</td>
<td>3</td>
<td>4.3</td>
<td>6</td>
<td>15.4</td>
<td>9</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Giant cell tumor</td>
<td>9</td>
<td>13</td>
<td>6</td>
<td>15.4</td>
<td>15</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

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**Table 2. Frequency distribution of types of benign bone tumors in patients referred to orthopedics ward in Poursina Hospital in Rasht over a 10-year period based on age ranges**

<table>
<thead>
<tr>
<th>Age range Type of tumor</th>
<th>Below 30 years N</th>
<th>%</th>
<th>31-40 years N</th>
<th>%</th>
<th>41-50 years N</th>
<th>%</th>
<th>51-60 years N</th>
<th>%</th>
<th>More than 60 years N</th>
<th>%</th>
<th>Mean age</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoid osteoma</td>
<td>6</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>31.2</td>
<td>2</td>
<td>12.5</td>
<td>0</td>
<td>0</td>
<td>41.5±19.87</td>
<td></td>
</tr>
<tr>
<td>Chondroblastoma</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37.44±56.21</td>
<td></td>
</tr>
<tr>
<td>Multiple exostoses</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>30</td>
<td>4</td>
<td>12.5</td>
<td>8</td>
<td>50</td>
<td>6</td>
<td>40</td>
<td>51.64±62.01</td>
<td></td>
</tr>
<tr>
<td>Simple bone cyst</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>3</td>
<td>9.4</td>
<td>3</td>
<td>18.8</td>
<td>0</td>
<td>0</td>
<td>41.13±87.32</td>
<td></td>
</tr>
<tr>
<td>Fibrous dysplasia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>20</td>
<td></td>
<td>66.67±10.12</td>
<td></td>
</tr>
<tr>
<td>Osteochondroma</td>
<td>6</td>
<td>40</td>
<td>6</td>
<td>20</td>
<td>12</td>
<td>37.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>58.11±65.43</td>
<td></td>
</tr>
<tr>
<td>Aneurysmal bone cyst</td>
<td>3</td>
<td>20</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>18.8</td>
<td>0</td>
<td>0</td>
<td>40.32±12.51</td>
<td></td>
</tr>
<tr>
<td>Giant cell tumor</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>20</td>
<td>3</td>
<td>9.4</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>40</td>
<td>31.70±91.43</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100</td>
<td>30</td>
<td>100</td>
<td>32</td>
<td>100</td>
<td>16</td>
<td>100</td>
<td>15</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Fisher’s exact test was applied.*
Bone tumors are currently of great concern to families, patients and physicians in terms of clinical, pathological, and diagnostic diversity\(^{(18)}\). In the present study, the frequency of benign bone tumors was higher in men, compared to women. Our results showed a significant difference between gender and type of benign bone tumors. In a research by Goedhart et al. in the Netherlands (2014), the frequency of benign bone tumors was slightly higher in men, compared to women (61%)\(^{(19)}\). In 2015, Roudbari et al. reported a lower percentage of women with this condition, compared to men (46.2% vs. 53.8%)\(^{(20)}\). In contrast, Bergovec et al. reported a slightly higher percentage of tumor in female patients, compared to male patients\(^{(21)}\). Evidence shows that men are more prone to benign bone tumors, compared to women.

In terms of underlying diseases, 25% of the subjects had diabetes while 13.9% and 19.4% of them had hypertension and hyperlipidemia, respectively. According to laboratory results, the mean calcium and hemoglobin levels in patients were 9.6±1.36 mg/dl and 12.49±1.76 mg/dl, respectively. In addition, one-way ANOVA showed a significant difference between hemoglobin levels of patients based on type of benign bone tumors in patients, which was not significant in terms of calcium level (Table 4).

Other results demonstrated that most subjects reported no family background for the diagnosis of benign bone tumors (59.3% vs. 40.7%). In addition, results of Fisher’s exact test were indicative of lack of a significant relationship between diagnosis of benign bone tumors and a positive history of family background (P=0.11).
observed in young adults\textsuperscript{(9, 23, 21, 24)}. Therefore, the majority of people at this age must undergo screening tests in case of having relevant symptoms.

In the current study, the highest percentage of patients had diploma, and an increased level of education was associated with a decrease in the diagnosis of this disease. In other words, a significant relationship was found between level of education and diagnosis of benign bone tumors. In a study by Hajiagha et al., lower education was associated with more specific symptoms of brain tumor disease resulting in lower quality of life for these patients\textsuperscript{(25)}. Obviously, education is one of the ways to increase knowledge and awareness, especially in health and medical fields. therefore, education can play an effective role in diagnosis and prevalence of benign bone tumors as an underlying variable.

In the present research, multiple exostoses had the most frequency, compared to other benign tumors. In line with our findings, osteochondroma and multiple exostoses were the most common benign bone tumors (28.4%), reported by Mazlomi et al.\textsuperscript{(22)}. Meanwhile, Niu et al. reported that the most common primary benign bone tumor was giant cell tumor\textsuperscript{(26)}. In addition, osteochondroma was the most common type of benign tumor reported at the frequencies of 62.9% and 21.3% reported by Solooki et al. and Bergovec et al.\textsuperscript{(21, 24)}. In the present study, lower extremity tumors had the most frequency in terms of involvement location, which is incongruent with other studies\textsuperscript{(22, 13, 26, 24)}. In the present study, no significant association was found between calcium level of patients with benign bone tumors based on the type of benign bone tumors. Garcha et al. also marked that hypercalcemia in a benign tumor is very unusual\textsuperscript{(27)}.

Our findings also demonstrated a significant association between mean levels of hemoglobin in patients with benign bone tumors based on the type of tumors. In a study by Mazloumi et al., 14 of 102 cases with benign tumors had anemia, among whom those with giant cell tumor had the highest level of anemia\textsuperscript{(22)}. Some of the major drawbacks of the present study included its retrospective nature, incomplete medical files, and lack of assessment of therapeutic methods for tumors. Notably, the present study was performed on adults with benign tumors and most children with this condition are not referred to this center.

Conclusion

According to the results of the present study, the most common bone tumors were multiple exostoses and osteochondroma. In addition, the most common involvement location of tumors was lower extremities. Moreover, variables such as gender and age range were recognized as factors contributing to the emergence of benign bone tumors.

Conflicts of Interest

None declared.

Acknowledgments

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