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A Retrospective Epidemiological and Histopathological Study of Soft Tissue Sarcomas in Iraqi Patients (2011–2024)

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ABSTRACT

Background: *Soft tissue refers to the non-epithelial extra skeletal tissue of the body, excluding the reticuloendothelial system, glial tissue, and some supporting tissue of different parenchymal organs. It consists of voluntary muscles, fibrous tissue, and fat, with the vessels serving these tissues. Also, the peripheral nervous system included with them because nerve tumors founded as masses of soft tissue with similar challenges in differentiating and treatment.* ***Objective****: Malignant soft tissue sarcomas (MSTS) are rare and heterogeneous group of mesenchymal tumors accounting for more than 1% of adult malignancies. Their low prevalence and histological heterogeneity make their diagnosis a challenging task. This retrospective cross-sectional study analyzed cases with confirmed STS diagnosis, dating back to January 2011 to September 2024.* ***Method:*** *The analyzed variables include: sarcoma subtype, grade, sex distribution, year of diagnosis and anatomical site. Assessments of associations and significance levels were assessed using standard statistical analyses.* ***Results:*** *There were 430 reported cases, male were 239 (55.6%) and 191 (44.4%) were females. The most frequent subtypes were liposarcoma (22.8%), rhabdomyosarcoma (12.6%), and leiomyosarcoma (11.9%). There was a high male preponderance ($p = 0.035$). There were no significant changes in terms of the year-on-year occurrence of sarcomas ($p = 0.948$). On grade distribution, the tumors were Grade I in magnitude of 50.9%, Grade II, and Grade III in 32.1 and 17.0, respectively, with statistically significant ($p < 0.001$). The most prevalent location of the lower limbs (27.2%), the abdomen (16.7%), and pelvis (16.1%) represented a statistically significant ($p = 0.0001$).* ***Conclusion:*** *The incidence of MSTS was observed to be higher in men. This male dominance could be associated with occupational exposure to environmental mutagens; however, this remains a hypothesis that warrants further investigation in future studies although the incidence appeared stable with time and this work offers insightful descriptive statistics, prospective studies can build on the outcomes of survival and other factors.*

Keywords: Sarcoma, Grading, Liposarcoma, Epidemiology.

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INTRODUCTION

Soft tissue refers to the non-epithelial extraskeletal tissue of the body, excluding the reticuloendothelial system, glial tissue, and some supporting tissue of different parenchymal organs. It consists of voluntary muscles, fibrous tissue, and fat, with the vessels serving these tissues. Also, the peripheral nervous system included with them because nerve tumors founded as masses of soft tissue with similar challenges in differentiating and treatment [1].

The spectrum of soft tissue sarcoma encompasses different neoplastic subtypes, classified based on their (putative) cell lineage of differentiation as follows: adipocytic;

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fibroblastic/ myofibroblastic; fibrohistiocytic; smooth muscle; pericytic; skeletal muscle; vascular or chondro-osseous neoplasms; nerve sheath neoplasms; and tumors of uncertain differentiation or undifferentiated/unclassified sarcoma [2].

STS are malignant tumors that can affect both adults and children of all age groups [3,4]. They account for approximately 1% of adult solid malignancies with an estimated annual incidence of 4–5/100000/year in Europe [5]. These tumors can develope in different sites such as soft tissues, skin and the visceral organs [6].

They can be classified into dozens of distinct histological categories, and they can arise in virtually any anatomical locations [4]. Histologically, various subtypes of soft tissue sarcomas have been detected, each with special appearance and biologic potential [7]. They differentiate towards multiple tissue types, including lipomatous, smooth muscle, myofibroblastic, neural, endothelial, and rhabdomyocytes. Many of them are primitive and may be aggressive [8].

Soft tissue tumors are further classified according to their grade. Higher-grade tumors associated with greater chance for aggressive local growth at the original site, and greater potential for distant metastases.

Clinically, they often present as a large painless or painful mass. Because benign soft tissue “lumps” are far more common than malignant ones, the diagnosis of a soft tissue sarcoma may be made after excision of a presumed benign mass at a local hospital or in the doctor’s office [9].

In most cases the etiology of sarcomas is unclear. Ionizing radiation, particularly prior radiotherapy for a previous cancer, is the most well-established exogenous factor [10]. Other factors include exposure to certain chemicals at the workplace, including herbicides such as phenoxy-acetic acids and chlorophenols in wood preservatives [10]. Many inherited genetic syndromes are associated with increased developement of sarcomas as in majority of familial cases include neurofibromatosis 1, heritable retinoblastoma and Li-Fraumeni syndrome [11].

Grading: Several systems exist, but the French Federation of Cancer Centers Sarcoma Group (FNCLCC) system is considered one of the most reliable for predicting both metastasis and mortality rates [12]. The FNCLCC grading system is based on three key histopathological parameters [13]:

1. Tumor differentiation (scored 1–3): based on the degree of resemblance to normal tissue.
2. Mitotic count (scored 1–3): assessing cellular proliferation.
3. Extent of necrosis (scored 0–2): reflecting tumor aggressiveness.

Soft tissue sarcomas are rare and histologically heterogenous, making it is hard to study their etiology and track their occurrence accurately in large populations [13]. In this regard, this necessitates efforts to investigate the prevalence and the pathological histotypes of soft tissue sarcomas within Iraqi population.

MATERIALS AND METHODS

This retrospective cross-sectional study was conducted at the Kufa Training Center, covering a period from January 2011 to September 2024. This study was based on the data taken from histopathology reports of soft tissue sarcoma cases registered at histopathology laboratory in Al-Sadr Medical City Teaching Hospital and some private histopathology laboratories within Al-Najaf governorate.

Study Population

All patients with soft tissue sarcoma diagnosed between January (2011) to September (2024). Patients who were referred to and registered in medical centers within Al-Najaf were included. There were also clinical data concerning tumor grade were also collected. Ambiguous or differential cases were

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re-assessed and classified according to histological subtype before being added.

Exclusion criteria included cases inadequate histopathological confirmation or incomplete data that preventing accurate diagnosis and classification.

Data Collection and Classification

All reports collected were re-classified by patient sex, histological subtype, tumor grade, and anatomical site.

Statistical Analysis

Analysis of data was performed using IBM SPSS Statistics software, version 22. Descriptive statistics were presented using tables, charts, and frequency distributions to ilucidate relationship between histological types, tumor grading, and diagnosis dates. The Chi-square test was employed to evaluate associations, statistical significance was considered at ≤ 0.05 (p -value cutoff was set at ≤ 0.05).

Study Limitations

Some reports did not have detailed information on patients' residence, limiting the ability to differentiate between cases developed inside or outside Najaf. In addition, data of tumor staging were not recorded for all cases, likely due to staging being primarily not based on histopathological findings alone but clinical and radiological assessment also involved.

RESULTS

According to the available data of malignant soft tissue tumors collected from (2011-2024) in, a total of 430 cases were reported, 239 cases (55.6%) were males and 191 (44.4%) were females. Indicating a significantly higher prevalence rate among males (P = 0.035). Furthermore, the more frequent malignancy in both genders was Liposarcoma, followed by Rhabdomyosarcoma, Leiomyosarcoma, Fibrosarcoma, MFH and Synovial sarcoma, other malignancy was less frequent contributed for a prevalence range between 1.9% to 5.1% while the least frequent type was ASPS.

In the current study with 430 cases (Table 1), Liposarcoma offers the highest histological variant in the study with 98 cases (22 %) of the total number of cases. The next most frequent subtype was Rhabdomyosarcoma, with 54 cases (12.6 %), followed by Leiomyosarcoma (51 cases; 11.9 %), and Fibrosarcoma (49 cases; 11.4 %). Other subtypes are less common, the MPNST (16 cases; 3.7 %), Angiosarcoma (11 cases; 2.6 %) and ASPS (10 cases; 2.3 %).

Liposarcoma was the most prevalent sarcoma type overall, was also more frequent in men. Similarly, leiomyosarcoma was found to be highly prevalent in women and, therefore, the second most common type in this study.

In analysis of primary sarcomas in terms of gender variations, a number of aspects are rather interesting to note. Ewing sarcoma and the angiomatoid form of synovial sarcoma show an unswervingly female-oriented predominance, even as diffuse form synovial sarcoma, dermatofibrosarcoma protuberans and malignant peripheral nerve sheath tumors have significantly higher infections in the male force.

Using a chi-squared test, the observed results would produce p-value of 0.035, indicating the existence of statistically significant dependence between gender and sarcoma histotype at the significant value of 5% ($p < 0.05$).

Table 1. Distribution of total MSTS by type of tumor and gender of patients for the years (2011 – 2024).

Type	Male		Female		Total	
	No.	%	No.	%	No.	%
Liposarcoma	59	24.7	39	20.4	98	22.8
Rhabdomyosarcoma	31	12.9	23	12.0	54	12.6
Leiomyosarcoma	17	7.1	34	17.8	51	11.9
Fibrosarcoma	25	10.5	24	12.6	49	11.4

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Type	Male		Female		Total	
	No.	%	No.	%	No.	%
MFH*	26	10.9	19	9.9	45	10.4
Synovial sarcoma	24	10.0	12	6.3	36	8.4
DFSP*	20	8.4	11	5.8	31	7.2
Ewing Sarcoma	13	5.4	16	8.4	29	6.7
MPNST*	11	4.6	5	2.6	16	3.7
Angiosarcoma	9	3.8	2	1.1	11	2.6
ASPS*	4	1.7	6	3.1	10	2.3
Total	**239**	**55.6**	**191**	**44.4**	**430**	**100**
p-value is 0.035						

MFH (malignant fibrous histiocytoma). DFSP (Dermatofibrosarcoma protuberans). MPNST (Malignant Peripheral Nerve Sheath Tumor). ASPS (Alveolar Soft Part sarcoma).

Regarding the prevalence rate of total malignancies across the whole period 2011-2024 the highest prevalence rate 9.3% was found in 2017 with the lowest prevalence rate 5.4% in 2012 (Table 2). Among males the highest reading was 8.9% in 2017 and the lowest reading was 4.6% in 2011, while among females the highest prevalence rate 10% in 2017 and the lowest was 4.2% in 2012.

The annual prevalence rates of each type of these malignancies and their annual trends, were almost similar to the overall distribution with regards to gender and types, these findings are summarized in Tables 2.

The corresponding p-value was approximately 0.948, indicating no statistically significant difference in the distribution of males and females across these years.

Table 2. Distribution of total MSTS by the years (2011 – 2024) and gender.

Years	Male		Female		Total	
	No.	%	No.	%	No.	%
2011	11	4.6	13	6.8	24	5.6
2012	15	6.3	8	4.2	23	5.4
2013	18	7.5	10	5.2	28	6.5
2014	19	7.9	13	6.8	32	7.4
2015	17	7.1	14	7.3	31	7.2
2016	17	7.1	16	8.4	33	7.7
2017	21	8.9	19	10.0	40	9.3
2018	16	6.7	17	8.9	33	7.7
2019	20	8.4	14	7.3	34	7.9
2020	17	7.1	15	7.9	32	7.4
2021	16	6.7	10	5.2	26	6.1
2022	18	7.5	13	6.8	31	7.2
2023	15	6.3	17	8.9	32	7.4
2024	19	7.9	12	6.3	31	7.2
Total	**239**	**55.6**	**191**	**44.4**	**430**	**100**
p-value is 0.948						

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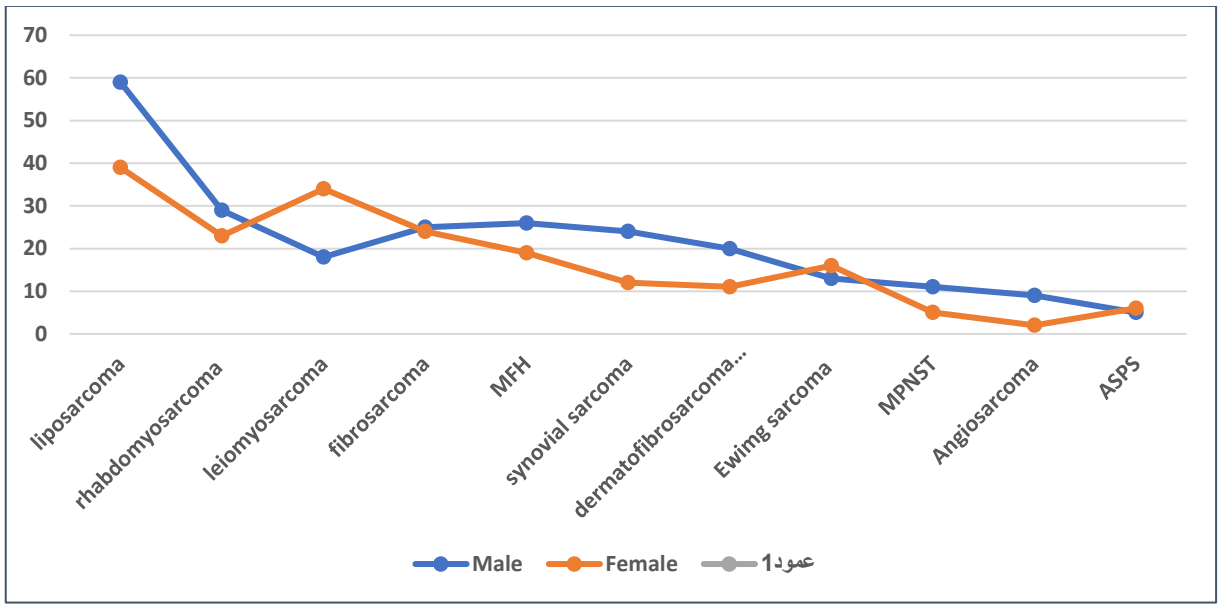


Figure 1. Distribution of total MSTS by type of tumor and gender of patients for the years (2011 – 2024).

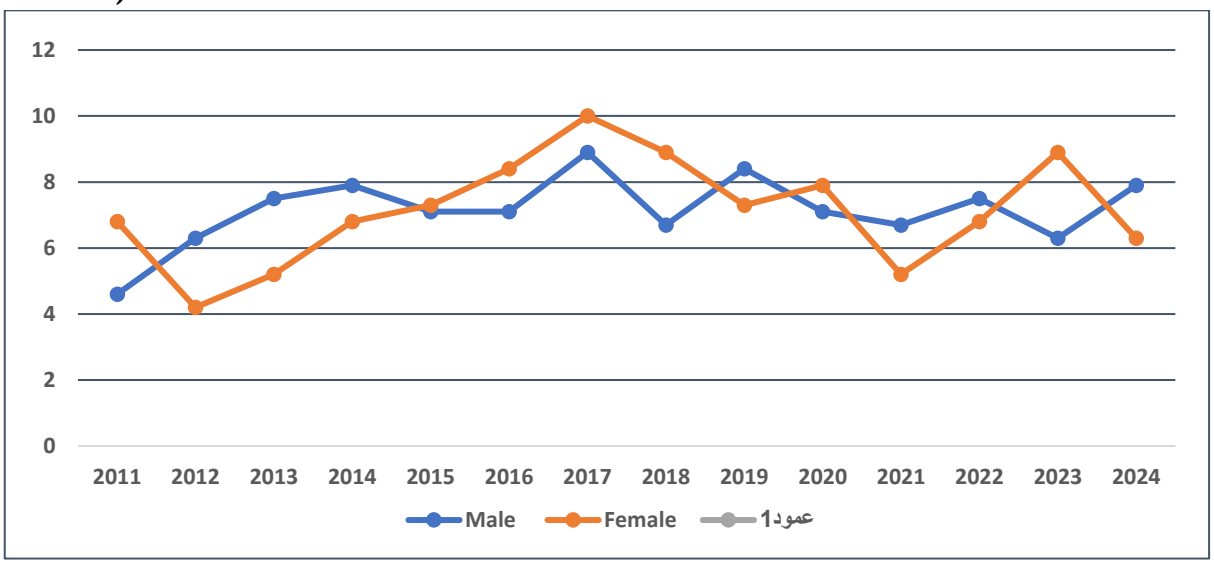


Figure 2. Trend of annual prevalence of soft tissue sarcoma for the period 2011-2024 distributed by gender.

Table 3. presents the annual distribution of soft tissue sarcoma subtypes diagnosed between the years 2011 and 2024, The highest number of total sarcoma cases occurred in 2017 with 40 cases (9.3%), whereas the lowest number was recorded in 2012, with 23 cases (5.4%). Despite these quantitative differences, statistical analysis using the chi-square test revealed a p-value of 0.99, suggesting that no statistically significant differences were found in the sarcoma subtypes distribution over the years of this study.

This indicate that this annual differences in case numbers were likely due to random variation rather than a significant time trend. Over the 14-year period distribution pattern of sarcoma subtypes persisted relatively stable.In specific years there is slight increases and decreases were observed in some subtypes—such as, a peak in liposarcoma cases in 2020 (9 cases) and higher leiomyosarcoma cases in 2024 (6 cases)—these showed no statistically significant changes.

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On the whole, the data collected over the period of study suggested that liposarcoma was the most prevalent sarcoma type. The consistent year to year distribution, supported by a non-significant p-value, indicates that there were no marked epidemiological changes in sarcoma subtype incidence from 2011 to 2024.

Table 3. Distribution of total MSTS by the years (2011 – 2024).

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Liposarcoma	6	7	8	8	7	5	8	6	8	9	7	5	6	8	98
Rhabdomyosarcomas	4	2	3	5	4	4	3	5	4	3	3	5	6	3	54
Leiomyosarcoma	2	4	5	2	4	3	4	5	2	4	4	3	3	6	51
Fibrosarcoma	3	2	3	3	3	4	5	3	5	4	2	5	4	3	49
MFH	2	2	3	4	3	4	5	4	2	2	3	4	3	4	45
Synovial sarcoma	1	2	2	3	2	5	5	2	3	3	3	2	2	1	36
DFSP	2	1	2	2	3	2	4	2	3	2	1	3	2	2	31
Ewing sarcoma	1	2	0	3	2	3	2	3	4	2	1	2	2	2	29
MPNST	1	1	1	1	1	2	2	1	1	1	1	1	1	1	16
Angiosarcoma	1	0	1	0	1	1	1	1	1	1	0	1	1	1	11
ASPS	1	0	0	1	1	0	1	1	1	1	1	0	1	1	10
Total	**24**	**23**	**28**	**32**	**31**	**33**	**40**	**33**	**34**	**32**	**26**	**31**	**32**	**31**	**430**
p-value is (0.99)															

Regarding the grades of different types of tumors, majority of cases in all types were of grade 1 which contributes for 64.3% in Liposarcoma, 72.2% of Rhabdomyosarcoma, 70.6% of Leiomyosarcoma and 55.1% of Fibrosarcoma, across the whole period; 2011 – 2024. The corresponding p-value is (0.001) indicating that there is a statistically significant association between gender and sarcoma types ($p < 0.05$).

Table 4. Distribution of total MSTS by type of tumor and its grade.

Type	Total number of cases	Grade 1		Grade 2		Grade 3	
		No.	%	No.	%	No.	%
Liposarcoma	98	63	64.3	18	18.4	17	17.3
Rhabdomyosarcoma	54	39	72.2	7	13.0	8	14.8
Leiomyosarcoma	51	36	70.6	11	21.6	4	7.8
Fibrosarcoma	49	27	55.1	10	20.4	12	24.5
MFH	45	17	37.8	16	35.5	12	26.7
Synovial sarcoma	36	18	50.0	13	36.1	5	13.9
DFSP	31	4	12.9	27	87.1	0	0.0
Ewing Sarcoma	29	10	34.5	15	51.7	4	13.8
MPNST	16	0	0.0	12	75.0	4	25.0
Angiosarcoma	11	5	45.4	3	27.3	3	27.3
ASPS	10	0	0.0	6	60.0	4	40.0
Total	**430**	**219**	**50.9**	**138**	**32.1**	**73**	**17.0**
p-value is (0.001)							

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Regarding the site distribution of soft tissue sarcomas in (Table 5), the lower limbs were the most common site for the whole malignancies (27.2%) with the shoulder being least common site (5.3%).

Liposarcoma was also most commonly found in the lower limbs (31) cases (31.6%) and least commonly found in head and neck (3) cases (3.06%), while rhabdomyosarcoma was found most commonly in the pelvis (17/54) cases (31.5%) and least commonly in the shoulder (2/54) cases (3.7%).

The most common site for leiomyosarcoma was the pelvis (33/51) cases (64.7%) followed by abdomen (12/51) cases (23.5%) and chest (6/51) cases (11.8%) with no other site.

The corresponding p-value is (0.0001) indicating that there is a statistically significant association between gender and sarcoma types ($p < 0.05$).

Table 5. Distribution of total MSTS by type of tumor and its anatomical sites.

Type	Head &Neck	Chest	Abdomen	Pelvis	Back	Shoulder	Upper Limbs	Lower Limbs	Total
Liposarcoma	3	11	22	10	7	5	9	31	98
Rhabdomyosarcoma	12	3	5	17	4	2	3	8	54
Leiomyosarcoma	0	6	12	33	0	0	0	0	51
Fibrosarcoma	4	8	3	1	2	2	7	22	49
MFH	1	3	19	2	3	4	3	10	45
Synovial sarcoma	0	3	0	2	3	5	6	17	36
DFSP	0	3	5	1	6	2	9	5	31
Ewing Sarcoma	3	5	1	2	0	1	6	11	29
MPNST*	0	1	3	1	0	1	4	6	16
Angiosarcoma	5	2	1	0	0	1	0	2	11
ASPS*	3	0	1	0	1	0	0	5	10
Total	**31 (7.2%)**	**45 (10.5%)**	**72 (16.7%)**	**69 (16.1%)**	**26 (6.1%)**	**23 (5.3%)**	**47 (10.9%)**	**117 (27.2%)**	**430**
p-value is (0.0001)									

MFH (malignant fibrous histiocytoma). DFSP (Dermatofibrosarcoma protuberans). MPNST (Malignant Peripheral Nerve Sheath Tumor). ASPS (Alveolar Soft Part Sarcoma).

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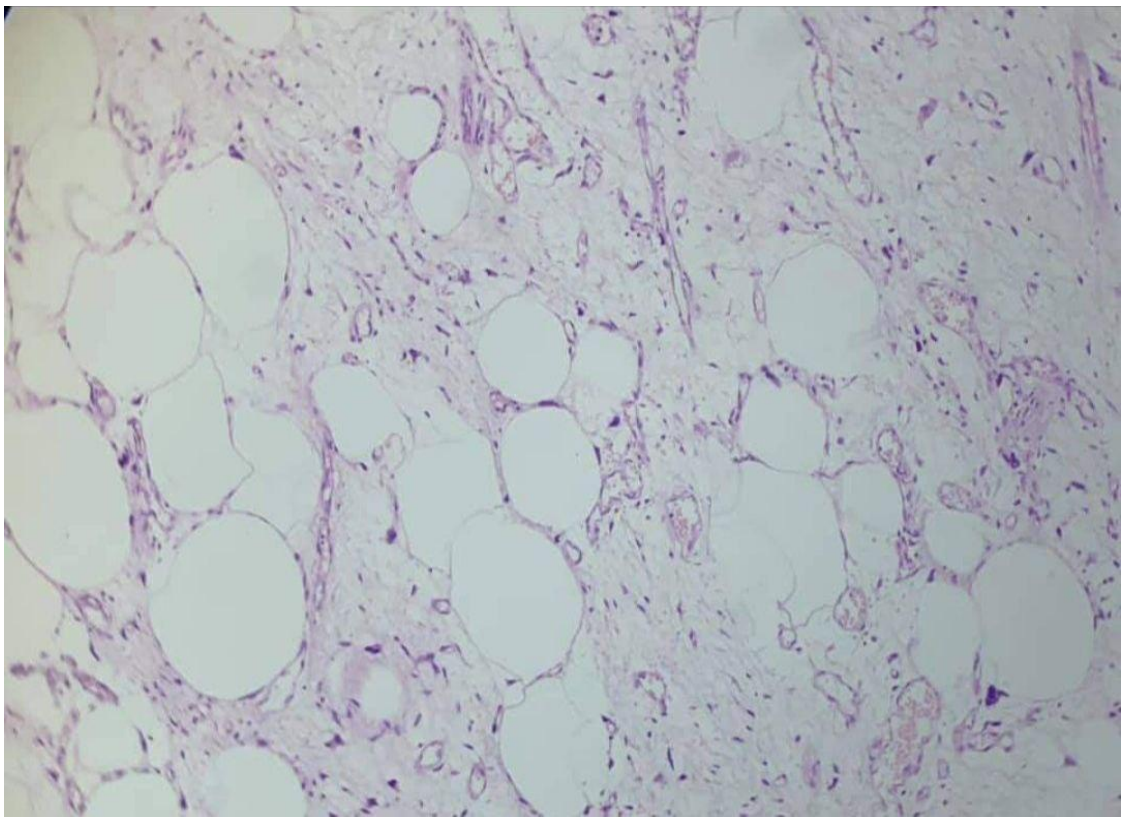


Figure 3. Microscopical picture of well differentiated liposarcoma.

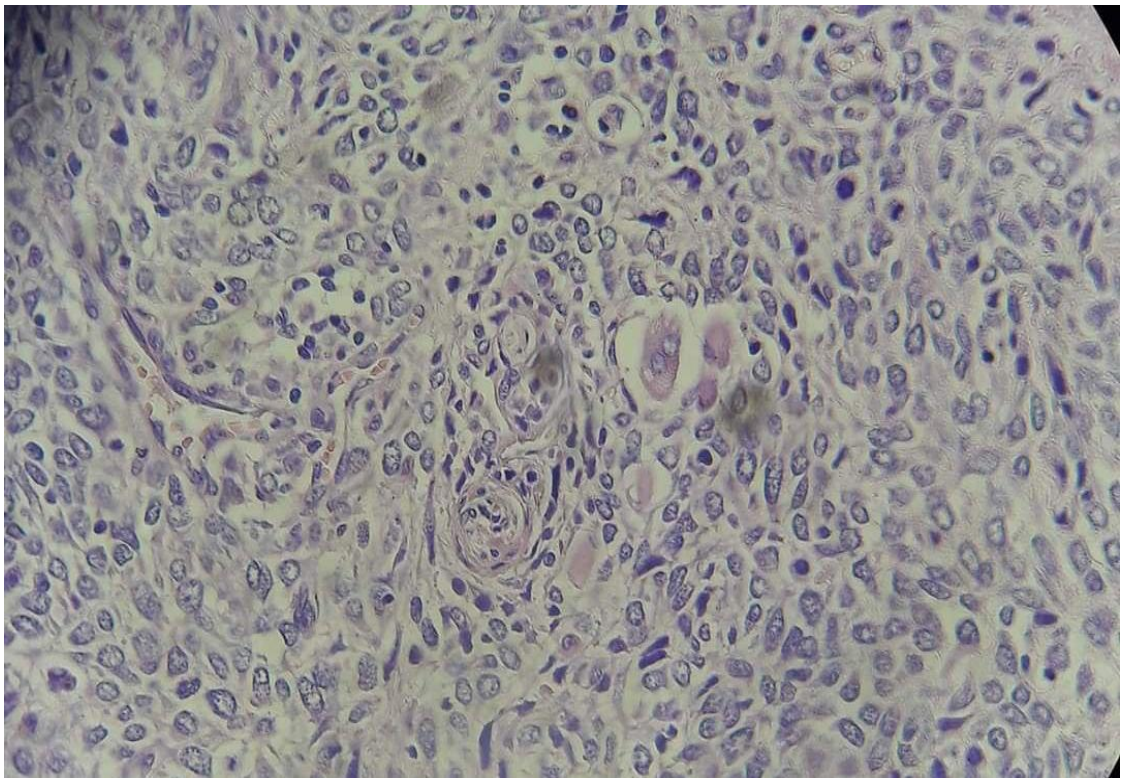


Figure 4. Microscopical picture of embryonal rhabdomyosarcoma.

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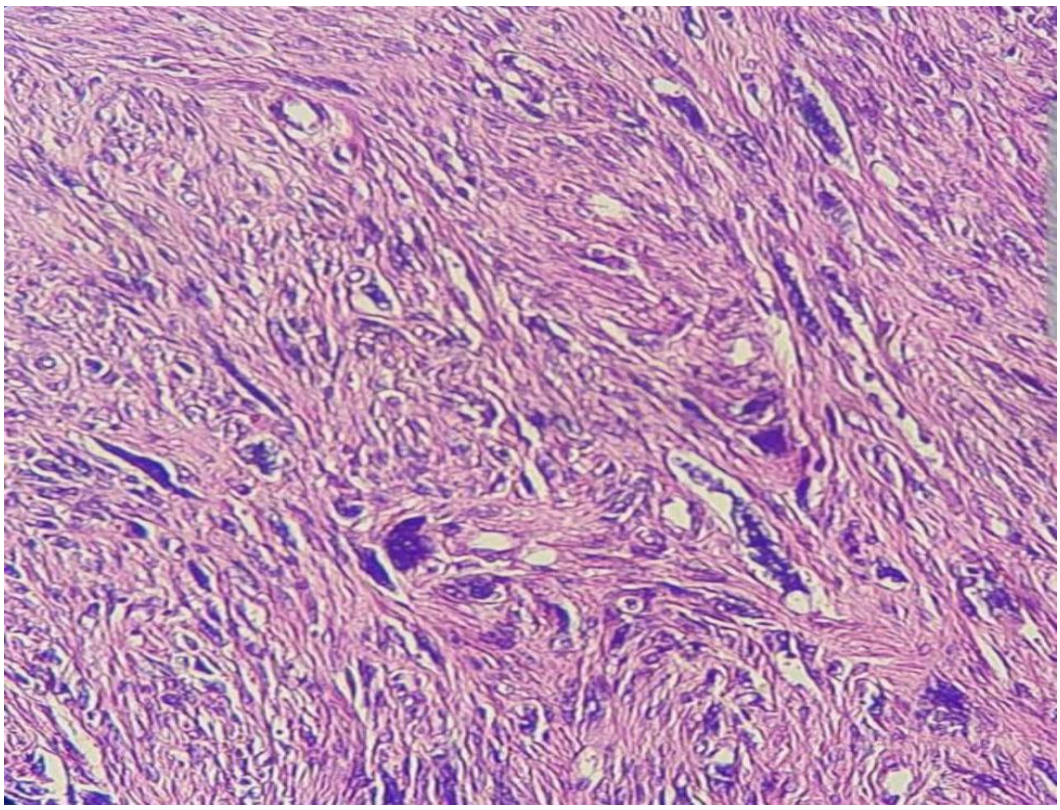


Figure 5. Microscopical picture of well differentiated leiomyosarcoma.

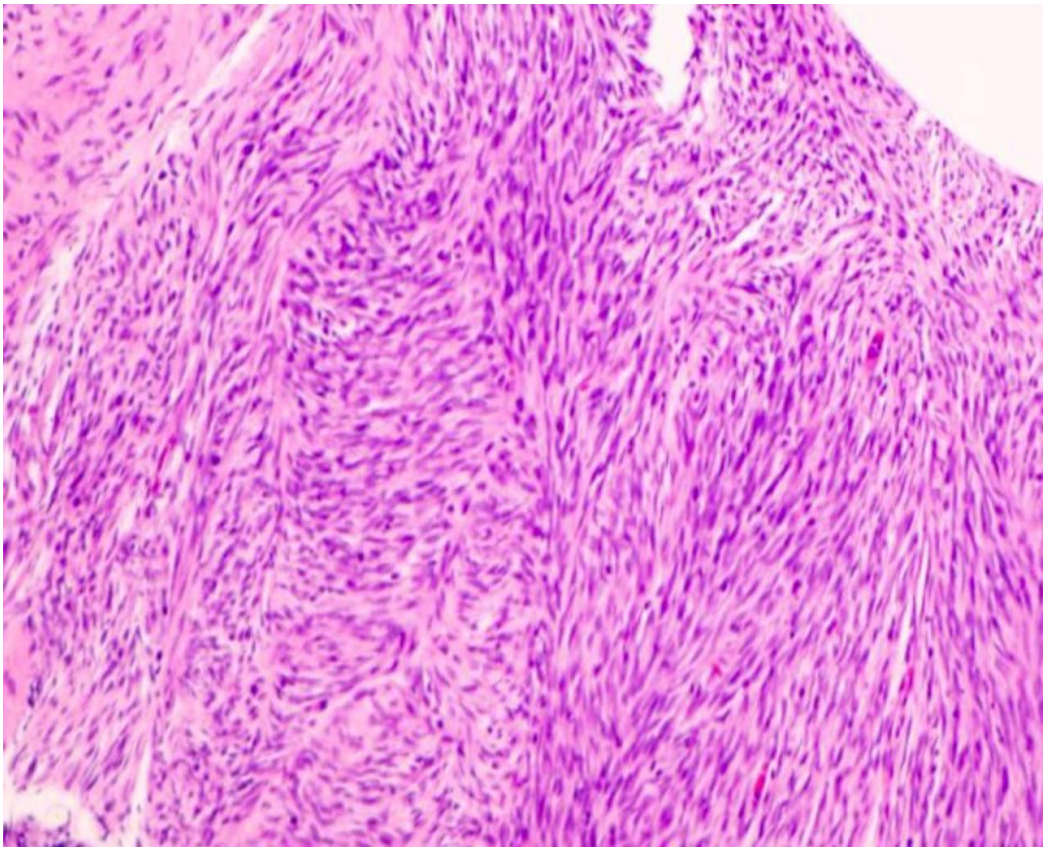


Figure 6. Microscopical picture of adult type fibrosarcoma. Showing typical herring bone pattern.

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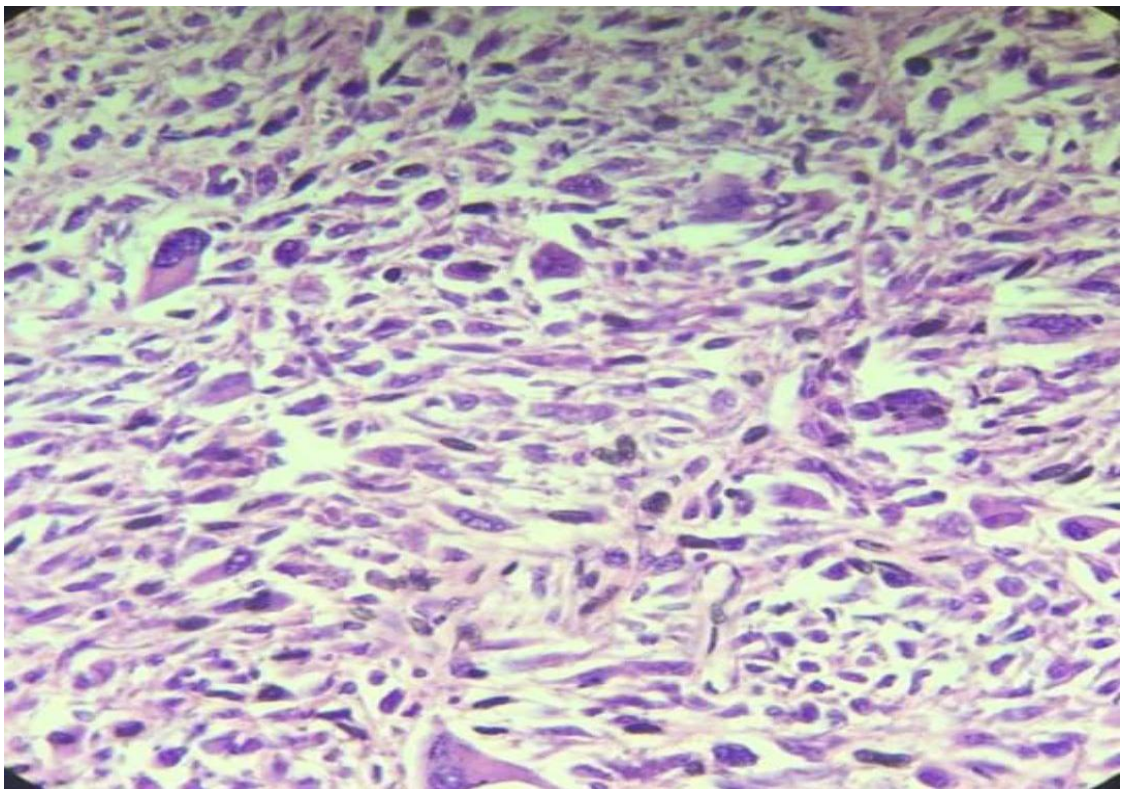


Figure 7. Microscopical picture of MFH (high grade sarcoma). Showing high grade pleomorphism with multiple atypical giant cells.

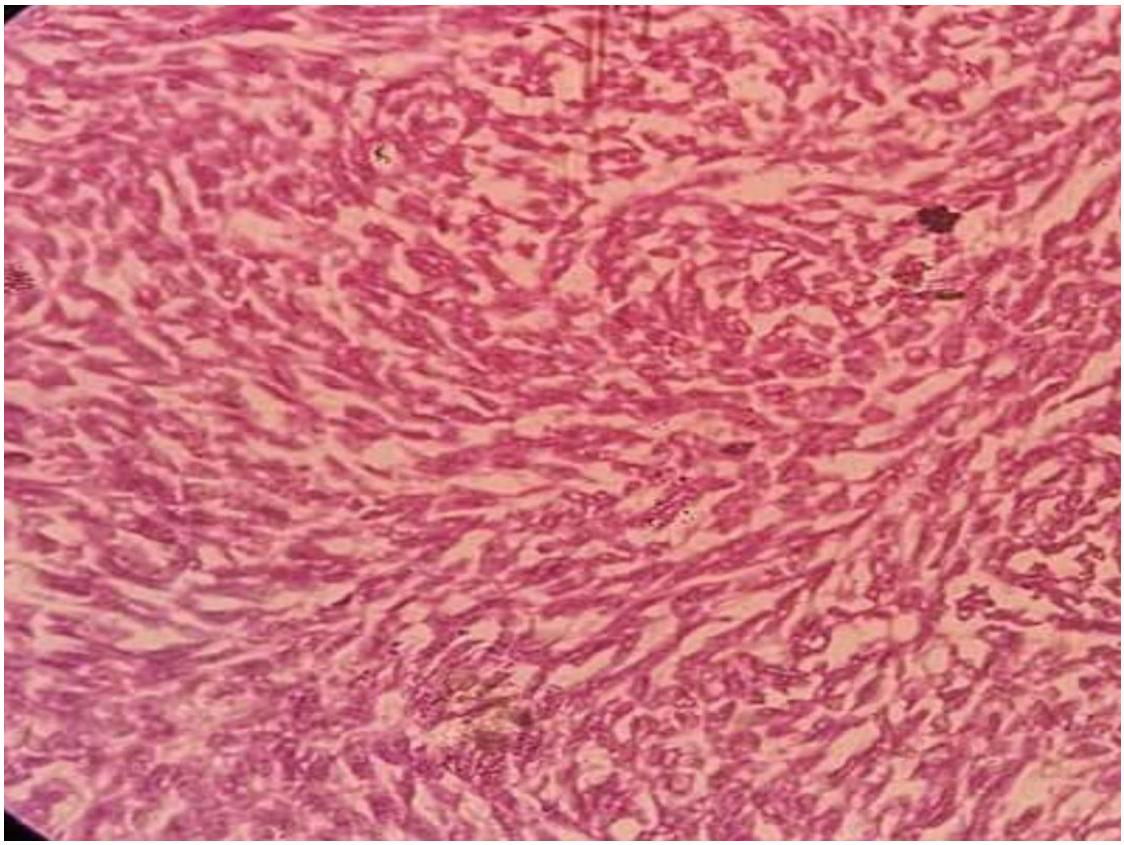


Figure 8. Microscopical picture of Synovial sarcoma.

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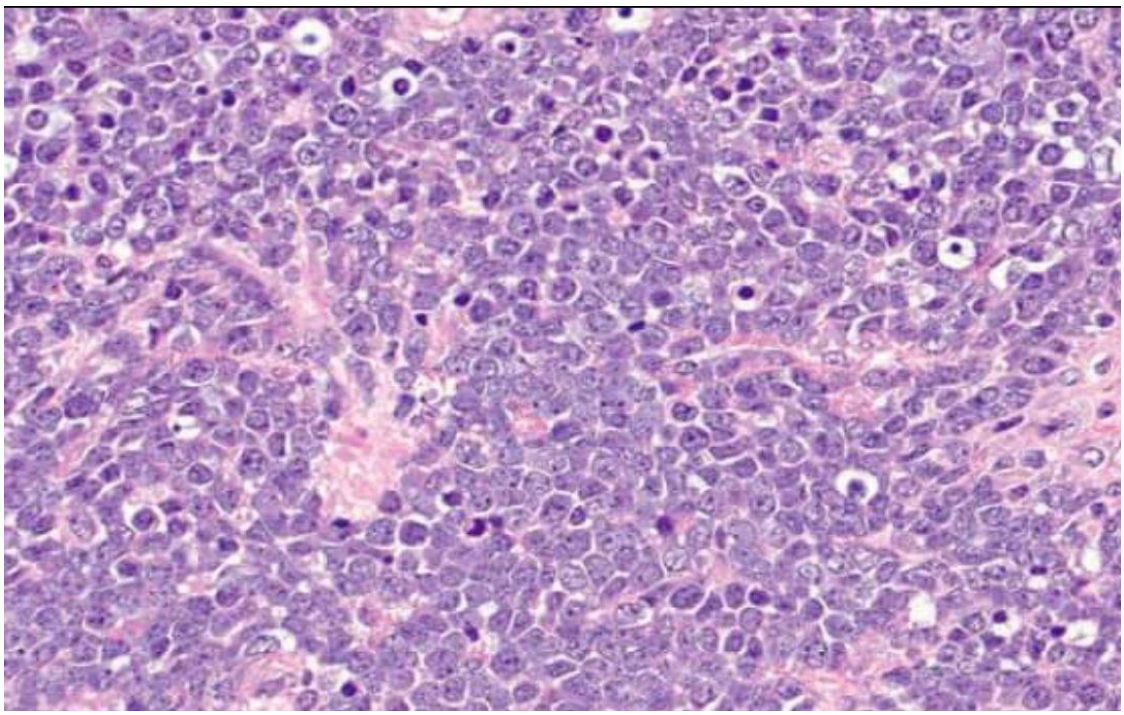


Figure 9. Microscopical picture of Ewing sarcoma showing diffuse proliferation of small round blue cells.

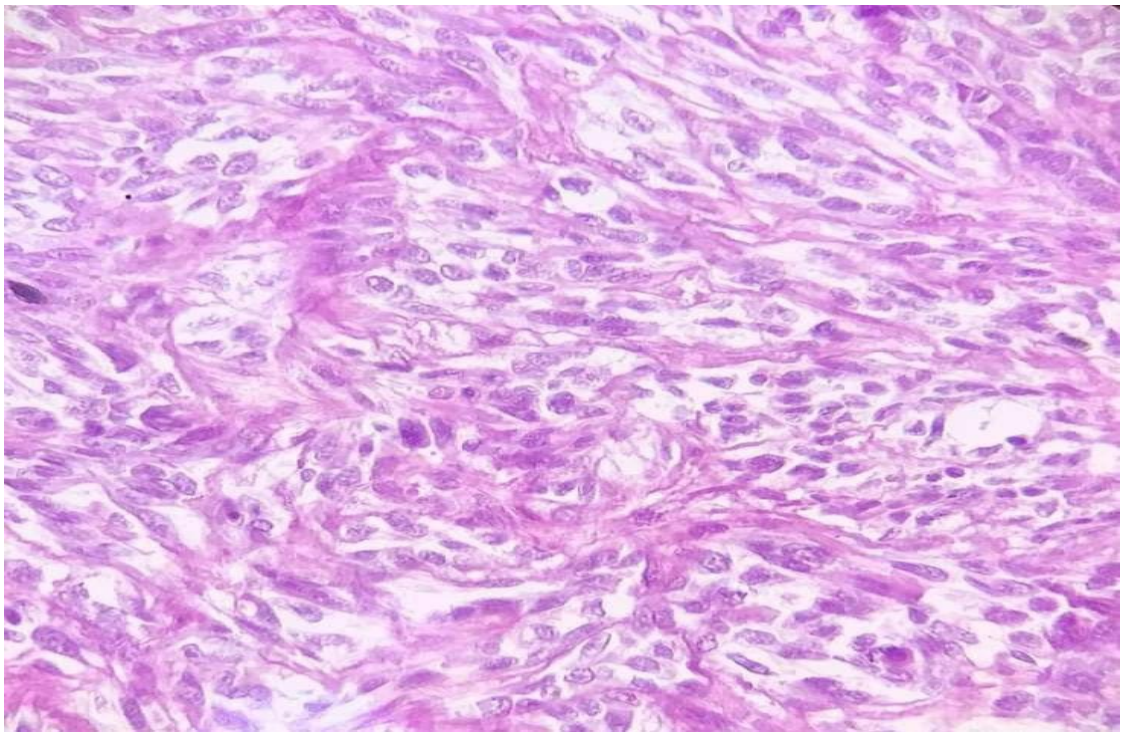


Figure 10. Microscopical picture of ASPS. Showing variable size of alveoli separated by blood vessels.

DISCUSSION

In the current retrospective study, we collected 430 cases of malignant soft-tissue sarcoma (MSTS) recorded back in the year 2011 to 2024.A notable gender difference of which male were in majority at (55.6%) of the cases and female at (44.4%) ($p = 0.035$). This is in line with literature published by Toro et al. (2006) [14] that indicated that the occurrence of soft tissue sarcomas was significantly higher in males under all age groups. Similarly, a population-based report by

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Stiller et al. (2013) [4], also established this same trend, which is related to occupational exposure and hormonal changes. Gender differences may also influence differant immune responses of them as well as genetic predisposition which required further investigations by applying molecular studies along with genetic research.

In terms of histologic distribution, liposarcoma (22.8 %), rhabdomyosarcoma (12.6 %) and leiomyosarcoma (11.9 %) were the most common subtypes. These proportions are in agreement with with the results of SEER database discussed by Brennan et al. (2014) [15], which also found that liposarcomas being in the most frequently occurring soft-tissue tumors within adult population. In contrast, the least common was the alveolar soft-part sarcoma (ASPS) which is not unexpected, since this tumor is classified as rare tumor according to data by Ordonez (1999) [16].

As reported in the literature, the tumor grade was established as a strong prognostic variable with high across-subtype agreement ($p = 0.001$). Of note, out of the explored cases, over a half of cases (50.9%) were Grade 1, indicating a rather benign phenotype. On the other hand, a study showed the highest frequency of this tumor with Grade 3: particulary MFH (Malignant Fibrous Histiocytoma), MPNST (Malignant Peripheral Nerve Sheath Tumor), and ASPS (Alveolar Soft Part Sarcoma), thus conforming to the verified correlation between increased histologic grade and increased metastatic tendency and poor survival. This inclination is in agreement with the trading statements revealed by Weiss & Goldblum (2014) [17], concluding the association of higher histologic grade with increased metastatic potential and poorer prognosis of patients.

We shall start with the distribution histological grading. In our study patients, the most common Grade of dermatofibrosarcoma protuberans (DFSP) was 2 (87.1 %), and substantially different to the prevalence of Grade 1 with the literature. In reality, we have returned with an opposite result as compared to that demonstrated by Mentzel et al. (1998) [18] who included a sub-group of 41 38Cs (DFSP-FS) with a fibrosarcomatous feature and the associated higher risk of recurrence. As a result, Abbott, Oliveira & Nascimento (2006) [19] give prominence to the prognostic importance of DFSP-FS transformation.

The grade of ASPS and MPNST is also high reinforcing past clinical findings (Casanova et al., 2015) [20] that underline the significance of early diagnosis and ambitious treatment guidelines. Another study, a pathology review conducted by Fletcher et al. (2012) [21] characterized about 85 percent of MPNSTs as high grade according to the FNCLCC criteria.

On Anatomical Distribution: the most prevalent locations of tumors were the lower limbs (27.2%), abdomen (16.7%), and pelvis (16%), the anatomical distribution being statistically significant ($p = 0.0001$). These results confirm the findings of Ferrari et al. (2004) [22] who noted extremities and retroperitoneal locations as common sites of soft tissue sarcomas predominance.

The site of the tumor is important in terms of its diagnosis and prognosis as well as treatment strategy. Abdominal or pelvic tumors are mainly not palpable in the initial stages and are usually detected at the advanced ones, which is why the prognosis is poor (McKee et al., 2016) [23].

Time Series 2011 - 2024

The annual distribution of sarcoma over 14 years period did not differ significantly, and there was no gender difference overtime ($p = 0.948$). The proportion of tumor types per year was also relatively constant ($p \approx 1.0$). This is compared to those of some developing countries where every year, MSTS changed due to environmental or occupational factors (Kamangar et al., 2006) [24].

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CONCLUSION

The evidence base of the current study is a strong regarding the demographic, histologic, and temporal patterns of MSTS. Generally, the data align with the published work; however, differences by gender and site highlight the value of targeted studies. The statistically significant correlations in the sex, grade, and site of anatomical location ensure the importance of accurate clinical management and epidemiological modeling.

Future studies ought to involve a combination of molecular profiling and socio-environmental data in order to gain a stronger insight into causality and enhance early diagnosis and therapy.

DECLARATIONS

Ethics Approval

This study was approved by the Department of Pathology and Forensic Medicine, Medicine College, Kufa University (Approval number: M253301, dated 04/4/2024).

Conflict of Interests

The authors declare no competing interests.

REFERENCES

1. Goldblum JR, Folpe AL, Weiss SW. Enzinger and Weiss's Soft Tissue Tumors. 6th ed. Philadelphia: Elsevier Saunders; 2014.
2. Gamboa AC, Gronchi A, Cardona K. Soft tissue sarcoma in adults: An update on the current state of histiotype-specific management in an era of personalized medicine. CA Cancer J Clin. 2020;70(3):200–229.
3. Cancer Council Australia Sarcoma Guidelines Working Party. Clinical Practice Guidelines for the Management of Adult Onset Sarcoma. Cancer Council Australia; 2016. Available from: https://www.cancer.org.au/health-professionals/clinicalguidelines/sarcoma.html.
4. Stiller CA, Trama A, Serraino D, RARECARE Working Group. Descriptive epidemiology of sarcomas in Europe: report from the RARECARE project. Eur J Cancer. 2013;49:684–695.
5. Burningham Z, Hashibe M, Spector L, Schiffman JD. The epidemiology of sarcoma. Clin Sarcoma Res. 2012;2(1):1.
6. Toro JR, Travis B, Wu H, et al. Incidence patterns of soft tissue sarcomas, regardless of primary site, in the SEER program, 1978–2001: Analysis of 26,758 cases. Int J Cancer. 2006;119(12):2922–2930.
7. Fletcher CDM, Unni KK, Mertens F. World Health Organization Classification of Tumors: Pathology and Genetics of Tumors of Soft Tissue and Bone. Lyon: IARC Press; 2002.
8. Downing M, Dite G, Ballinger M; International Sarcoma Kindred Study Consortium. An increased incidence of Hodgkin's lymphoma in patients with adult-onset sarcoma. Clin Sarcoma Res. 2012;2:1.
9. Reshadi H, Rouhani A, Mohajerzadeh S, Moosa M, Elmi A. Prevalence of malignant soft tissue tumors in extremities: An epidemiological study in Syria. Arch Bone Jt Surg. 2014;2(2):106–110.
10. Helman LJ, Meltzer P. Mechanisms of sarcoma development. Nat Rev Cancer. 2003;3(9):685–694.
11. Lindor NM, McMaster ML, Lindor CJ, Greene MH. Concise handbook of familial cancer susceptibility syndromes. 2nd ed. J Natl Cancer Inst Monogr. 2008;38:1–93.
12. Guillou L, Coindre JM, Bonichon F, et al. Comparative study of the National Cancer Institute and French Federation of Cancer Centers Sarcoma Group grading systems in a population of 410 adult patients with soft tissue sarcoma. J Clin Oncol. 1997;15(1):350–362.
13. Jones K, Schiffman J, Kohlmann W, et al. Complex genotype sarcomas display familial inheritance independent of known cancer predisposition syndromes. Cancer Epidemiol Biomarkers Prev. 2011;20:751–757.
14. Toro JR, et al. Epidemiology of soft tissue sarcoma. Clin Orthop Relat Res. 2006.

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15. Brennan MF, et al. Management of soft tissue sarcoma. SEER Program. 2014.
16. Ordonez NG. Alveolar soft part sarcoma: a review. Adv Anat Pathol. 1999.
17. Weiss SW, Goldblum JR. Enzinger and Weiss's Soft Tissue Tumors. 6th ed. Philadelphia: Elsevier Saunders; 2014.
18. Mentzel T, Calonje E, Wadden C, et al. Myxofibrosarcoma: clinicopathologic analysis of 75 cases with emphasis on the low-grade variant. Am J Surg Pathol. 1996;20:391–405.
19. Abbott JJ, Erickson-Johnson M, Wang X, Nascimento AG, Oliveira AM. Gains of COL1A1–PDGFB genomic copies occur in fibrosarcomatous transformation of dermatofibrosarcoma protuberans. Mod Pathol. 2006;19(11):1512–1518.
20. Casanova M, et al. Soft tissue sarcomas in children and adolescents. Cancer Treat Rev. 2015.
21. Fletcher CDM, Bridge JA, Hogendoorn PCW, Mertens F, editors. Enzinger and Weiss's Soft Tissue Tumors. 5th ed. Philadelphia: Elsevier Saunders; 2012.
22. Ferrari A, et al. Soft tissue sarcoma in children and adolescents: the Italian experience. Cancer. 2004.
23. McKee BJ, et al. Clinical outcomes of sarcomas based on primary site. Am J Surg. 2016.
24. Kamangar F, et al. Patterns of cancer incidence, mortality, and prevalence across five continents. J Clin Oncol. 2006.

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