

EPIDEMIOLOGY OF MUSCULOSKELETAL MALIGNANCIES IN BASRAH

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ABSTRACT

Background: Musculoskeletal malignancies, including primary and secondary bone and soft tissue cancers, are uncommon but represent an important public health concern because of their associated morbidity and mortality. Describing their epidemiological characteristics is essential for improving diagnosis, management, and cancer surveillance. **Methods:** This cross-sectional, record-based study reviewed all registered musculoskeletal malignancies in Basrah Governorate, Iraq, from 2005 to 2009. Demographic and clinicopathological data, including age, sex, residence, anatomical site, and histopathological diagnosis, were extracted and analysed. Annual incidence rates were estimated using population data. **Results:** A total of 357 musculoskeletal malignancies were identified, including 202 bone cancers and 137 soft tissue cancers. There were 210 males and 147 females (male-to-female ratio 1.43:1), with ages ranging from 6 months to 87 years. The second decade of life was the most frequently affected age group (18.2%). The mean annual incidence rate was 3.12 per 100,000 populations, comprising 1.77 per 100,000 for bone cancers and 1.20 per 100,000 for soft tissue cancers. Primary tumours accounted for 265 cases, secondary tumours for 74, and 18 cases were unspecified. The lower limbs and pelvis were the most commonly involved sites. Metastatic bone tumours (26.7%) and fibroblastic/myofibroblastic soft tissue tumours (24.8%) were the predominant histological types. Only 2.2% of cases originated from the eastern area of Basrah. **Conclusions:** Musculoskeletal malignancies in Basrah occurred more frequently than expected, predominantly affecting young individuals and males. Strengthening cancer registration systems and conducting further epidemiological studies are recommended to improve surveillance, early detection, and management of these rare malignancies.

KEYWORDS: Epidemiology, Musculoskeletal, Malignancies, Basrah.**INTRODUCTION**

Cancer remains one of the leading causes of morbidity and mortality worldwide, imposing a substantial burden on healthcare systems in both developed and developing countries. The global incidence of cancer continues to rise because of population growth, ageing, urbanization, and increasing exposure to lifestyle-related risk factors. Developing countries are expected to experience the greatest increase in cancer burden over the coming decades owing to demographic transitions and limited healthcare resources for early diagnosis and treatment.^[1,2] Musculoskeletal malignancies, comprising malignant bone tumors and soft tissue sarcomas, are relatively uncommon neoplasms that originate from mesenchymal tissues. Although they account for less than 1% of all human malignancies, they are associated

with considerable morbidity, functional disability, and mortality because of their aggressive biological behavior and tendency for local invasion or distant metastasis.^[3,4] Bone malignancies include both primary tumors, such as osteosarcoma, Ewing sarcoma, and chondrosarcoma, and secondary (metastatic) lesions, which are considerably more common than primary bone cancers.^[4,5] Soft tissue sarcomas represent a heterogeneous group of tumors arising from adipose, fibrous, muscular, vascular, and peripheral nerve tissues and encompass numerous histological subtypes with distinct clinical characteristics.^[3] The epidemiology of musculoskeletal malignancies varies according to age, sex, geographical region, ethnicity, and environmental exposures. Primary bone cancers occur predominantly in children, adolescents, and young adults, whereas metastatic bone

disease is more common among older individuals with advanced carcinomas.^[4,6] Likewise, soft tissue sarcomas demonstrate marked histological diversity and age-dependent distribution. Despite their rarity, accurate epidemiological data are essential for healthcare planning, resource allocation, and the development of effective diagnostic and therapeutic strategies.^[3] In the Middle East, published epidemiological information on musculoskeletal malignancies remains limited compared with Western countries. Available cancer registry reports from Iraq and neighboring countries indicate that bone and connective tissue cancers constitute only a small proportion of all registered cancers; however, regional variations in incidence and histopathological patterns have been reported.^[7,8] Basrah has one of the oldest population-based cancer registries in Iraq, providing an important opportunity to evaluate the occurrence and characteristics of these uncommon malignancies and to identify potential geographical differences within the governorate. Therefore, the present study aimed to describe the epidemiological and clinicopathological patterns of incident musculoskeletal malignancies, including bone and soft tissue cancers, registered in Basrah Governorate during 2005–2009, and to estimate their annual incidence rates in the population.

METHOD

This retrospective, descriptive, record-based study was conducted in Basrah Governorate, located in southeastern Iraq, bordering Kuwait to the south and Iran to the east. Basrah covers an area of approximately 19,070 km² and had an estimated population of 2.41 million in 2009, with an almost equal distribution of males and females. The study included all registered cases of musculoskeletal malignancies (bone and soft tissue cancers) diagnosed between 1 January 2005 and 31 December 2009. Cases were identified from the population-based Basrah Cancer Registry, which integrates information from multiple sources, including the Department of Pathology and Forensic Medicine, Oncology Center at Al-Sadr Teaching Hospital, Pediatric Oncology Unit, Breast Cancer Early Detection Centre, inpatient hospital records, and specialist physicians. Leukemia, lymphoma, and multiple myeloma were excluded because they are not classified as musculoskeletal malignancies in this study. For each patient, demographic and clinicopathological information was extracted, including age at diagnosis, sex, place of residence, year of diagnosis, anatomical site, histopathological diagnosis, and tumor type (primary, secondary, or unspecified). Age was categorized into eight groups (<10, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, and ≥70 years). Anatomical sites were classified according to the affected body region, while histopathological diagnoses of bone and soft tissue malignancies were categorized according to the World Health Organization classification of bone and soft tissue tumors. Population estimates from the Iraqi Ministry of Planning were used to calculate annual incidence rates. Data were entered into Microsoft Excel and screened for

duplicate registrations because individual cases could be reported from more than one source. Records of patients residing outside Basrah Governorate were excluded from the analysis. The cleaned dataset was transferred to SPSS version 17.0 (SPSS Inc., Chicago, IL, USA) for statistical analysis. Descriptive statistics were used to summarize demographic and clinicopathological characteristics. Categorical variables were presented as frequencies and percentages, and annual incidence rates were expressed per 100,000 populations.

RESULTS

A total of 357 patients with musculoskeletal malignancies were included in the study. Males predominated, accounting for 58.8% of cases, while females represented 41.2%, yielding an overall male-to-female ratio of 1.43:1. The mean age at diagnosis was 38.6 ± 21.3 years (range: 6 months to 87 years), indicating that musculoskeletal malignancies affected a wide age spectrum.

The highest proportion of patients was observed in the 10–19 years' age group (18.2%), followed by those aged 20–29 years (15.4%) and 30–39 years (13.4%). Overall, more than half of all cases (52.9%) occurred in individuals younger than 40 years, demonstrating that musculoskeletal malignancies predominantly affected children, adolescents, and young adults. Regarding geographical distribution, the majority of patients (68.1%) were residents of Basrah City Centre, whereas substantially smaller proportions originated from the northern (12.6%), western (9.5%), and southern (7.6%) areas. The Eastern area contributed the fewest cases (2.2%). This distribution likely reflects differences in population density, healthcare accessibility, referral patterns, or disease registration coverage across the governorate. As in table 1.

Table 1: Demographic characteristics of patients with musculoskeletal malignancies in Basrah Governorate, Iraq (2005–2009) (N = 357).

Characteristic	n	%
Sex		
Male	210	58.8
Female	147	41.2
Age group (years)		
<10	21	5.9
10–19	65	18.2
20–29	55	15.4
30–39	48	13.4
40–49	44	12.3
50–59	41	11.5
60–69	46	12.9
≥70	37	10.4
Place of residence		
Basrah City Centre	243	68.1
Northern area	45	12.6
Western area	34	9.5
Southern area	27	7.6
Eastern area	8	2.2

A total of 357 musculoskeletal malignancies were identified during the study period. Bone malignancies constituted the majority of cases (56.6%), whereas soft tissue malignancies represented 38.4%; 5.0% of records lacked topographic classification. Overall, primary tumors predominated, accounting for 74.2% of all cases, while secondary (metastatic) tumors comprised 20.7%.

Regarding the temporal distribution, the highest proportion of cases was recorded in 2005 (24.4%), followed by relatively stable annual frequencies during 2006–2009 (17.6%–19.9%), indicating no substantial temporal variation in the number of registered musculoskeletal malignancies over the five-year study period. As in table 2.

Table 2: Clinical characteristics of patients with musculoskeletal malignancies in Basrah Governorate, Iraq (2005–2009) (N = 357).

Characteristic	n	%
Topographic type		
Bone malignancies	202	56.6
Soft tissue malignancies	137	38.4
Unrecorded musculoskeletal malignancies	18	5.0
Tumor type		
Primary	265	74.2
Secondary (metastatic)	74	20.7
Unrecorded	18	5.1
Year of diagnosis		
2005	87	24.4
2006	66	18.5
2007	63	17.6
2008	70	19.6
2009	71	19.9

Osteosarcoma was the most frequently diagnosed primary bone malignancy, accounting for 25.4% of all histologically confirmed primary bone tumors. Giant cell tumor (21.9%) and Ewing's sarcoma (20.2%) were the next most common diagnoses. Together, these three tumor types constituted more than two-thirds of all primary bone malignancies. Chondrosarcoma represented 12.3% of cases, whereas Langerhans cell granuloma accounted for 7.9%. The remaining histopathological subtypes, including fibrosarcoma, malignant fibrous histiocyoma, adamantinoma, rhabdomyosarcoma of bone, chordoma, and malignant Schwannoma, were individually uncommon, each comprising less than 5% of cases. As in table 3.

Fibroblastic/myofibroblastic tumors were the most common soft tissue malignancies, comprising 24.8% of all soft tissue tumors. Malignant fibrous histiocyoma ranked second (17.5%), followed by tumors of uncertain differentiation and metastatic soft tissue tumors, each accounting for 16.1% of cases. Adipocytic tumors represented 6.5%, while malignant Schwannoma and skeletal muscle tumors each contributed 5.1%. Chondro-osseous tumors (2.2%) and smooth muscle tumors (1.5%) were relatively uncommon. Cases without a definitive histopathological diagnosis accounted for 5.1% of the study population. Overall, fibroblastic/myofibroblastic tumors and malignant fibrous histiocyoma together represented more than two-fifths of all soft tissue malignancies registered during the study period. As in table 4.

Table 3: Distribution of primary bone malignancies by histopathological diagnosis (n = 114).

Histopathological diagnosis	n	%
Osteosarcoma	29	25.4
Giant cell tumor	25	21.9
Ewing's sarcoma	23	20.2
Chondrosarcoma	14	12.3
Langerhans cell granuloma	9	7.9
Fibrosarcoma	5	4.4
Malignant fibrous histiocyoma	3	2.6
Adamantinoma	2	1.8
Rhabdomyosarcoma of bone	2	1.8
Chordoma	1	0.9
Malignant Schwannoma	1	0.9
Total	114	100.0

Table 4: Distribution of soft tissue malignancies by histopathological diagnosis (n = 137).

Histopathological diagnosis	n	%
Fibroblastic/Myofibroblastic tumors	34	24.8
Malignant fibrous histiocytoma (MFH)	24	17.5
Tumors of uncertain differentiation	22	16.1
Metastatic soft tissue tumors	22	16.1
Adipocytic tumors	9	6.5
Malignant Schwannoma (MPNST)	7	5.1
Skeletal muscle tumors (Rhabdomyosarcoma)	7	5.1
Chondro-osseous tumors	3	2.2
Smooth muscle tumors (Leiomyosarcoma)	2	1.5
No clear-cut diagnosis	7	5.1
Total	137	100.0

The average annual incidence rate of musculoskeletal malignancies in Basrah was 3.12 per 100,000 populations, with a higher incidence among males (3.52 per 100,000) than females (2.41 per 100,000). Bone malignancies demonstrated higher incidence rates than soft tissue malignancies in both sexes. Age-specific incidence increased progressively with advancing age, reaching the highest overall rate among individuals aged ≥ 70 years. Bone cancer incidence peaked in males aged

60–69 years (9.55/100,000) and females aged ≥ 70 years (10.93/100,000), whereas soft tissue malignancies showed their highest incidence in the ≥ 70 -year age group for both males (15.01/100,000) and females (7.29/100,000). Overall, males exhibited higher incidence rates than females across most age groups, particularly for soft tissue malignancies after the age of 30 years, indicating a clear age- and sex-related pattern of musculoskeletal cancer occurrence. As in table 5.

Table 5. Average annual incidence rates of musculoskeletal malignancies by sex and age group in Basrah (2005–2009)

Incidence rates are expressed per 100,000 population per year.

Age group (years)	Bone malignancies		Soft tissue malignancies		Overall
	Male	Female	Male	Female	
<10	0.43	0.42	0.36	0.28	0.74
10–19	2.29	1.5	0.55	0.71	2.53
20–29	1.8	0.8	1.08	1.1	2.41
30–39	1.86	1.22	1.51	0.86	2.74
40–49	2.85	1.45	2.24	1.61	3.96
50–59	3.82	3.21	2.87	1.46	5.63
60–69	9.55	5.36	5.31	4.02	12.44
≥ 70	8.76	10.93	15.01	7.29	20.95
Overall	2.14	1.39	1.38	1.01	3.12

The highest incidence rate of musculoskeletal malignancies was in 2005 (4.07/100000 population). The incidence rates of bone and soft tissue cancers were

2.06/100000 and 1.87/100000, respectively. However, no major change in the incidence rate of musculoskeletal cancers was observed over the study period. Table (6)

Table 6: The annual incidence rates of musculoskeletal cancers according to year, Basrah (2005–2009)

Year of registration	Total population	Musculoskeletal malignancies					
		Bone cancer		Soft tissue cancer		Total musculoskeletal	
		No.	IR	No.	IR	No.	IR
2005	2137197	44	2.06	40	1.87	87	4.07
2006	2201313	39	1.77	26	1.18	66	3.00
2007	2267352	36	1.59	24	1.06	63	2.78
2008	2335373	47	2.01	19	0.81	70	3.00
2009	2405434	36	1.50	28	1.16	71	2.95

DISCUSSION

This descriptive epidemiological study provides one of the first population-based assessments of musculoskeletal malignancies in Basrah Governorate using data from the Basrah Cancer Registry during 2005–2009. Musculoskeletal malignancies accounted for

4.39% of all registered cancers, with bone malignancies representing a greater proportion than soft tissue malignancies. This proportion appears higher than that reported in national Iraqi cancer statistics and neighbouring countries such as Jordan and the Kurdistan Region, although differences in registry coverage,

diagnostic practices, and inclusion criteria between studies should be considered when interpreting these findings^(5,9-11). Male predominance was observed for both bone and soft tissue malignancies, consistent with reports from Iraq, Kuwait, Iran, and international cancer registries.^[9,12,13] Similarly, the age distribution demonstrated the characteristic epidemiological pattern of musculoskeletal malignancies. Bone cancers occurred predominantly among younger individuals, with more than two-thirds of cases diagnosed before the age of 40 years and nearly one-third occurring during childhood and adolescence. This distribution reflects the predominance of osteosarcoma and Ewing's sarcoma during the second decade of life, as consistently described in previous epidemiological studies.^[9,12,13] In contrast, soft tissue malignancies affected a broader age range, with almost half of the cases occurring between 20 and 49 years, reflecting the marked biological heterogeneity of soft tissue sarcomas.^[14] The geographical distribution showed that more than two-thirds of registered patients resided in Basrah city centre. This pattern probably reflects the higher population density and concentration of specialised diagnostic services within the city. The comparatively low number of registered cases from the eastern district may be explained by differences in healthcare utilisation or incomplete case ascertainment because of the district's proximity to the Iranian border. Similar geographic variation in sarcoma incidence and case distribution has also been observed in population-based registry studies from other countries.^[14] Primary musculoskeletal malignancies represented approximately three-quarters of all registered tumours, with an even greater proportion among soft tissue malignancies. Lower limbs and the pelvis were the most frequently involved anatomical sites in both tumour groups, consistent with the recognised predilection of primary musculoskeletal sarcomas for the appendicular skeleton and extremities.^[9,12-15] Vertebral involvement was particularly common among secondary bone tumours, reflecting the well-established tendency of metastatic disease to involve the axial skeleton.^[15] Histopathological analysis demonstrated that osteosarcoma was the most common primary bone malignancy, followed by giant cell tumour and Ewing's sarcoma. The predominance of osteosarcoma agrees with most published studies from Iraq and neighbouring countries and is consistent with international epidemiological reports identifying osteosarcoma as the most frequent primary malignant bone tumour.^[7,12-16] More recent international registry analyses have similarly confirmed that osteosarcoma remains the leading primary bone malignancy worldwide, particularly during adolescence and young adulthood. In contrast, the relatively high proportion of giant cell tumour observed in the present study differs from many published series and may reflect diagnostic variation, differences in pathological classification, or genuine regional variation in disease occurrence. Among soft tissue malignancies, fibroblastic/myofibroblastic tumours constituted the largest histopathological group, followed

by malignant fibrous histiocytoma and tumours of uncertain differentiation, highlighting the histological diversity of soft tissue sarcomas.^[14] The average annual incidence rates of bone and soft tissue malignancies were 1.77 and 1.20 per 100,000 populations, respectively, with consistently higher rates among males than females. Incidence increased progressively with advancing age and reached its highest level among individuals aged 70 years or older, reflecting the general epidemiological pattern of cancer occurrence.^[17] Nevertheless, the incidence of bone malignancies in Basrah exceeded that reported in several international populations, including the United States and Kuwait.^[13,17] Contemporary international studies indicate that primary bone cancers remain rare worldwide, with overall incidence generally ranging from 0.8 to 1.2 cases per 100,000 populations annually, whereas osteosarcoma shows remarkable consistency in incidence across different geographic regions. Therefore, the relatively higher incidence observed in Basrah warrants continued surveillance and further analytical studies to investigate possible environmental, occupational, genetic, and lifestyle-related determinants. Overall, the findings of the present study provide valuable baseline epidemiological data for healthcare planning and future research on musculoskeletal malignancies in southern Iraq.

CONCLUSION

Musculoskeletal malignancies in Basrah showed a relatively high incidence compared with neighbouring countries, predominantly affecting young males and involving primary tumours of the lower limbs. Osteosarcoma was the leading histopathological subtype. Incidence increased with advancing age without significant temporal variation, underscoring the need for strengthened cancer surveillance and further epidemiological research.

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