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An 8-YEAR analysis of bone tumours in a Caribbean island

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HIGHLIGHTS

- The incidence of primary bone tumours is low in the Caribbean.
- Osteosarcoma is the most common primary bone tumour and present in males 11–20 years old.

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ABSTRACT

Background: An epidemiologic analysis of bone tumours in Trinidad & Tobago.
Methods: A retrospective analysis of primary and secondary bone tumours, site of origin and demographic data was conducted.
Results: 63 bone tumours were analysed and included 27 primary benign (43%), 12 primary malignant (19%), 19 metastatic (30%) and 5 by contiguous spread (8%). The most common malignant primary tumour was the osteosarcoma (n = 7), originating from the femur in mostly males in the 11–20 age group. There was 1 chondrosarcoma, 2 fibrosarcomas and 2 plasmacytomas. Benign tumours consisted of 8 osteochondromas, 2 osteomas, 3 giant cell tumours, 3 bone cysts and 11 cases of fibrous dysplasia.
Conclusion: Bone tumours are rare with a low incidence of 1.125 per 100,000 population annually and malignant tumours being even rarer at an incidence of 0.18 per 100,000 population annually. There is need for better documentation and data registries in Trinidad and Tobago.

1. Introduction

Bone tumours are a rare occurrence generally from a worldwide perspective. The Surveillance, Epidemiology and End Results (SEER) Cancer Statistics estimate that bone sarcomas represent just 0.2% of all malignancies diagnosed in the United States with an age adjusted incidence rate for all bone and joint malignancies of 0.9 per 100,000 persons per year [1] In Italy primary malignant bone tumors according to the Association of Italian Tumor Registries also represent 0.2% of all malignancies diagnosed in the period 1998–2002 [2]. Although benign bone tumors are more common than primary bone sarcomas the incidence is likely to be an underestimation given their often subtle clinical appearance. Many articles have been published on the topic in North America, the United Kingdom, Africa and India [3,5–18]. However, little has been published regarding the incidence in the Caribbean and no data exists from Trinidad and Tobago in the West Indies. It is with this in mind that we set out to document the incidence of Primary and Secondary bone tumours in the Northern region of Trinidad as well as Tobago and to make comparisons to world data and recommendations for further research.

2. Methods

Trinidad and Tobago is the largest of the English-speaking Caribbean Islands in the Eastern Caribbean, with a population of 1.3 million. The Government of Trinidad and Tobago provides free health care to residents through a network of public health care facilities. These public facilities are managed by five Regional Health Authorities (RHAs). The General Hospital, Port-of-Spain (POSGH) is an 850 bed hospital that serves the most densely populated region in the island and the Pathology Department at the POSGH is the most advanced in the island receiving specimens from three of the five RHA territories including: POSGH, Sangre Grande Hospital (SGH) and Scarborough Regional Hospital (SRH). Together, these three RHAs are responsible for healthcare delivery to an estimated population of 700,000 persons.

Ethical approval was granted to retrospectively collect data from

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the electronic records at the Department of Pathology, POSGH over the period October 2003 to February 2012. All reports from bone biopsy specimens were retrieved and the following information extracted: specimen collection date, patient age, gender, Hospital of origin, site of origin and histologic findings. Analysis was conducted using SPSS 2.0.

3. Results

There were 1176 histologic records for bone biopsy for the period October 2003 to February 2012. Trephine biopsies and bone marrow aspirates were excluded leaving 261 Orthopaedic bone biopsy records. There were 28 records that were duplicated, leaving 233 cases for analysis. The majority (89%) originated from POSGH and the 11% from SRH and SGH.

A further breakdown of the samples revealed that 142 cases were documented as normal tissue, 15 cases as inflammatory and in 13 cases there was insufficient tissue for analysis. This left a total of 63 relevant cases for analysis which was composed of the following: 29 benign primary lesions, 10 malignant primary lesions, 19 metastatic and 5 were lesions infiltrating bone by contiguous spread but not arising from bone.

Primary benign lesions accounted for 27 cases (43%) of 63 histologic records and consisted of the following: osteochondroma = 8, fibrous dyplasia = 11, osteoma = 2, giant cell tumour = 3 and bone cyst = 3. There were 12 females and 15 males with a mean age of 39 (range = 8–92). 24% occurred in the 11–20 year age group and 17 (59%) cases occurred between 21 and 70. The sites of origin were as follows: skull = 3, femur = 2, Iliac crest = 2, hand = 1, ulnar = 1, mandible = 1 and 17 were not specified. Number of cases seen annually varied from 1 to 6 with an average of 3.6 with 20 originating from Orthopaedics, 4 from Neurosurgery and 3 from other sources. With regard to the most common types osteochondroma and fibrous dysplasia. The osteochondromas occurred mostly in the 11–20 year age group with a male to female ratio of 1.6: 1 respectively. The fibrous dysplasia did not show any age or gender preponderance.

Primary malignant tumours were composed of 12 cases (19%) of 63 composed of 7 osteosarcomas, 1 chondrosarcoma, 2 fibrosarcomas and 2 plasmacytomas. There were 6 males and 6 females with and age range of 9–27 and a mean of 19. The 11–20 age group was most affected with 6 cases (50%) and the bone of origin was the femur in 5 and in 7 the bone of origin was not stated. With regard to the osteosarcoma group there was a male dominance with 5 (71%) of 7 cases affected.

The metastatic malignant group consisted 19 (30%) cases and included the following: 7 prostatic metastases, 5 breast, 16 squamous cell carcinomas and 1 metastatic adenocarcinoma. There were 17 males (89.5%) and 2 females with a mean age of 68 and a range of 48–83. The most common bones affected were the iliac crest (n = 4) and the femur (n = 3). Other bones included the mandible and skull and the bone of origin was not stated in 9 cases (47%).

Finally, there were 5 (8%) cases with contiguous spread where the tumour was infiltrating but not involving bone. These included: 2 meningiomas, 1 adenoid cystic carcinoma of the parotid, 1 neurofibroma and 1 rhabdomyosarcoma. The age range was 4–58 with a mean of 39. The most common age group affected was the 51–60 year age group with 4 males (80%) and 1 female overall. The cases originated from Neurosurgery in 3 and Ear Nose and Throat in 2.

The incidence of bone tumours in our catchment is estimated at 8 new cases per year serving an estimated population of 700,000 giving an incidence of 1.125 new cases per 100,000 population per year. For malignant tumours the incidence is 0.18 new cases per 100,000 population per year consisting of 7 osteosarcomas, 1 chondrosarcoma and 2 fibrosarcomas over 8 years.

4. Discussion

The incidence of primary tumours is estimated at 0.2% of all tumours in the United States of America (USA) and the United Kingdom (UK) and Secondary tumours occur in up to 30% of new cancer cases in the USA. We conducted a PubMed search by entering the keywords “bone tumor” and “West Indies” or “Caribbean” into the search engine, this produced a total of 57 hits which after careful analysis was refined to 7 papers that were relevant to our topic. The paucity of data from the Caribbean that looks at this important aspect of health care was the catalyst for this study. The aim being to estimate the incidence of bone tumours in Trinidad and Tobago.

Additionally, Trinidad & Tobago is a twin island state which is geographically located off the northern tip of South America and Venezuela and are the southern-most islands in the Caribbean sea. It possesses a diverse mix of people due to its colourful history of invasion by the Spanish, French, Portugese and British with migrants over hundreds of years from India, Africa, China, Syria, Lebanon, Arabic countries and Amerindian areas. The estimated composition of the population is as follows: East Indian (37%), African descent (36%), mixed races (24%) and Caucasion, Arabic, Chinese and Amerindian (3%) [4]. This adds a different slant to the population being analysed and is useful for migrant populations in developed countries such as the United Kingdom, Canada and the USA.

In a study by Polednak et al. the incidence of bone cancer in black and white residents of New York State is described. This involved the incidence of osteosarcoma, Ewing's sarcoma and chondrosarcoma between 1975 and 1980. There was a significant lower incidence of Ewing's sarcoma and chondrosarcoma in blacks versus whites however, there was a higher incidence of osteosarcoma of the leg in the black population and comparisons to African data showed similar patterns of disease [5]. Interestingly, we have not seen any Ewing's sarcomas in our population in the last 8 years and may be related to the fact that we have a small pure caucasian populace.

In the UK there have been many studies analysing the data on bone cancer nationally and regionally [5–8]. In a study done by McNally et al. in 2012 a national population-based analysis was done looking at 2566 osteosarcomas and 1650 Ewing's sarcomas in 0–49 year olds between 1980 and 2005. Males were at increased risk of osteosarcoma compared to females however, females of higher socioeconomic status and Ewing's sarcoma was increased in rural environments suggesting possible risk factors such as agricultural exposures including pesticides and zoonotic agents [8].

In another analysis done in teenagers and young adults with bone tumours, Arora et al. in 2012 described the differences. The study noted that bone tumours comprise 0.2% of all cancer but 5.7% of 15–24 year olds. Osteosarcoma accounted for 34.2%, chondrosarcoma 27.2%, Ewing's sarcoma 19.3% and other type 19.4%.The distribution varied by age showing Ewing's sarcoma most common in 0–9 year olds, osteosarcoma in 10–29 year olds and chondrosarcoma in 30–84 year olds. 29.2% of all tumours occurred in 0–24 year olds with the highest incidence of osteosarcoma and Ewing sarcoma occurring in females 10–14 years old. The peak incidence in males was at 15–19 years and exceeded that in females. Chondrosarcoma incidence steadily increased with age. Osteosarcoma tumours of long bones were 6 times more common showing an adolescent peak suggesting pubertal bone growth to be a key factor in etiology while different biological pathways could be relevant for Ewing's sarcoma [9].

With regards to African data, a Libyan study by Sarma et al. in 1994 described their experience over 10-years from 1981 to 1990 and showed of 165 bone tumours 40 (24%) were malignant and 125 (76%) were benign with males being more significantly affected and the femur being the most common site [10]. Our results indicate that of the bone tumors diagnosed by biopsy 19% are primary malignant tumours, 43% are primary benign tumours and 30% are metastatic lesions with the femur being the most common site being affected for primary malignancy.

Another analysis done by Abdulkareem et al. in Lagos, Nigeria, looked at 77 cases of bone tumours. Benign tumours accounted for 79.2% and malignant tumours 15.6% with a male:female ratio of 2:1. The commonest bone tumour was the osteosarcoma all occurring in males. The peak incidence was in the second and third decades and commonest sites were the distal femur and proximal tibia. Four (5.2%) cases of metastatic bone tumours located commonly in the proximal femur and humerus were also recorded. It was concluded that the osteochondroma and giant cell tumour were the commonest benign types while osteosarcoma was the most common primary tumour occurring in the first two decades of life [11].

Concerning Far East and Indian data, in 1996 Rao et al. looked at the data on primary bone tumours around Dakshina Kannada district of Karnataka. There were 523 cases over a period of 36 years with 39% malignant and the remaining benign. Osteosarcoma was the most common malignant tumour accounting for 45.7% followed by Ewing's sarcoma, 19.4%. Osteochondroma was the most frequent in the benign tumour accounting for 30.3%. Peak incidence of tumour was in the 2nd and 3rd decade of life with males being most affected. The most commonly affected bones were femur, tibia and humerus. It was concluded that there was a significantly higher incidence of primary bone tumours in that part of India [12].

Regarding local and regional data on bone tumours very little has been published on the topic regionally and no data is present with regards to Trinidad & Tobago. A study done by Coard et al. at the University Hospital, Mona, Jamaica reviewed all primary tumours and tumour-like lesions of bone over a 10-year period. There were 136 cases with 69 benign and 54 malignant tumours and 13 cases of tumour-like lesions [13].

Another Jamaican study done by Ogunsalu et al. in 2001 analysed 32 cases of fibro-osseus lesions of the jaw over 15 years. There were 15 cases of fibrous dysplasia, 10 ossifying fibromas, 3 gigantiform cementoma, 1 periapical cemental dysplasia, 1 cementoblastoma and 2 cases of recurrent fibrous dysplasia [14]. In 2003, Ogunsalu et al. also described odontogenic tumours over the same period and associated them with low socioeconomic status in Jamaica [15].

In conclusion, our data is in keeping with worldwide trends [16–18] and particularly that from the African and Asian subcontinent [16], this is not surprising as our population represents predominately a diverse mixture of those two races. Interestingly, we found no cases of Ewing's sarcoma but this may be accounted for by the fact that our Pathology Department does not receive specimens from the main Paediatric Hospital in Trinidad and Ewing's tumours occur to a large extent in the paediatric age group. We hope that the information provided in this publication is useful and serves as a platform for further research in this very important area of Medicine. It may also be useful for those practicing in the field of Orthopaedics in countries such as the UK, USA and Canada where there is a large migrant West Indian population.

Ethical approval

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Author contribution

1st author-Idea wrote researched paper (Michael Ramdass).
2nd, 3rd authors-Justin Mooteeram, Allan Beharry researched paper, corrected data.
4th author-Marlon Mencia, senior Orthopod who edited paper.
5th author-Shaheeba Barrow was the Pathologist and assisted in editing the paper.

Conflicts of interest statement

None declared.

Guarantor

Michael James Ramdass FRCS, Consultant Surgeon.
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