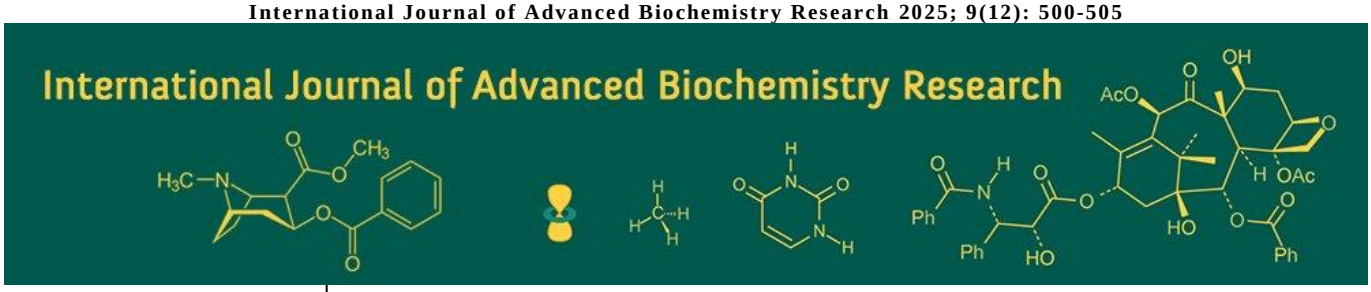


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# One hundred Tumours in 100 Dogs: A histopathological study

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**Abstract**
The rising incidence of tumours in canine populations poses significant challenges for veterinary health and clinical management. This one-year retrospective study evaluated the occurrence and histopathological spectrum of 100 canine tumours submitted to a private diagnostic laboratory in Gujarat. Of these, epithelial tumours were most prevalent (76%), followed by round cell (14%) and mesenchymal tumours (10%). Mammary gland tumours were the most common neoplasms, with melanoma, mast cell tumours, and lipoma also frequently identified. Epithelial malignancies predominated across cases. The findings highlight the importance of early detection, routine screening of cutaneous and mammary masses, and improved awareness for timely diagnosis and management of canine neoplasia. These results also emphasize the influence of regional factors, referral patterns, and owner awareness on tumour profiles. Strengthening diagnostic practices and preventive strategies may help reduce the overall tumour burden in dogs.

**Keywords:** Canine tumours, retrospective study, histopathological spectrum, epithelial tumours

## Introduction
Canine neoplasia is becoming an increasingly important health concern as pets live longer and many breeds exhibit specific cancer predispositions. Tumors are now among the most commonly diagnosed conditions in veterinary practice, and their accurate identification is essential for appropriate case management and for predicting their biological behavior. The studies of spontaneous neoplasia in companion animals, particularly in canine species, provides useful information in the research on comparative epidemiology, pathogenesis, and therapeutics, since dogs have a shorter lifespan and develop tumors similar to those diagnosed in humans regarding both morphological and biological behaviour [1]. Recent hospital- and registry-based studies report that mammary tumors, mast cell tumors, and lymphoma remain the most common cancers seen in veterinary practice [2, 3]. Accurate diagnosis of neoplasia in dogs is fundamental to effective veterinary oncology, yet remains challenging due to tumour heterogeneity, overlapping morphology and varying biological behaviour among tumour types. Although cytology provides a rapid first impression**,** histopathology remains the gold-standard diagnostic method because it allows detailed evaluation of tissue architecture, cellular patterns, tumour margins and invasion characteristics. It also enables accurate tumour classification, grading, and assessment of biological aggressiveness, which are critical for determining prognosis [4]. Despite these advances, challenges still remain in predicting tumor aggressiveness and selecting the most effective therapy. Therefore, a clear understanding of the current trends, diagnostic methods, and biological behavior of canine tumors is essential for improving clinical outcomes and guiding future research.
In this study, we performed a comprehensive retrospective analysis of canine tumour cases over the past one year, using tissue samples submitted to our laboratory (V Cross Diagnostic Laboratory & Research Centre) by private veterinary practitioners from the Palanpur and nearby regions of Gujarat to determine the incidence and distribution of neoplasms in dogs.

## Materials and Methods

### Sample collection

In the present investigation, tumor-suspected canine tissue samples were collected from cases submitted to our laboratory by private veterinary practitioners in and around the Palanpur regions of Gujarat.

### Tissue Processing and Staining

The collected representative tissues samples were fixed in 10% neutral buffered formalin. Dehydration was accomplished with increasing concentrations of isopropyl alcohol (30%, 70%, 90%, and absolute alcohol). Three changes of xylene were used to clean the dehydrated tissues before impregnating them in melted paraffin. The entire tissue processing was done in an automated tissue processor (Yorco YSI 103). The paraffin impregnated tissues were embedded with the Leica EG1160 paraffin embedding station and cooled with the Leica EG1150 C Cold Plate. A Leica RM2125 semi-automated rotary microtome was used to cut the 4 to 5 micron thick slices. The sections were taken on 2% 3-Aminopropyltriethoxysilane (APES) coated slides and stained with Harris Hematoxylin and Eosin (H&E) stain before being deparaffinized with xylene and rehydrated with increasing grades of isopropyl alcohol and water. Hematoxylin was used to stain the hydrated tissue sections, followed by acid alcohol, then ammonia water to blue them [5]. Tissue sections were then stained with eosin, dehydrated in 100% isopropyl alcohol, xylene, and mounted with DPX. For further diffentiation and confirmation special staining techniques, such as Masson's Trichome, VanGieson, Mayer's Mucicarmine, and Toluidine blue stains, were selectively employed as and when needed.

## Results

Over the course of the one-year retrospective study, a total of 100 canine tumour specimens were examined. The tumours were classified according to their histogenesis into epithelial, mesenchymal, and round cell tumours. Tumours of epithelial origin were the most frequent, accounting for 76% of cases, while mesenchymal tumours represented 10% and round cell tumours accounted for 14%. This distribution highlights the predominance of epithelial tumours in the canine population studied. Table 1 presents the histological classification and percentage incidence of the various types of canine neoplasms identified during the study period. The frequency of occurrence of epithelial, mesenchymal, and round cell tumours among the confirmed neoplastic cases was 76%, 14%, and 10%, respectively, as illustrated in Figure 1.

**Table 1:** Histological classification and percentage incidence of the various types of canine neoplasms:

| Type of tumor | No of total cases | % |
|---|---|---|
| **Tumours of epithelial origin** | | |
| | | |
| Mammary Gland Tumor | 26 | 26 |
| Malignnat melanoma | 11 | 11 |
| Soft tissue sarcoma | 7 | 7 |
| Squamous Cell carcinoma | 6 | 6 |
| Hepatoid gland adenoma | 5 | 5 |
| Trichoblastoma | 5 | 5 |
| Trichoepithelioma | 3 | 3 |
| Sertoli cell tumor | 3 | 3 |
| Solid carcinoma | 3 | 3 |
| Meibomian epithelioma | 2 | 2 |
| Nasal Carcinoma | 1 | 1 |
| Pilomatricoma | 1 | 1 |
| Sebeceous adenoma | 1 | 1 |
| Urothelial carcinoma | 1 | 1 |
| Canine acanthomatous ameloblastoma | 1 | 1 |
| **Tumours of mesenchymal origin** | | |
| | 6 | 6 |
| Hemangiosarcoma | 1 | 1 |
| Hemengioma | 1 | 1 |
| Peripheral odontogenic fibroma | 1 | 1 |
| Histiocytic sarcoma | 1 | 1 |
| **Round cell tumors** | | |
| Mast cell tumor | 8 | 8 |
| Plasma cell tumor | 4 | 4 |
| Lymphoma | 2 | 2 |
| | | |

Mammary gland tumors were the most common epithelial tumors, accounting for 26% of all neoplastic cases, followed by malignant melanoma (11%), soft tissue sarcoma (7%), squamous cell carcinoma (6%), hepatoid gland adenoma (5%), trichoblastoma (5%), trichoepithelioma (3%), Sertoli cell tumor (3%), solid carcinoma (3%), meibomian epithelioma (2%), nasal carcinoma (1%), pilomatricoma (1%), sebaceous adenoma (1%). The most common mesenchymal tumors were lipoma (6%), hemangiosarcoma (1%), hemangioma (1%), peripheral odontogenic fibroma (1%), and histiocytic sarcoma (1%). Mast cell tumor (8%), plasma cell tumor (4%), and lymphoma (2%) were the most common round cell tumors. Table 1 shows the precise distribution and incidence of different tumor forms, which are also visually depicted in Figure 2.

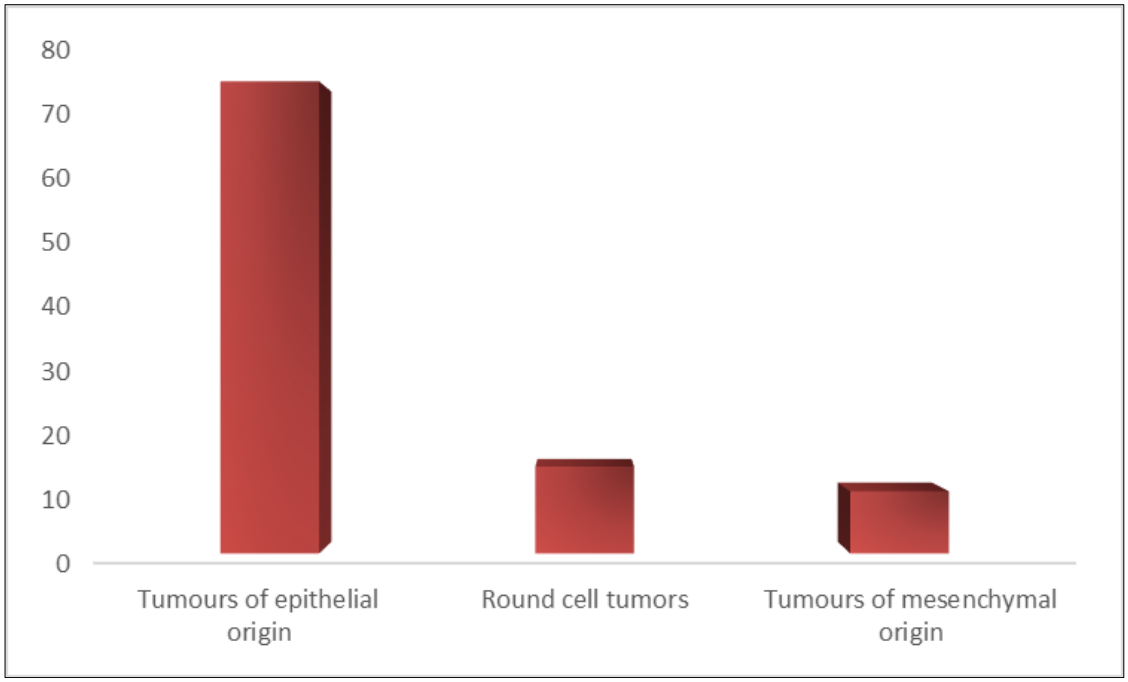


**Fig 1:** Graphical representation of the percentage incidence of epithelial, mesenchymal, and round cell tumours among histologically confirmed canine neoplasms

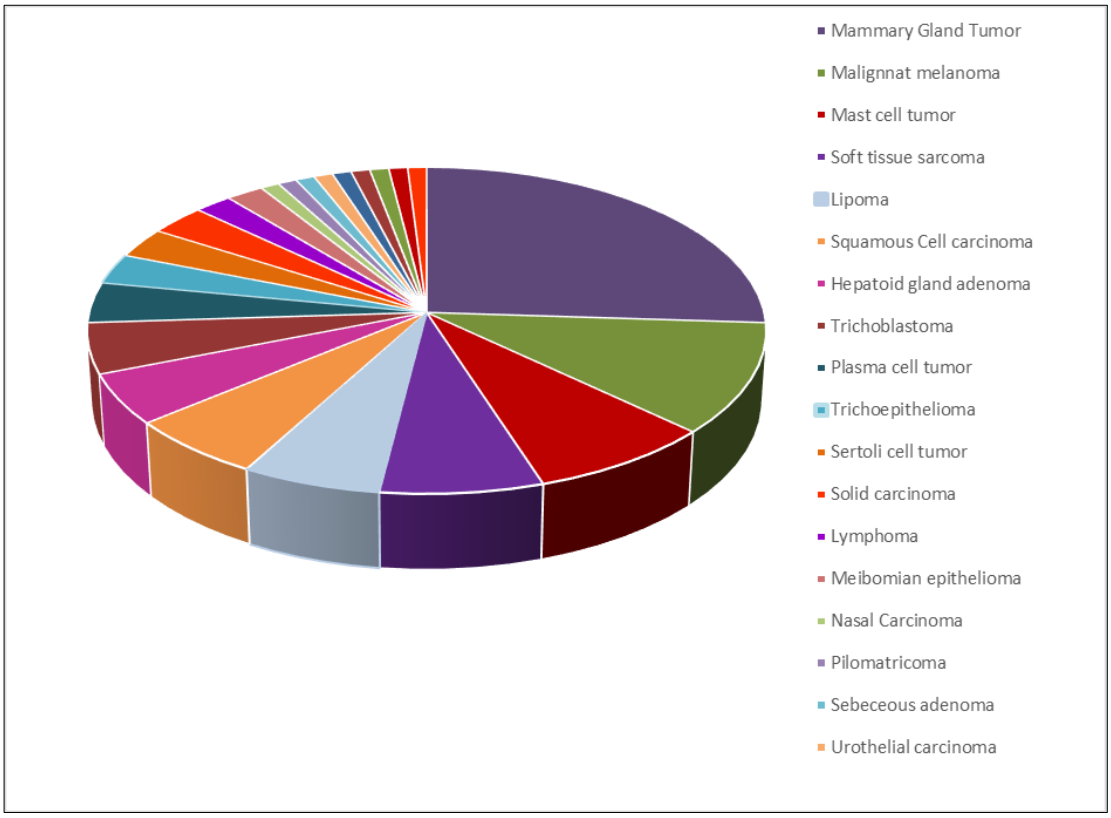


**Fig 2:** Percentage incidence of various histologically confirmed canine tumours identified during the one-year retrospective study

### 3.1 Below is the attached photograph showcasing the canine tumor discussed in the article:

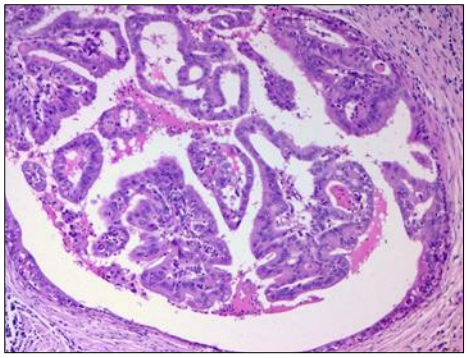

**Fig 3: Squamous cell carcinoma:** Unencapsulated, infiltrative neoplasm composed of polygonal cells arranged in cords, trabeculae, and islands, with occasional individualized cells supported by a moderate amount of fibrovascular to often desmoplastic stroma. Neoplastic cells have distinct cell borders, abundant amphophilic to eosinophilic cytoplasm, irregularly and round to oval nuclei with finely stippled chromatin.

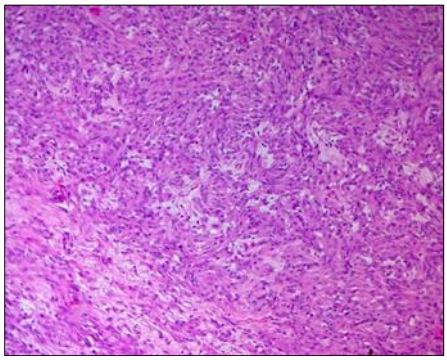

**Fig 4:** Malignant Melanoma Unencapsulated, neoplasm composed of spindle cells arranged in short, interlacing streams and bundles separated by moderate amounts of collagenous matrix. Neoplastic cells have indistinct cell borders, moderate amounts of eosinophilic cytoplasm that occasionally contains brown, globular pigment (melanin) and an oval to elongate nucleus with finely stippled.

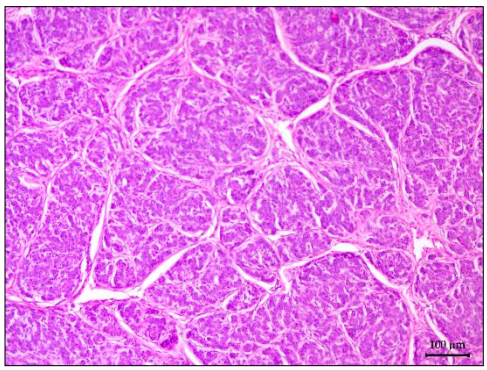


**Fig 5:** Trichoblastoma, Skin Densely cellular, unencapsulated, well-demarcated, neoplasm composed of polygonal cells arranged islands with ribbons, solid, or rarely interwoven arrangement. The islands are separated and surrounded by a dense collagenous stroma. Neoplastic cells have indistinct cell borders, scant eosinophilic cytoplasm, and oval vesicular nucleus variably indistinct nucleolus.

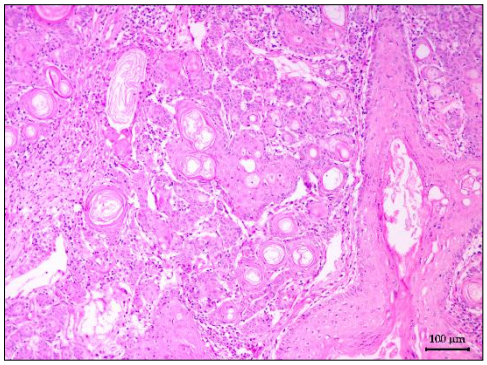


**Fig 6:** Trichoepithelioma, Skin Unencapsulated, multilobulated neoplasm composed of islands of basaloid polygonal cells supported by a moderate fibrovascular stroma. Neoplastic cells undergo incomplete trichogenesis. Neoplastic cells form variably sized keratin filled cysts and exhibit gradual keratinization. Neoplastic cells have indistinct cell borders, small amounts of eosinophilic cytoplasm, round to oval nuclei, coarsely stippled chromatin, and indistinct nucleoli

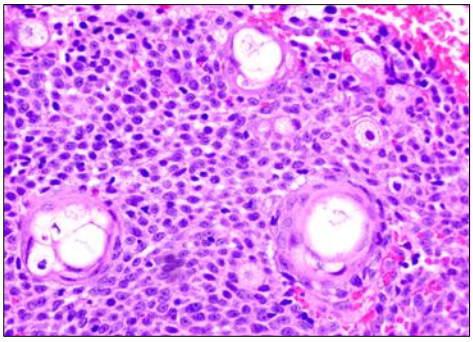

**Fig 7:** Sebaceous eoitheilomaoma Unencapsulated, moderately cellular neoplasm composed of round cells arranged in sheets on a pre-existing collagenous stroma, surrounded and separated by lakes of amorphous, smudgy, extracellular, eosinophilic amyloid material. Neoplastic cells have distinct cell borders, a moderate amount of eosinophilic cytoplasm, and a round to irregular nucleus with coarsely stippled chromatin. At periphery of neoplasm, well differentiated plasma cell noted.

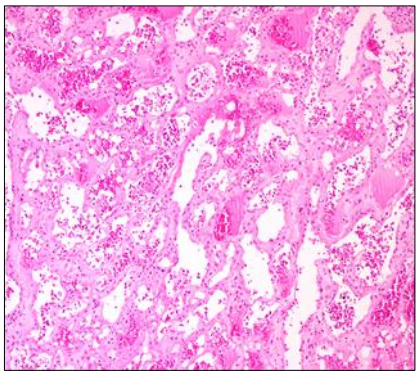

**Fig 8:** Hemangiosarcoma Unencapsulated, infiltrative, cellular neoplasm composed of spindle cells that form irregularly anastomosing vascular channels with cavernous to capillary morphology containing erythrocytes. The channels are discontinuously, lined by single plump, atypical endothelial cells that have large, often hyperchromatic nuclei.

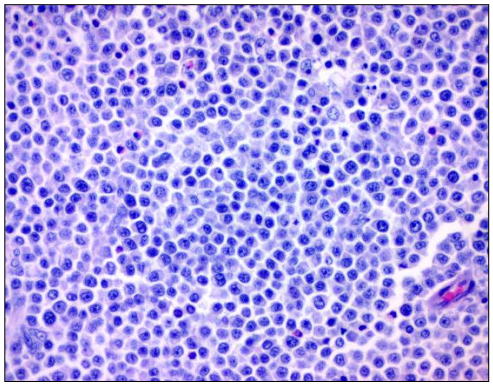

**Fig 9:** Plasma cell tumour Unencapsulated, infiltrative, moderately cellular neoplasm composed of discrete round cells that forms loose sheets with little collagen stroma and few prominent blood vessels. Neoplastic cells have distinct cell borders, a moderate amount of cytoplasm, and round to oval, or indented and twisted, vesicular nuclei and one or more distinct nucleoli. There is marked anisocytosis and anisokaryosis. Abundant well to moderately differentiated plasma cells and low number of neutrophils, lymphocytes, macrophages and are frequently mixed with neoplastic cells.

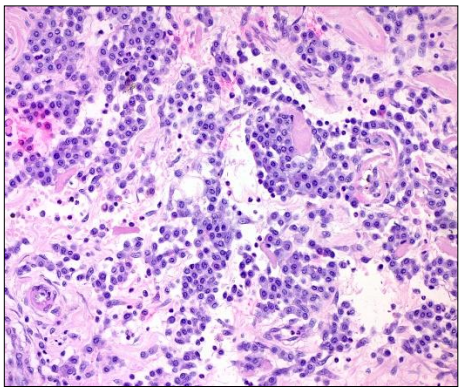

**Fig 10:** Mast cell tumour, Low grade (Two-tier grading system) Unencapsulated, poorly-circumscribed neoplasm composed of sheets of neoplastic mast cells expanded dermis and subcutaneous tissue. Neoplastic cells are round with distinct cell borders, moderate amounts of amphophilic to vacuolated cytoplasm that occasionally contains fine basophilic granules.

## Discussion

Neoplastic illnesses continue to be a major cause of morbidity in dogs, with reported frequencies and patterns varying greatly among geographies, research populations, and sample sources. In the current one-year research of 100 canine tumor specimens, epithelial tumors dominated (76%), followed by round-cell tumors (14%), and mesenchymal tumors (10%). These findings are largely consistent with other regional and worldwide publications that identify epithelial neoplasms—particularly mammary gland tumors—as a major tumor category in many clinical and pathology studies. For example, extensive epidemiological surveys have found a high relative prevalence of mammary tumours in tumor-bearing dogs, underscoring the ubiquity of epithelial mammary neoplasms in humans [6].

Several probable theories account for the epithelial preponderance found. First, mammary tumors are commonly brought to clinical attention because of their appearance and functional significance, establishing a referral and submission bias toward epithelial diseases. Second, owner understanding and cultural traditions around spaying differ by area; lower spay rates raise the population's risk for mammary neoplasia. Third, diagnostic accessibility—cutaneous and mammary masses are simpler to collect and submit for histology than some interior mesenchymal tumours—improves the discovery of epithelial lesions in pathology-based research. Finally, the local dog population's breed and age structure (older, intact females) impacts tumor spectrum, which may account for our comparatively high epithelial fraction [7].

Even though the primary focus of this study was tumor histogenesis, biological behavior evaluation is still crucial for evaluating prognosis. Numerous findings show that a large percentage of epithelial tumors, especially carcinomas and mammary tumors, appear as malignant, greatly increasing clinical morbidity. Our results' increased percentage of malignant cases might be due to geographical differences in tumor aggressiveness, delayed presentation, or referral bias. When assessing malignancy rates from a single-center, one-year dataset, certain parameters should be taken into account [6, 7].

Due to their frequency and varying propensity for malignancy, mammary gland tumors are among the most clinically significant tumors in female dogs. Age, particular breeds, and intact status are known risk factors, and epidemiological studies consistently show that mammary gland tumor is the most common neoplasm in female dogs seen by veterinary services in many areas. Mammary gland tumors require a prioritized diagnostic workup (cytology/histopathology) and owner education on spaying as a preventative strategy because to their prevalence and propensity for malignancy [6, 7].

Canine melanoma, especially when located in the oral cavity, behaves aggressively with a high risk for metastasis, and low median survival periods; if not treated early. Due to the severe course of oral melanomas and the requirement for multimodal therapy, melanocytic tumors have a significant therapeutic impact even if their total proportion in mixed tumor series is just a few percent. For prompt treatment, early biopsies and staging (regional lymph nodes) are crucial [8].

In various pathology studies, mast cell tumors are among the most often diagnosed cutaneous tumors. The stated incidence varies greatly (typically mentioned ranges ~7-22% of submitted cutaneous tumors), reflecting variations in study design and geographical caseloads. Grading (histologic grade or Kiupel/Patnaik schemes), staging, and suitable supplementary therapy are crucial to management strategies since MCTs exhibit extremely varied behavior, ranging from benign, surgically curable lesions to very aggressive systemic disease. The percentage of mast cell tumors we reported (8%) is within known estimates for caseloads with heterogeneous pathologies [9].

There are specific diagnostic, prognosis, and treatment implications for squamous cell carcinoma, lipoma, sarcomas, and round-cell tumors (lymphoma, plasma cell tumor). For instance, lipomas are usually benign but may need to be removed if they are causing dysfunction, but cutaneous and oral SCC frequently require broad local excision with examination for local invasion. Systemic treatment and staging are frequently required for lymphomas and other round-cell tumors. The histological spectrum directly influences clinical processes and resource allocation, which is explained by these practical distinctions.

This study's tumor distribution reveals a number of recommendations that are relevant to clinical practice. First, the incidence of mammary tumors may be decreased by raising owner knowledge of early mass identification and the advantages of elective spaying. Second, in order to reduce diagnostic delays, regular inspection and prompt sample of cutaneous and mammary lesions should be given top priority. Third, referral and sample bias can be lessened by standardizing the submission of biopsy specimens together with thorough clinical histories. Fourth, effective prognostication and treatment planning depend on the application of suitable staging methods, such as lymph node assessment and thoracic imaging for high-risk tumors such oral melanoma and high-grade mast cell tumors, in conjunction with recognized grading systems.

This single-centre, one-year, pathology-based study is subject to referral and submission biases and may not fully represent true population incidence. Future multi-centre, population-based registries and prospective studies that include spay/neuter status, breed demographics, and long-term outcomes (survival/recurrence) will better define canine tumour epidemiology in the region and permit assessment of temporal trends.

## Conclusion

This retrospective study provides valuable insights into the prevalence and pathological diversity of tumours in canines, revealing a clear predominance of epithelial neoplasms, particularly mammary gland tumours and melanocytic lesions. Round cell tumours, such as mast cell tumours and plasma cell tumours, and mesenchymal tumours like lipoma and hemangiosarcoma were also documented, reflecting the broad oncological spectrum encountered in clinical practice. The substantial occurrence of epithelial tumours highlights the importance of early detection, routine clinical screening, and preventive strategies—particularly elective spaying—to reduce tumour burden. The patterns observed in this study underscore the need for greater diagnostic vigilance among veterinarians and increased awareness among pet owners regarding the early evaluation of cutaneous and mammary masses. Future studies incorporating larger multicentric datasets, molecular diagnostics, and breed-specific risk analysis will be critical for advancing our understanding of the etiopathogenesis of canine neoplasia and for developing more effective preventive and therapeutic approaches.

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