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A Clinicopathological Study of Soft Tissue Tumors in Tertiary care institute in Uttar Pradesh

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HIGHLIGHTS

1. Most common age group: 21–40 years
2. Lipoma was the predominant benigntumor
3.Synovial sarcoma, fibrosarcoma were frequent malignancies
4.Histopathology remainsdiagnostic gold standard
5.Male cases showed higher prevalence overall

Key words:
Soft tissue tumors,
Lipoma
Leiomyoma
Dermatofibrosarcoma protuberans
Alveolar Rhabdomyosarcoma

ABSTRACT

Background: Soft tissue tumors are a heterogeneous group of neoplasms that can occur at any age and in various anatomical locations. They range from benign to malignant types. While some are more common in children, others primarily affect the elderly. Recognizing their histomorphological patterns is crucial for accurate diagnosis and effective management. **Aim:** This study is aimed to evaluate the histomorphological characteristics of soft tissue tumors with respect to age, gender, and type distribution. **Materials and Methods:** A combined retrospective and prospective observational study was conducted over one year in the Department of Pathology at GSVM Medical college, Kanpur. A total of 252 cases were analyzed. Data were collected from departmental archives and samples were obtained from the Department of General Surgery along with clinical requisition forms detailing demographic and clinical information. **Results:** Among the 252 cases studied, patient ages ranged up to 95 years. The highest incidence was in the 31–40 years age group (74 cases, 29.37%), followed by the 21–30 years group (63 cases, 25.0%). The cohort included 84 males (33.3%) and 168 females (66.7%). Of the 252 cases evaluated for tumor type, 228 (91.93%) were benign, and 20 (8.06%) were malignant. Lipomas were the most frequent benign tumors (75 cases, 29.7%), followed closely by leiomyomas (68 cases, 26.9%). Dermatofibrosarcoma protuberans was the most common intermediate tumors (6 cases, 2.3%). Alveolar rhabdomyo - sarcoma was the most common malignant tumour (5cases, 1.98%) followed by malignant spindle cell tumour (3 cases, 1.19%). **Conclusion:** Soft tissue tumors were more prevalent in females, particularly in the third and fourth decades of life. Benign tumors, especially lipomas and leiomyomas, predominated over malignant types. The study highlights the relevance of demographic factors in the diagnosis and epidemiology of soft tissue tumors.

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INTRODUCTION

Soft tissue tumors are a diverse group of neoplasms that originate from mesenchymal tissues located outside the skeletal system and do not involve epithelial tissues, internal organs (viscera), the coverings of the brain (meninges), or the lymphoreticular system [1]. These tumors can develop at any stage of life, affecting individuals across all age groups. From an embryological perspective, soft tissues predominantly arise from the mesodermal layer, although certain elements may also derive from the neuroectoderm. These tumors exhibit significant heterogeneity and are classified based on their histological resemblance to normal adult tissues, following the presumed line of differentiation. This classification system helps in identifying the tumor subtype by comparing it to the mature soft tissue type it mimics, such as adipose, muscular, vascular, fibrous, or neural tissue [2].

It represents a complex and diverse group of lesions that exhibit a wide spectrum of cellular differentiation. These tumors can be broadly categorized into three main types: benign (non-cancerous), intermediate and malignant (cancerous), the latter commonly referred to as soft tissue sarcomas [3]. Among these, benign tumors are far more prevalent. Benign soft tissue tumors generally exhibit slow growth, remain localized without invading surrounding tissues, and are often asymp tomatic or painless. In contrast, malignant soft tissue tumors tend to be more aggressive, characterized by rapid growth, the potential to invade adjacent structures, and the ability to metastasize (spread) to distant sites in the body [4].

Soft tissue tumors can develop in individuals of any age and affect both males and females without significant gender predilection. Clinically, they most commonly present as a gradually enlarging, painless swelling or mass, which is often the initial and only symptom. Among the benign soft tissue tumors, lipoma- a tumor arising from adipose (fat) tissue- is the most frequently encountered type. On the other hand, in adults, the most common malignant soft tissue tumor is undifferentiated pleomorphic sarcoma, previously known as malignant fibrous histiocytoma [5,6].

The development of malignant tumors, particularly sarcomas, is influenced by a complex interplay of genetic, environmental, and immuno-logical factors. A well-recognized risk factor is genetic predisposition, where inherited mutations signifi-cantly heighten an individual's susceptibility to certain types of cancer. Environmental exposure to carcinogenic substances such as asbestos, benzene, and various pesticides has also been linked to an increased risk of malignancy. Additionally, ionizing radiation, including therapeutic radiation used in medical treatments, is a well-established carcinogen. Viral infections, notably those caused by human papillomavirus (HPV) and human T-lymphotropic virus type 1 (HTLV-1), are implicated in the pathogenesis of specific cancers. Immunodeficiency, whether congenital or acquired, can impair the body's ability to recognize and eliminate abnormal cells, thereby facilitating the development of malignancies [7,8,9]

The present study was conducted to analyze the distribution of benign and malignant soft tissue tumors across different age groups and genders in a cohort of 252 patients. The primary objective was to gain a clearer understanding of the demographic patterns associated with soft tissue tumors, including how their occurrence varies by age and gender. Additionally, the study aimed to identify the most frequently observed types of soft tissue tumors within the study population. By examining these variables, the research seeks to contribute valuable insights into the epidemiology and potential risk factors influencing the development of both benign and malignant soft tissue neoplasms.

MATERIALS AND METHODS

Material

A combined retrospective and prospective obser - vational study was carried out over a period of one year in the Department of Pathology at GSVM Kanpur. A total of 252cases were analyzed during this time.

Inclusion Criteria:

· The study included both trucut biopsy samples and excision biopsy specimens.

· Paraffin-embedded tissue blocks referred for a second opinion were also considered eligible for analysis.

Exclusion Criteria:

· Lesions resembling tumors but not confirmed as true soft tissue neoplasms on histopathological examination were excluded.

· Specimens deemed inadequate for diagnostic evaluation were also excluded.

Methodology

For the retrospective part of the study, relevant data were obtained from the medical records department. Histopathology slides from previously diagnosed cases were retrieved and re-evaluated. In the prospective phase, all tissue samples were received from the Department of General Surgery and submitted to the Department of Pathology along with duly filled

requisition forms. These forms included comprehensive patient information such as demographic details, clinical presentation including the location, duration, and progression of the swelling, findings from general, systemic, and local examinations, as well as any pertinent investigation results related to metastatic evaluation. All study protocols and sample collection, were reviewed and approved by the Institutional Ethics Committee (IEC) of institute.

RESULTS

Table 1: Age-wise Distribution of Patients with Soft Tissue Tumors

Age (year)	Number of cases	Percentage (%)
0-10	09	3.57
11-20	19	7.54
21-30	63	25.0
31-40	74	29.37
41-50	42	16.67
51-60	29	11.51
61-70	13	5.16
71-80	2	0.79
81-90	0	0.0
91-100	1	0.4

Out of the total 252 patients included in the study, 84 (33.3%) were males and 168 (66.7%) were females. The majority of the cases, 74 patients (29.37%), were concentrated in the 31–40 year age group, highlighting this decade as the most commonly affected

Table 2: Age-wise Distribution of cases of Soft Tissue Tumors in Males

Age (year)	Number of cases	Percentage (%)
0-10	03	1.19
11-20	11	4.36
21-30	23	9.12
31-40	20	7.93
41-50	08	3.17
51-60	12	4.76
61-70	06	2.38
71-80	01	0.39
81-90	0	0.0
91-100	0	0.0

Table 3: Age-wise Distribution of cases of Soft Tissue Tumors in Females

Age (year)	Number of cases	Percentage (%)
0-10	06	2.38
11-20	08	3.17
21-30	40	15.8
31-40	54	21.4
41-50	34	13.4
51-60	17	6.74
61-70	07	2.77
71-80	01	0.39
81-90	00	0.00
91-100	01	0.39

Table 4: Age-wise Distribution of Benign cases of Soft Tissue Tumors

Age (year)	Number of benign cases	Percentage (%)
0-10	07	2.77
11-20	16	6.34
21-30	59	23.4
31-40	69	27.3
41-50	37	14.6
51-60	26	10.3
61-70	11	4.36
71-80	02	0.79
81-90	01	0.39
91-100	0	0.00

Table 5: Age-wise Distribution of Intermediate cases of Soft Tissue Tumors

Age (year)	Number of Intermediate cases	Percentage (%)
0-10	00	0.00
11-20	02	0.79
21-30	04	1.58
31-40	03	1.90
41-50	01	0.39
51-60	00	0.00
61-70	01	0.39
71-80	00	0.00
81-90	00	0.00
91-100	00	0.00

Table 6: Age-wise Distribution of Malignant cases of Soft Tissue Tumors

Age (year)	Number of Malignant cases	Percentage (%)
0-10	01	0.39
11-20	02	0.79
21-30	00	0.00
31-40	02	0.79
41-50	05	1.98
51-60	02	0.79
61-70	01	0.39
71-80	00	0.00
81-90	00	0.00
91-100	00	0.00

Table 7: Benign Soft Tissue Tumor Distribution Profile

Benign soft tissue tumors	No. of cases	Percentage (%)
Lipoma	75	29.7
Leiomyoma	68	26.9
Hemangioma	25	9.92
Schwannoma	19	7.53
Meningioma	18	7.14
Neurofibroma	9	3.57
Tenosynovial Giant cell tumour	4	1.58
Benign spindle cell lesion	2	0.79
Myofibroblastic tumour	1	0.39

Among the benign soft tissue tumours analyzed, lipoma emerged as the most prevalent diagnosis, accounting for 75 cases (29.7%) in both males (31 cases) and females (44 cases). This was closely followed by leiomyoma, which constituted 68 cases (26.9%), making it the second most frequent benign tumour observed in the study and also the second most common benign tumour observed in females. Other commonly encountered benign tumours Included Hemangioma with 25 cases in total (includes capillary, intramuscular, hobnail varieties) (9.92%) which is the second most common benign tumour in males (13 cases). Peripheral nerve sheath tumour included Schwannoma with 19 cases (7.53%), Meningiomas (transitional, fibroblastic, meningothelial) with 18 cases and Neurofibroma with 9 cases. Less frequently observed tumour included Giant cell tumour, spindle cell lesions and myofibroblastic tumour.

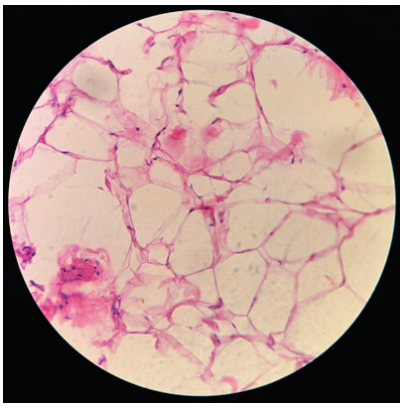
Table 8: Intermediate Soft Tissue Tumor Distribution Profile

Intermediate soft tissue tumors	No. of cases	Percentage (%)
Dermatofibrosarcoma protuberance	6	2.3
Hemangioendothelioma	2	0.79
Benign spindle cell lesion- Desmoid fibromatosis	2	0.79
Fibrosarcoma	1	0.39

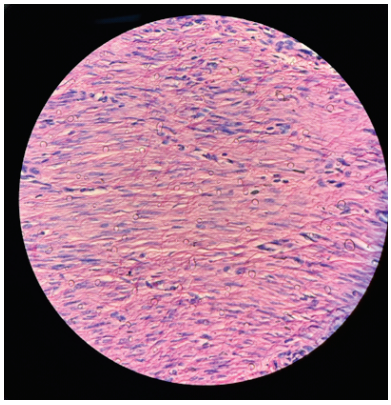
Table 9: Malignant Soft Tissue Tumor Distribution Profile

Malignant soft tissue tumors	No. of cases	Percentage (%)
Alveolar Rhabdomyosarcoma	5	1.98
Malignant Spindle cell tumour	3	1.19
Metastatic small round cell tumour	2	0.79
Leiomyosarcoma	1	0.39
High grade papillary meningioma	1	0.39
sinonasal undifferentiated carcinoma	1	0.39
Angiosarcoma	1	0.39

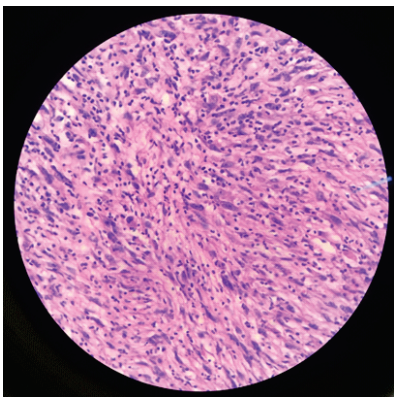
In the present study, malignant soft tissue tumours were considerably less frequent compared to their benign counterparts. Among these, Alveolar Rhabdomyosarcoma was identified as the most common malignant lesion, accounting for 5 cases (1.98%). This was followed by Malignant Spindle cell tumour reported in 3 cases (1.19%).



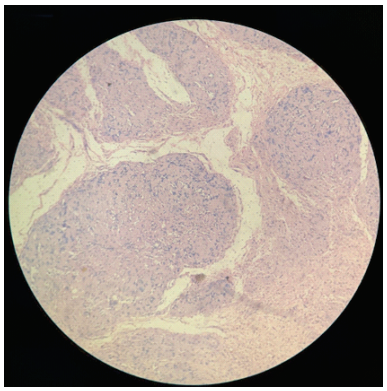
Lipoma



Leiomyoma



Leiomyosarcoma



Verocay Bodies in Schwannoma

DISCUSSION

Soft tissue tumors are relatively uncommon in the general adult population, representing less than 1% of all adult malignancies. However, they hold greater significance in pediatric oncology, accounting for approximately 15% of all childhood cancers. The global incidence of soft tissue sarcomas, which are malignant in nature, is estimated to range between 1.8 to 5 cases per 100,000 individuals per year. In contrast, benign soft tissue tumors such as lipomas are considerably more prevalent and are encountered far more frequently in clinical practice than their malignant counterparts (10).

In the present study, a total of 252 with mean age of 31.0 ± 8.49, patients diagnosed with soft tissue tumors were evaluated. The majority of the cases, 74 patients (29.37%), were concentrated in the 31- 40 year age group followed by 21-30 year age group, highlighting this decade as the most commonly affected. This suggests a possible trend or predisposition in this age bracket, which may warrant further investigation. Other age groups had relatively fewer cases, with a gradual decline in incidence observed both in younger (below 20 years) and older (above 50 years) populations. This trend of age group is supported by previously by Ramnani *et al.*, 2014 (11).

In our study, the most frequently observed tumor types were lipomas and leiomyomas, together accounting for 143 out of 252 total cases. Lipomas are slow-growing tumors composed of mature adipose tissue and are typically benign in nature (12). They most commonly arise in the subcutaneous layer but can also develop in deeper anatomical locations, including intermuscular planes, abdominal organs, oral cavity, internal auditory canal, cerebellopontine angle, and thoracic cavity (13). Although lipomas can occur across all age groups, they are most frequently identified in adults. These tumors are often asymptomatic and are usually diagnosed through clinical evaluation without the need for extensive imaging or intervention. In the majority of cases, treatment is not necessary unless the lesion becomes painful, enlarges significantly, or causes cosmetic concern (14, 15). Whereas, leiomyoma is a benign smooth

muscle tumor that arises from mesenchymal tissue and is most commonly found in the uterus, although it can occur in other locations such as the skin (cutaneous leiomyoma), gastrointestinal tract, and deep soft tissues. These tumors are well-circum scribed, slow-growing, and typically non-invasive, presenting more frequently in women of reproductive age (16). Uterine leiomyomas are prevalent benign tumors of the female reproductive tract, frequently occurring in women of reproductive age. They are often linked to significant gynecological symptoms and can negatively impact fertility outcomes. Despite their common occurrence, the underlying causes of leiomyoma development remain largely unclear. Their presence poses a clinical challenge, particularly when identified in patients undergoing Assisted Repro ductive Technologies (ART), as determining the appropriate management strategy can be complex in such cases (17). This trend of benign soft tissue tumour is well compared in Chakrabarti et al 23 where out of 140 benign cases in a study of total 150 cases, Lipoma was the most common benign soft tissue tumour with 49 cases followed by leiomyoma accounting for 44 cases.

In the study of 252 patients, 84 individuals (33. 3%) were male, while a significantly higher proportion-168 patients (66.7%) were female. This observation indicates a clear predominance of female patients in the study population. The male-to-female ratio was determined to be approximately 0.5:1, implying that for every one female diagnosed with a soft tissue tumor, there were only half as many males affected. Contrary to our findings, several studies (18-21) have reported a higher prevalence of soft tissue tumors in males. These studies suggest that male patients are more commonly affected by various types of soft tissue tumors, indicating a gender-based predo minance. Leiomyomas, which are benign smooth muscle tumors, are particularly common in the uterus (also known as uterine fibroids), and therefore, are predominantly found in females (22). This explains the higher percentage of female patients in our study, as a significant number of cases were uterine leiomyomas. The predominance of female patients may also be influenced by the nature of the tumors studied, with certain types, such as leiomyomas, being far more prevalent among women due to anatomical and hormonal factors.

Additionally, this gender disparity could be due to differences in clinical presentation or healthcare-seeking behaviour. It is possible that female patients were more likely to report symptoms or pursue medical evaluation and treatment during the study period, especially for conditions like uterine fibroids that can cause significant discomfort or complications. Therefore, the higher female representation may not only reflect tumor distribution but also patterns in healthcare utilization.

	Current study	Tapadar Et al[24]	Chakrabarti et al[23]	Anitha et al[18]
Total cases	**252**	**89**	**150**	**150**
Benign	**228**	**76**	**140**	**120**
Lipoma	**75**	**39**	**49**	**69**
Leiomyoma	**68**	**No data**	**44**	**4**
Hemangioma	**25**	**26**	**19**	**20**
Schwannoma	**19**	**11**	**19**	**9**
Intermediate	**11**	**4**	**1**	-
Malignant	**13**	**9**	**9**	**30**

CONCLUSIONS

This study highlights the predominance of benign soft tissue tumors, with lipomas and leiomyomas being the most commonly encountered types. A significant female predominance was observed, largely attributed to the high incidence of uterine leiomyomas. The majority of tumors were seen in the third and fourth decades of life, indicating a potential age-related trend. Malignant soft tissue tumors were relatively rare, with alveolar rhabdomyosarcoma being the most frequent.

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