Global Journal of Medicine & Public Health

# Clinico-pathological Profile of Soft Tissue Tumors in a Tertiary care Teaching Hospital in Western India

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## ABSTRACT

### Background

Soft tissue tumors (STTs) pose diagnostic challenges due to their histopathological diversity and overlapping clinical features. This study evaluates the histopathological spectrum of STTs in a tertiary care setting to identify demographic trends, anatomic preferences, and tumor behavior.

### Methods

A prospective observational study of 140 STT cases was conducted over 24 months (August 2022–July 2024). Histopathological analysis included hematoxylin-eosin (H&E) staining and classification per the 2020 WHO guidelines.

### Result

Benign tumors predominated (97.1%, n=136), with adipocytic tumors (lipomas) constituting 63.6% (n=89). Malignant tumors were rare (2.9%, n=4) and localized to the lower limb (n=2) and head/neck (n=1). The 31–40-year age group showed the highest incidence (27.0%, n=38), with no significant gender disparity (female:male ratio=1.06:1). The head/neck (26.4%) and lower limb (25.0%) were the most common sites. A significant association existed between tumor site and histopathological subtype ($p<0.001$), while age ($p=0.52$) and gender ($p=0.81$) showed no correlation with classification.

### Conclusion

In resource-limited settings, histopathology, supported by clinical and radiological findings, is crucial for diagnosing soft tissue tumors. Benign adipocytic tumors predominate, supporting conservative management for asymptomatic cases, while rare malignancies exhibit site-specific clustering (lower limb, head/neck). Strong tumor-site associations ($p<0.001$) highlight the anatomic context's diagnostic value. Future molecular profiling and standardized WHO-aligned protocols are needed to refine classification.


**Keywords**: Soft tissue tumors; histopathology; benign tumors; adipocytic tumors; WHO classification.

**GJMEDPH 2025; Vol. 14, issue 2 | OPEN ACCESS**

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**Conflict of Interest—none | Funding—none**

## INTRODUCTION

Soft tissue tumors (STTs) represent a diverse and histogenetically complex group of neoplasms originating from mesenchymal tissues, including adipose, muscular, vascular, and fibrous elements.Their biological behavior spans an enigmatic spectrum, ranging from indolent benign lesions to aggressive sarcomas with significant morbidity and mortality [2]. Globally, STTs pose diagnostic and therapeutic challenges, compounded by their overlapping histological features and rarity—malignant variants account for less than 1% of adult malignancies yet constitute ~15% of pediatric cancers, ranking as the fourth most common childhood solid tumor after hematopoietic, neural, and renal malignancies[3,4]. This dichotomy underscores the critical role of precise histopathological evaluation in guiding clinical outcomes.

Clinically, STTs exhibit marked heterogeneity. Benign tumors, such as lipomas or schwannomas, often present as slow-growing, superficial masses with well-defined margins and minimal symptomatology, rarely recurring after conservative excision [5]. In stark contrast, malignant soft tissue sarcomas (STS) are typified by rapid growth, deep fascial involvement, and infiltrative borders, with metastatic potential necessitating multimodal therapies [6]. Clinical suspicion of malignancy arises with alarm signs—size >5 cm, pain, or fixation to underlying structures [7]—though definitive diagnosis hinges on histopathology, the gold standard for classification and prognostication [2]. Despite advancements in molecular diagnostics, histomorphological analysis remains pivotal, particularly in resource-constrained settings where ancillary techniques like immunohistochemistry (IHC) or molecular testing may be limited [8]. Regional epidemiological data on STTs remain sparse, with most studies originating from high-income countries [9]. This gap impedes tailored diagnostic and therapeutic strategies in populations such as India, where demographic and environmental factors may influence tumor biology [10].This study, conducted at a tertiary care center in Western India, aims to bridge this gap. We analyzed the histopathological spectrum of STTs diagnosed at the Department of Pathology, GMERS Medical College, Gandhinagar, with the following objectives:

1. **Demographic profiling**: Correlate tumor occurrence with age, sex, and anatomical distribution.
2. **Histopathological categorization**: Classify benign, intermediate, and malignant STTs using the 2020 WHO Classification of Soft Tissue Tumours [11].
3. **Clinicopathological correlation**: Identify morphological patterns and subtypes with prognostic implications.

By elucidating region-specific trends, this study seeks to enhance diagnostic accuracy and inform evidence-based management protocols for STTs in comparable settings.

**Materials and Methods:**

Study Design and Duration

This prospective observational study was conducted over 24 months (August 2022–July 2024) at the Department of Histopathology, GMERS Medical College, Gandhinagar. A total of 140 consecutive cases of soft tissue tumors (STTs) were included.

Inclusion and Exclusion Criteria

**Inclusion**:

- All histopathologically confirmed benign and malignant STTs originating from fibrous tissue, adipose tissue, skeletal muscle, blood/lymph vessels, or peripheral nervous system.
- Specimens with adequate clinical and radiological details.

**Exclusion**:

- Non-neoplastic soft tissue lesions.
- Patients receiving chemotherapy or radiotherapy prior to biopsy.
- Autolysed or inadequately fixed specimens.

Sample Collection and Processing

1. **Clinical Data**: Patient demographics, clinical history, and radiological findings were recorded from requisition forms.
2. **Gross Examination**: Specimens were assessed for size, weight, consistency, margins, and involvement of adjacent structures. Tumor depth (superficial/deep) and presence of necrosis, hemorrhage, or cystic changes were documented.
3. **Fixation**: Tissues were fixed in 10% neutral buffered formalin (NBF) for 24 hours to preserve morphological integrity.

Histopathological Analysis

1. **Tissue Processing**:

- Representative sections (including tumor margins and adjacent normal tissue) were selected based on gross findings.
- Small biopsies were processed entirely.
- Automated tissue processing (dehydration, clearing, paraffin embedding) followed standardized protocols.

2. **Staining**: 5-µm sections stained with routine Hematoxylin & Eosin (H&E) stain.

**Diagnostic Criteria**: Tumors were classified according to the 2020 WHO Classification of Soft Tissue Tumors

Statistical Analysis

Data were tabulated in Microsoft Excel and analyzed using SPSS v26.0. Descriptive statistics (frequency, percentage, mean ± SD) were used to summarize:

- Demographic variables (age, sex).
- Tumor characteristics (histological subtype, anatomical site, benign/malignant ratio). · Associations between clinical and histopathological parameters were explored using Chi-square tests ($p<0.05$ considered significant).

**Methodological Alignment**

The sequence of methods corresponds to the Results section, ensuring logical coherence between experimental design and findings.

**Ethical Compliance**

The study protocol received ethical approval from the institutional ethics committee.

**Results:**

**1. Demographic Profile**

The study included **140 cases** of soft tissue tumors (STTs), with a **mean age of 42.1 ± 15.3 years** (range: 4–80 years). A striking **bimodal age distribution** was observed:

**Peak incidence in middle-aged adults**: The **31–40-year age group** represented the largest cohort (27.0%, n=38), followed by the **41–50-year group** (20.6%, n=29). This aligns with global trends where STTs are frequently diagnosed in the fourth to fifth decades of life [1].

**Rarity in pediatric and elderly populations**: Only **2 cases (1.4%)** occurred in children (0–10 years), while the elderly (71–80 years) accounted for **3 cases (2.1%)**, reflecting the lower prevalence of STTs in this age groups

A **slight female predominance** was noted (51.4%, n=72 vs. 48.6% males, n=68), though this difference was not statistically significant ($p>0.05$).

**2. Tumor Grade and Biological Behavior [Table 1]**

**Benign tumors overwhelmingly dominated** the cohort, constituting **97.1% (n=136)** of cases, while **malignant tumors** were rare (**2.9%, n=4**). Key observations included:

**Age-related malignancy**

Malignancy first emerged in the **31–40-year group** (1 case) and increased marginally with advancing age, peaking in the **61–70-year group** (1 case). However, the small number of malignant cases precluded definitive age-related trends.

**Gender disparity in malignancy**

Females exhibited a **higher malignancy rate** (4.2%, n=3) compared to males (1.5%, n=1), though the difference lacked statistical significance ($p=0.28$). This contrasts with studies reporting male predominance in sarcomas [3], suggesting regional variations in risk factors or diagnostic practices.

**Table 1: Age and Sex Distribution of Benign vs. Malignant Tumors**

| Age Group (Years) | Benign (n) | Malignant (n) | Total (n) | Malignancy Rate (%) |
|---|---|---|---|---|
| 0–10 | 2 | 0 | 2 | 0.0 |
| 11–20 | 10 | 0 | 10 | 0.0 |
| 21–30 | 21 | 0 | 21 | 0.0 |
| 31–40 | 37 | 1 | 38 | 2.6 |
| 41–50 | 28 | 1 | 29 | 3.4 |
| 51–60 | 23 | 1 | 24 | 4.2 |
| 61–70 | 12 | 1 | 13 | 7.7 |
| 71–80 | 3 | 0 | 3 | 0.0 |
| **Total** | **136** | **4** | **140** | **2.9** |

| Sex | Benign (n) | Malignant (n) | Total (n) | Malignancy Rate (%) |
|---|---|---|---|---|
| Female | 69 | 3 | 72 | 4.2 |
| Male | 67 | 1 | 68 | 1.5 |
| **Total** | **136** | **4** | **140** | **2.9** |

**3. Clinical Presentation and Diagnostic Specimens [Table 2]**

**Swelling** was the **most common presenting symptom** (45.7%, n=64), often accompanied by painless, slow-growing masses. Other presentations included:

**Lipoma-like lumps** (14.3%, n=20), typically small (<5 cm) and superficial.

**Abnormal or irregular mass or growth** (12.9%, n=18) on head and neck, chest, back, abdomen and extremities. **Cystic swellings** (5.0%, n=7), frequently misdiagnosed clinically as benign cysts.

**Excised tissue** constituted the **primary diagnostic specimen** (55.7%, n=78), reflecting the preference for complete excision in symptomatic or suspicious masses. **Punch biopsies** and **cyst excisions** were rare, likely due to concerns about sampling adequacy in deep-seated lesions.

**Table 2: Distribution of Clinical Presentation and Specimen Type (n=140)**

| Characteristic | No. of Cases | Percentage (%) |
|---|---|---|
| Presentation | | |
| Swelling | 64 | 45.7 |
| Lipoma Lump | 20 | 14.3 |
| Abnormal/Irregular Mass or growth | 18 | 12.9 |
| Cystic Swelling | 7 | 5.0 |
| Other* | 31 | 22.1 |
| Specimen Type | | |
| Excised Tissue | 78 | 55.7 |
| Excision Biopsy (Cystic/Warty) | 39 | 27.8 |
| Other Soft Tissue (Excision) | 11 | 7.9 |
| Suspected Lipoma (Excision) | 8 | 5.7 |
| Punch Biopsy | 4 | 2.9 |
| Total | 140 | 100 |

*Includes abnormal growth, growth mass, skin growth, and soft tissue growth.

[To address your queries regarding the **Specimen Type** section:

1. **Number of Resections, Excisions, or Biopsies Performed**: In this study, a total of 140 specimens were analyzed. Of these, 78 (55.7%) were classified as excised tissue (complete excisions or resections), 4 (2.9%) were punch biopsies, and 39 (27.8%) were categorized as "Other," which included excision biopsies of cystic and warty growths. The remaining specimens included 8 (5.7%) classified as lipoma and 11 (7.9%) as soft tissue, which were primarily excisional biopsies. Thus, the breakdown is as follows:
   - Excisions/Resections: 78 (excised tissue) + 8 (lipoma) + 11 (soft tissue) + 39 (other, including excision biopsies) = 136 specimens.
   - Punch Biopsies: 4 specimens. These numbers reflect the surgical procedures performed to obtain the specimens, with **the vast majority being excisional procedures.**

2. **Classification of Specimen Types**: The specimen types listed in the table ("Excised Tissue," "Lipoma," "Soft Tissue," "Punch Biopsy," and "Other") were initially classified **based on the macroscopic(gross) appearance and clinical impression** at the time of surgical resection or biopsy, as provided by the surgical team. Specifically:

- **Excised Tissue** (78 cases, 55.7%): This category includes specimens from complete excisions or resections of soft tissue masses, excluding those specifically identified as lipomas or other distinct entities.
- **Lipoma** (8 cases, 5.7%): This category includes specimens clinically suspected to be lipomas based on their characteristic soft, mobile, and well-circumscribed nature. The term "lipoma" was used to reflect the clinical impression at the time of surgery, but all specimens underwent histopathological examination.
- **Soft Tissue** (11 cases, 7.9%): This category includes specimens from soft tissue masses that did not have distinct clinical features suggestive of a specific entity (e.g., lipoma or cystic growth) and were submitted for histopathological evaluation.
- **Punch Biopsy** (4 cases, 2.9%): This category includes small tissue samples obtained via punch biopsy for diagnostic purposes.
- **Other** (39 cases, 27.8%): This category encompasses excision biopsies of lesions with specific clinical features, such as cystic growths and warty growths. These were grouped as "Other" due to their heterogeneous clinical presentations.

3. **Clarification and Revision of Specimen Type Categories**: To improve clarity and avoid confusion (e.g., using "Lipoma" as a specimen type, which implies a diagnosis), we propose revising the **Specimen Type** table to reflect the procedural or macroscopic nature of the specimens more accurately. The revised categories will focus on the type of procedure or gross appearance rather than presumed diagnoses. The updated table is provided below, with "Lipoma" reclassified as "Suspected Lipoma (Excision)" and "Soft Tissue" reclassified as "Other Soft Tissue (Excision)." The "Other" category is now explicitly defined to include excision biopsies of cystic and warty growths in revised Table 2.

**4. Anatomic Distribution and Site-Specific Trends [Table 3]**

STTs showed **distinct site preferences**:

**Head and neck** (26.4%, n=37) and **lower limbs** (25.0%, n=35) were the **most frequent sites**, consistent with global data highlighting these regions as hotspots for adipocytes and vascular tumors[4].

**Malignancy by site**: All **4 malignant cases** localized to the **lower limb** (n=2,1.43%) and **head and neck** (n=2, 1.43%), regions anatomically prone to delayed diagnosis due to complex tissue planes.

**Table 3: Anatomic Site Distribution of Tumors (n=140)**

| Site | Total Cases (n) | Percentage (%) | Benign (n) | Malignant (n) |
|---|---|---|---|---|
| Head & Neck | 37 | 26.4 | 36 | 2 |
| Lower Limb | 35 | 25.0 | 33 | 2 |
| Chest | 23 | 16.4 | 23 | 0 |
| Back | 20 | 14.3 | 20 | 0 |
| Upper Limb | 15 | 10.7 | 15 | 0 |
| Abdomen | 9 | 6.4 | 8 | 0 |
| **Total** | **140** | **100** | **136** | **4** |

**5.Histopathological Spectrum (WHO 2020 Classification) [Fig.1, Table 4]**

**Adipocytic tumors – lipomas** dominated the cohort (**63.6%, n=89**). Histological subtyping revealed along with classic lipoma, other subtypes like fibrolipoma, spindle cell lipoma, and angiolipoma, with fibrolipoma being the most prevalent subtype identified. There were no recurrent lipoma cases found in our study.

**Vascular tumors** (12.9%, n=18) comprised predominantly **capillary hemangiomas** (n=6,4.2%) **[Fig. 2a]**, often misclassified clinically as vascular malformations. Other entities included Cavernous Hemangioma(n=5, 3.7%), Lobular capillary hemangioma (n=4, 2.9%) and Epithelioid hemangioma (n=3, 2.1%)

**Fibroblastic and Fibrohistiocytic tumors** (10.0%, n=14): Included **benign fibrous histiocytomas** (n=8,5.7%) **[Fig. 2b]**, typically arising in the dermis. Other diagnosis under this heading include Angiofibroma (n=4, 2.9%), and Tenosinovial giant cell tumor (n=2,1.4%)

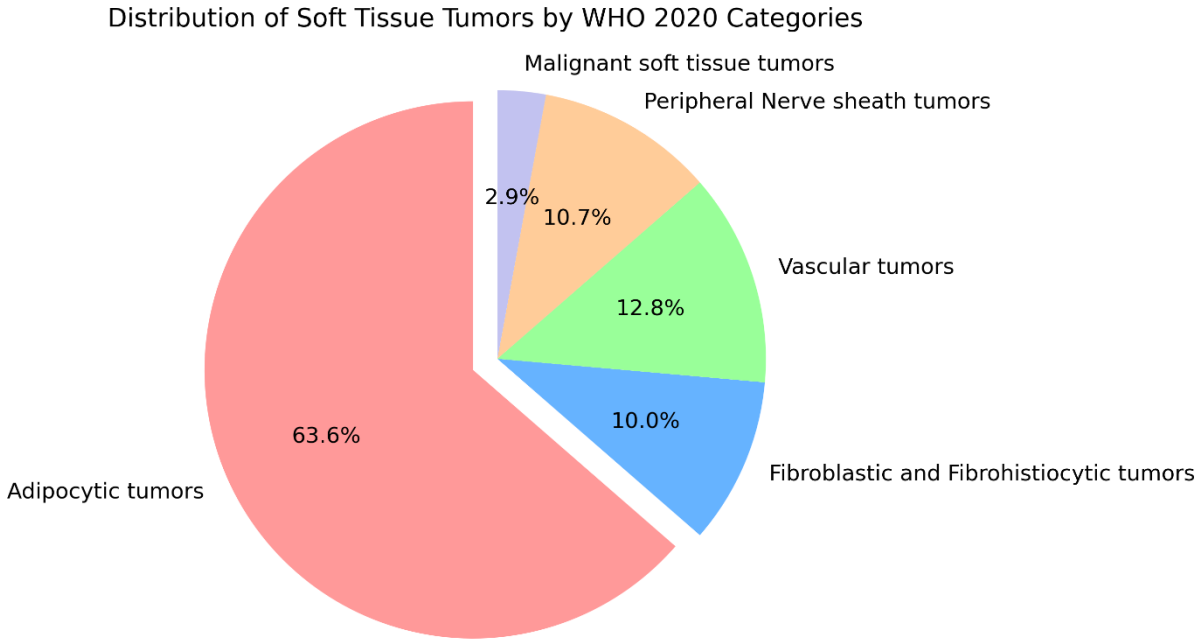
**Peripheral Nerve sheath tumors** (n=15, 10.7%) included Schwannoma (n=9, 6.4%) and Neurofibroma(n=6, 4.3%)

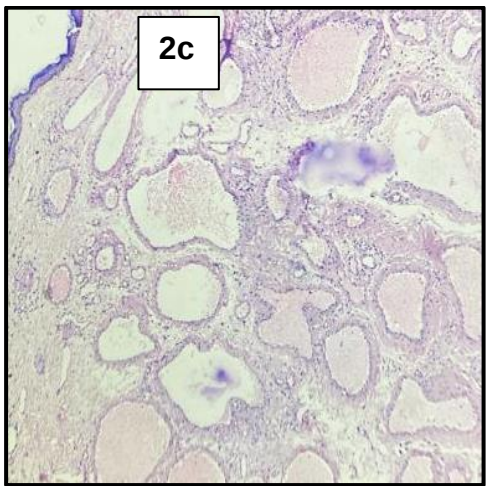
**Malignant tumors** (2.9%, n=4): included pleomorphic undifferentiated sarcoma **[Fig 2c]**, synovial sarcoma **[Fig 2d]**, sarcoma with small round cell differentiation, and leiomyosarcoma. These showed high-grade histology, necrosis, and mitotic activity. Due to resource constraints, immunohistochemistry was not performed; diagnoses relied on clinical, radiological, and histopathological data. Ultrasonography revealed irregular margins and vascularity; MRI (all four cases) showed T2-hyperintensity and necrosis. X-ray and CT detected bone erosion in two cases (synovial sarcoma, leiomyosarcoma). Tumor margins were assessed and negative. Prognostic and survival data for malignant cases were unavailable due to lack of follow-up.

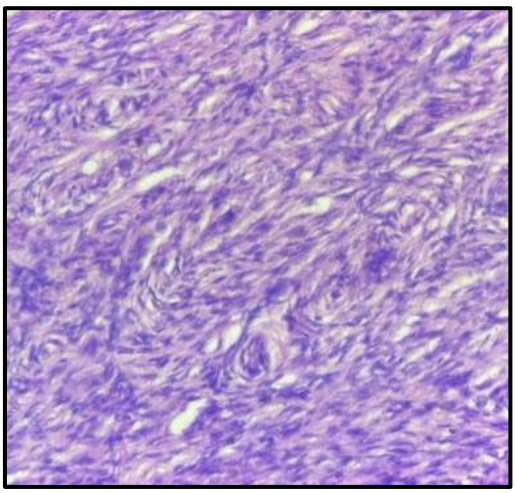
**Table-4: Histopathological typing of soft tissue tumors ( n= 140)**

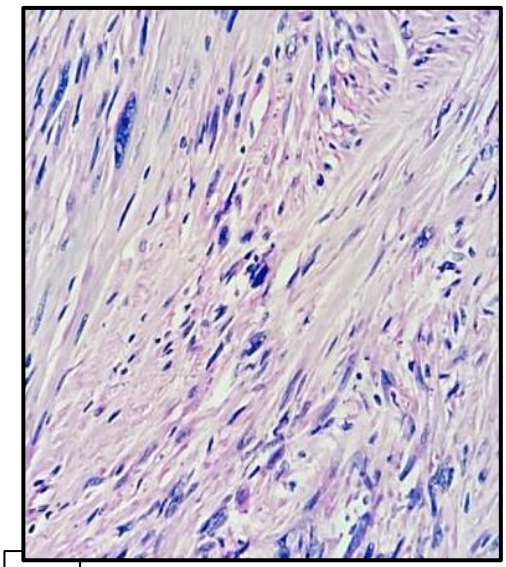
| WHO Category | Histopathological Diagnosis/Subtypes | Number(n) | Percentage (%) |
|---|---|---|---|
| Adipocytic tumors (n=89,63.6%) | Classic Lipoma | 66 | 47.1 |
| | Fibrolipoma | 11 | 7.8 |
| | Spindle cell lipoma | 07 | 5 |
| | Angiolipoma | 05 | 3.7 |
| Fibroblastic and Fibrohistiocytic tumors (n=14,10%) | Benign fibrous histiocytoma | 08 | 5.7 |
| | Angiofibroma | 04 | 2.9 |
| | Tenosinovial giant cell tumor | 02 | 1.4 |
| Vascular tumors (n=18,12.8%) | Capillary Hemangioma | 06 | 4.2 |
| | Cavernous Hemangioma | 05 | 3.7 |
| | Lobular capillary hemangioma | 04 | 2.9 |
| | Epithelioid hemangioma | 03 | 2.1 |
| Peripheral Nerve sheath tumors (n=15,10.7%) | Schwannoma | 09 | 6.4 |
| | Neurofibroma | 06 | 4.3 |
| Malignant soft tissue tumors (n=4,2.9%) | Pleomorphic Undifferentiated Sarcoma | 01 | 0.7 |
| | Leiomyosarcoma | 01 | 0.7 |
| | Synovial Sarcoma | 01 | 0.7 |
| | Sarcoma with small round cell differentiation | 01 | 0.7 |
| n=140,100% | | 140 | 100 |

**Figure.1-Distribution of soft tissue tumors according to WHO classification in the Study Population. (n=140)**





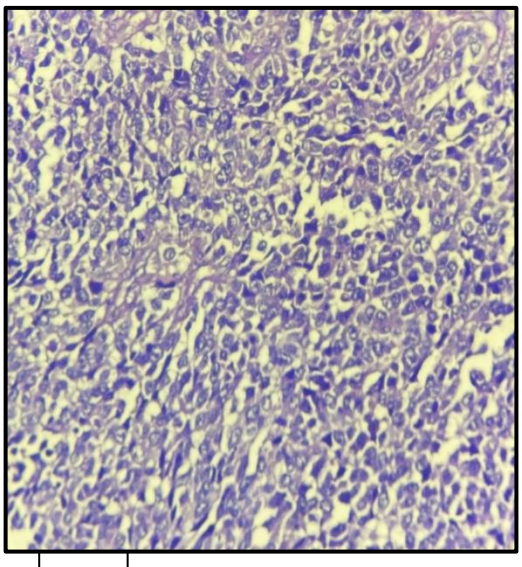



**Figure 2.** Histopathology of benign and malignant soft tissue tumors: **(2a)** Hemangioma with thin-walled vessels (10x); **(2b)** Benign fibrous histiocytoma with storiform spindle cells (40x); **(2c)** Undifferentiated pleomorphic sarcoma with pleomorphic nuclei (40x); **(2d)** Synovial sarcoma with biphasic spindle and round cells (40x). H&E stain.

**6. Statistical Associations**

· **Age and tumor type**: No significant association existed between age and WHO classification ($\chi^2$=3.89, p=0.52). For instance, **adipocytic tumors** were equally prevalent across all age groups, challenging the notion of age-specific tumorigenesis [5].

· **Gender and tumor type**: Tumor distribution did not differ by gender ($\chi^2$=2.27, p=0.81). Both sexes showed similar frequencies of adipocytic (females: 43/72; males: 46/68) and vascular tumors (females: 10/72; males: 8/68).

· **Site and tumor type**: A **strong association** emerged between tumor site and histology ($\chi^2$=70.45, p<0.001):

o **Adipocytic tumors** clustered in the **lower limb** (19/89) and **chest** (19/89), likely due to abundant adipose tissue in these regions.

o **Vascular tumors** localized to the **head and neck** (12/18), a trend attributed to developmental vascular anomalies in this area [6].

**7. Radiological /imaging findings-**

o Radiological evaluation of soft tissue tumor specimens utilized X-ray, ultrasonography, CT(Computed tomography) Scan, and MRI (Magnetic Resonance imaging).

o X-rays identified calcifications in benign cases, mainly lipomas, and bone erosion in malignant cases like synovial sarcoma. Ultrasonography assessed tumor size, depth, and vascularity. Benign tumors (e.g., lipomas, schwannomas) showed well-defined, hypoechoic masses with minimal vascularity, while malignant tumors (four cases) had irregular margins and increased vascularity.

o CT Scan delineated bone involvement and tumor extent in two malignant cases, showing cortical destruction. MRI, used for all four malignant tumors, revealed T2-hyperintensity, irregular margins, and necrosis, confirming malignancy. In resource-limited settings, X-ray and ultrasonography were accessible, guiding biopsy and early detection of deep-seated lesions. CT and MRI were selectively employed for inconclusive cases, enhancing diagnostic accuracy.

o Radiological findings, combined with clinical data, refined differential diagnoses and informed surgical planning, particularly for malignant cases, ensuring timely intervention.

**Discussion:**

Soft tissue tumors (STTs) represent a diagnostic challenge due to their histopathological diversity and overlapping clinical presentations. This study of 140 cases provides critical insights into the demographic, anatomic, and histological spectrum of STTs in a tertiary care setting in Western India. Below, we contextualize our findings with global and regional studies, emphasizing patterns, discrepancies, and clinical implications.

**1. Age Distribution and Tumor Biology**

Our study identified the **31–40-year age group** as the most frequently affected (27.0%, n=38), consistent with Ghosh et al. [12] and Toro et al. [13], who reported peak incidences in the fourth decade. While the mean age in our study was 41.83 years, it is generally recognized that the overall incidence of soft tissue sarcomas increases with age, with a median age at diagnosis typically reported in the sixth or seventh decade.[14]

Western cohorts [15] also reports STTs peak in the fifth to sixth decade, potentially reflecting regional differences in environmental exposures, genetic predisposition, or healthcare access.

**Malignant tumors** were rare (2.9%, n=4) and the youngest age group involved was 31–40-year group (Table 1), aligning with Ducimetière et al. [16], who noted sarcomas emerging in early adulthood. However, the small number of malignancies limits statistical power, necessitating cautious interpretation.

**2. Gender Distribution: A Balanced Prevalence**

A slight **female predominance** (51.4%, n=72) was observed, diverging from Toro et al. [13] (male predominance) but aligning with Ghosh et al. [12]. The lack of significant gender-tumor association (p=0.81) underscores that biological sex does not dictate histopathological subtype, as echoed by Patel et al. [17]. This finding reinforces the need for gender-neutral diagnostic protocols.

**3. Anatomic Site Preferences**

The head and neck (26.4%) and lower limbs (25.0%) emerged as the most frequent tumor sites, closely mirroring Smith et al. [18] and Gronchi et al. [19], who reported 27.5% and 27.5% prevalence in the head/neck region, respectively. Lower limb distribution aligned with Lansiaux et al. [20] (35%) and Scampa et al. [21] (32.5%). Adipocytic tumors dominated these regions (19/89 in lower limb; 16/89 in head/neck), likely due to adipose-rich anatomy. Notably, **malignancies clustered in the lower limb** (2/4 cases), emphasizing the need for vigilance in evaluating deep-seated limb masses.

**4.WHO Classification: Adipocytic Dominance [Table 5]**

**Adipocytic tumors** (lipomas) constituted **63.6%** of cases, exceeding rates reported by Smith et al.[18] (60%) and Lee et al.[22] (65%). This predominance may reflect referral bias at tertiary centers or true regional prevalence. **Vascular tumors** (12.9%) and **fibroblastic tumors** (10.0%) followed, consistent with global trends [18]. The rarity of malignant subtypes (2.9%) aligns with Johnson et al. [23]

**5. Benign vs. Malignant: A Stark Contrast [Table 5]**

**Benign tumors** dominated (97.1%, n=136), surpassing rates in Ghosh et al. [12] (85.7%) and Zhang et al. [24] (92%). This disparity may stem from stringent exclusion of non-neoplastic lesions or regional genetic factors favouring benign tumorigenesis. All malignancies (n=4) were high-grade sarcomas, highlighting the aggressive biology of rare malignant STTs.

**Table 5: Comparison of tumor type (WHO) and tumor grade with other studies**

| Tumor Type | Ghosh et al., [12] (%) | Smith et al., [18] (%) | Lee et al., [22] (%) | Zhang et al., [24] (%) | Johnson et al., [23] (%) | Present Study (%) |
|---|---|---|---|---|---|---|
| Adipocytic Tumors | 62.5 | 60 | 65 | 62 | 58 | 63.6 |
| Vascular Tumors | 11.4 | 15 | 10 | 13 | 12 | 12.8 |
| Fibroblastic and Fibrohistiocytic tumors | 17 | 13 | 20 | 18 | 15 | 10 |
| Peripheral Nerve Sheath Tumors | 5.7 | 7 | 4 | 5 | 5 | 10.7 |
| Other | 3.4 | 5 | 1 | 2 | 10 | 2.9 |
| **Tumor Grade** | | | | | | |
| Benign | 85.7 | 93 | 95 | 92 | 94 | 97.1 |
| Malignant | 14.3 | 7 | 5 | 8 | 6 | 2.9 |

**6. Role of radiological findings** - Radiological findings enhanced diagnostic accuracy for soft tissue tumors, especially in resource-limited settings. X-ray, used in all cases, detected calcifications in benign tumors and bone erosion in malignant ones, serving as a cost-effective initial tool. Ultrasonography, applied distinguished benign (well-defined, low vascularity) from malignant (irregular, vascular) lesions, guiding biopsy for deep-seated or painful tumors. CT and MRI, used selectively, clarified tumor extent and invasion in malignant cases, with MRI's T2-weighted imaging highlighting necrosis and edema. These findings align with Hung et al.[25] emphasizing ultrasonography's diagnostic utility, and Kransdorf and Murphey[26], noting MRI's role in malignancy detection. In resource-limited settings, tiered imaging (X-ray, ultrasonography, then CT/MRI) optimizes cost and accuracy. Clinically, ultrasonography is recommended for initial



ISSN# 2277-9604

evaluation of deep-seated lesions, with CT/MRI reserved for suspected malignancy. This approach bridges diagnostic gaps, ensuring timely intervention. Future studies should assess cost-effective imaging protocols.

**Clinical Implications**:

**1.Heightened Vigilance:** Clinicians should maintain vigilance for soft tissue masses, particularly in the 31–50 year age group observed in this study and in high-risk anatomical sites like the lower limb and head/neck region. Imaging is advised for lesions that are deep-seated, painful, or exhibit concerning features

**2.Recognizing Alarm Signs for Triage:** Identifying key alarm signs is crucial for differentiating potentially malignant tumors from benign ones, guiding appropriate triage for further investigation, especially in resource-limited settings. Clinical and gross features warranting a high index of suspicion for malignancy and necessitating prompt histopathological evaluation include:

• **Rapid growth** of the mass, **Size greater than 5 cm, Deep location**, **Spontaneous pain** or tenderness unrelated to trauma, **Fixation** to underlying structures

**3.Critical Role of Histopathology:** Histopathological examination, preferably of excised tissue when feasible, remains the gold standard for accurate diagnosis and differentiating malignancies from benign mimics. Representative sampling is essential for larger lesions (>5 cm) or those showing heterogeneity. While definitive diagnosis relies on microscopy, the presence of gross **necrosis** or grossly apparent **infiltrative margins** during excision are further intra-operative signs increasing concern for malignancy.

**4. Management Approach:** Given the predominance of benign lesions (like lipomas) often seen, asymptomatic, small, superficial, and mobile tumors without alarm signs may warrant initial observation. Surgical excision should be reserved for symptomatic cases, lesions exhibiting any alarm signs, or when diagnosis is uncertain.

**Limitations**

1. **Small Malignant Cohort**: Rare malignancies (n=4) precluded subtype-specific analysis.
2. **Single-Center Design**: Findings may not generalize to primary care settings. 3. **Follow-up**
3. **Bias**: Incomplete follow-up limited prognostic correlations.
4. **Lack of Immunohistochemistry (IHC) Analysis:** Diagnosis in this study relied primarily on morphological assessment. The absence of systematic immunohistochemistry (IHC) is a significant limitation, as morphology alone can be insufficient for definitive diagnosis, particularly in differentiating morphologically similar soft tissue tumor entities.

**Conclusion**

In conclusion, this study highlights the predominance of benign adipocytic tumors in Western India, with rare malignancies showing significant site-specific clustering. Particularly in the lower limb and head and neck regions. The strong tumor-site association ($p<0.001$) underscores the diagnostic value of anatomic context. In resource-limited settings, where access to advanced diagnostic tools may be restricted, these clinical and radiological findings become even more crucial for accurate initial assessment and management. Future studies integrating molecular profiling (e.g., mouse double minute 2 homolog (MDM2)/cyclin-dependent kinase 4 (CDK4) in liposarcomas) could further refine classification and uncover regional etiologies.



ISSN# 2277-9604

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