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Histomorphological study of canine superficial tumours in Thrissur district

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Abstract

Canine superficial tumours are among the most frequently diagnosed neoplasms in dogs, arising from the skin, mucosa and underlying connective tissues, and they exhibit wide biological diversity ranging from benign growths to highly malignant lesions with metastatic potential. Between May 2024 and July 2025, a total of 28 such tumours were collected from Veterinary Hospitals under Kerala Veterinary and Animal Sciences University in Thrissur and the tissue samples were fixed in 10 per cent neutral buffered formalin for detailed histopathological evaluation. Out of the 28 cases, the majority were diagnosed in dogs aged between 4 and 12 years (22 cases), with peak occurrence in the 4–6 and 10–12 year groups (8 cases each). Breed-wise, non-descript dogs were most affected, followed by Labrador Retrievers and German Shepherds. Most of the cases were observed in female dogs accounting for 17 cases (60.7 per cent) compared to 11 cases (39.3 per cent) in males, and malignant tumours were seen in both sexes. The study showed a higher prevalence of malignancies (64.3 per cent) compared to benign forms (35.7 per cent). Mesenchymal tumours were the most common type, followed by round cell and epithelial tumours. Gross pathology revealed that superficial tumours varied widely in size, shape and consistency. Histopathology confirmed that fibrosarcoma, malignant melanoma, histiocytic sarcoma and squamous cell carcinoma were among the malignant tumours, while lipomas, trichoblastomas and fibromas were the common benign tumours. The present research work highlights the need for large-scale epidemiological studies to identify risk factors and better understand the etiopathogenesis of canine superficial tumours.

Keywords: *Tumours, canine, superficial, histopathology*

Cancer is a complex and heterogeneous group of diseases characterised by uncontrolled cellular growth and proliferation (Brown et al, 2023). Genetic and epigenetic alterations disrupt normal regulatory mechanisms, enabling cells to evade growth suppression and immune destruction (Vogelstein & Kinzler, 2004). Superficial tumours rank as the most frequently diagnosed tumours in dogs, representing roughly one-third of all canine tumour cases (Rothwell et al., 1987). They are among the most common canine tumours, frequently brought to veterinary attention due to their visible nature (Martins et al., 2022). These tumours in dogs may be benign or malignant and can originate from various cell types within the skin and mucosa. They affect dogs of all ages, breeds, and sizes. The high rate of tumor development in the

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skin and mucosa is likely due to its constant exposure to a variety of physical, chemical and environmental factors (Subapriya et al., 2021). The incidence of these tumours show a noticeable rise in recent years. This increase may partly reflect improved awareness and early detection of superficial lesions by pet owners and veterinarians. Interestingly, studies from different regions of the world have reported considerable variation in the occurrence and types of canine superficial tumours, which is often linked to differences in environmental carcinogen exposure and the distribution of popular dog breeds in specific geographical areas (Pakhrin et al., 2007). This article provides an overview of the occurrence and clinicopathological features of superficial tumours in dogs from Thrissur region. The study aimed to highlight the clinical significance of these tumours by documenting their types and patterns, thereby contributing to a better understanding of canine superficial tumours.

Materials and methods

The present study was based on the pathomorphological studies on suspected superficial tumour samples from canine cases presented to the Teaching Veterinary Clinical Complex, Mannuthy and University Veterinary Hospital, Kokkalai. A total of 28 samples were obtained between May 2024 to July 2025. Clinical data, including age, species, breed, sex, tumour location, shape and size, were recorded for each case. The samples were fixed in 10 per cent neutral buffered formalin, processed, sectioned into 5 µm thickness and stained with routine haematoxylin and eosin for histopathological evaluation.

Results and discussion

Occurrence of tumours

The majority (22 cases, 78.5 per cent) of the superficial tumours were diagnosed between 4 and 12 years of age, and a median age of around 10 years. Younger dogs (≤ 4 years) accounted for only a small fraction of cases (21.5 percent), indicating that tumourigenesis in dogs is strongly age-linked, likely due to cumulative genetic damage, declining immune surveillance and prolonged environmental exposures. These findings are consistent with Kok et al. (2019), Kashyap et al. (2013) and Dolka et al. (2024), who also reported a clear predilection for superficial tumours in older dogs.

Gender and breed patterns also emerged, with females contributing 60.7 per cent of the cases compared to 39.3 per cent in males. Malignant tumours were more frequent than benign ones in both sexes, with a slightly higher number in females. This female predominance has been previously highlighted by Martins et al. (2022), potentially due to hormonal influences although there was no statistical difference between incidence of tumour between females and males ($p > 0.05$). Breed-wise, non-descript dogs were the most frequently affected, followed by Labrador Retrievers and German Shepherds, while Dobermanns, Rottweilers and Golden Retrievers were less frequent. The observed distribution corresponds with the findings of Karnik et al. (2020), suggesting that both breed-related genetic factors and ownership patterns contribute to susceptibility.

Fig.1.A) - Tightly attached, firm mass on the left thigh. **B)** - Firm, ulcerated mass on the right forelimb. **C)** - Large, soft mass on the perianal region. **D)** - Small, black mass on the upper lip. **E)** - Ulcerated, mass on the ventral neck region. **F)** - Large, soft mass on the thorax.

Anatomically, the abdomen was the most frequently affected site (21.4 per cent), followed by the hindlimbs and neck (14.3 per cent each) and gums (10.7 per cent). The thorax, perineal region and right hindlimb each contributed 7.1 per cent of cases, while forelimbs, ear and upper lip were less frequently involved (3.6 per cent each), these findings were similar to the observations made by Athira et al. (2024). The tumours on the different anatomical locations are depicted in Figure 1. The predominance of tumours on the abdomen, limbs and neck may partly reflect detection bias during grooming and handling, but these regions are also predisposed due to repeated trauma, environmental exposure and dense population of sebaceous and sweat glands, which are common origins for superficial tumours. These findings align with the biological and environmental risk factors described in the literature and underscore the value of gross pathology as an initial guide to tumour behaviour. The gross features of all the superficial tumours are given in Table 1.

Classification of tumours

The tumours were classified into mesenchymal, epithelial and round cell types. Among these, mesenchymal tumours were the most common which was similar to the findings by Pakhrin et al. (2007). These tumours comprised of 7 benign (38.8 per cent) and 11 (61.2 per cent) malignant cases, followed by round cell tumours with 6 malignant cases, while epithelial tumours were less frequent with 3 benign and 1 malignant case. Among the benign superficial tumours, trichoblastoma was the most frequent (3 cases), followed by lipoma (2 cases). In the malignant category, mast cell tumour was the predominant type (3 cases), while sarcomas such as hemangiosarcoma (2 cases), histiocytic sarcoma (2 cases), and myxosarcoma (2 cases) were also observed. Overall, mesenchymal origin tumours accounted for majority of the cases, with a significant proportion being malignant. The increased incidence of superficial tumours could be attributed to exposure of environmental pollutants, better diagnostics,

Table 1. Gross pathology of canine superficial tumours

Sl. No.	Classification	Size (cm)	Location	Shape	Consistency	Colour
1	Dedifferentiated liposarcoma	4	Abdomen	Spherical	Soft	Greyish white
2	Leiomyoma	8	Right Forelimb	Irregular	Soft	Greyish white
3	Fibrosarcoma	6	Abdomen	Irregular	Firm	Greyish white
4	Fibroma	6	Left hindlimb	Oval	Firm	White
5	Squamous cell carcinoma	5	Neck	Irregular	Firm	Greyish white
6	Trichoblastoma	5	left hindlimb	iregular	Soft	White
7	Myxosarcoma	15	Thorax	Irregular	Soft	Reddish white
8	Myxosarcoma	22	Abdomen	Spherical	Soft	Reddish white
9	Malignant melanoma	4	Gum	Spherical	Soft	Black
10	Fibromatous epulis	5	Gum	Oval	Firm	Reddish white
11	Histiocytic sarcoma	5	Right hindlimb	Irregular	Firm	Greyish white
12	Melanocytoma	3	Upper lip	Oval	Soft	Black
13	Trichoblastoma	6	Neck	Irregular	Soft	Greyish White
14	Mastcell tumour	5	Abdomen	Spherical	Soft	Greyish white
15	Hemangiosarcoma	20	Thorax	Irregular	Soft	Reddish white
16	Trichoblastoma	3	Ear	Oval	Firm	Greyish white
17	Myopericytoma	7	Left hindlimb	Spherical	Firm	White
18	MPNST	14	Right hindlimb	Irregular	Soft	Greyish white
19	Hemangiosarcoma	8	Neck	Spherical	Soft	Red
20	Hepatoid gland adenocarcinoma	10	Perineal region	Irregular	Soft	Grey
21	Lipoma	13	Perineal region	Spherical	Soft	White
22	Lipoma	8	abdomen	Oval	Soft	White
23	Liposarcoma	10	Forelimb	Spherical	Firm	Greyish White
24	Malignant melanoma	8	Gum	Oval	Firm	Black
25	Mastcell tumour	6	Left forelimb	Spherical	Firm	Greyish White
26	Histiocytic sarcoma	20	Neck	Irregular	Soft	Greyish White
27	Mastcell tumour	8	left hindlimb	Oval	Firm	Greyish White
28	Cutaneous lymphoma	3	Abdomen	Spherical	Soft	White

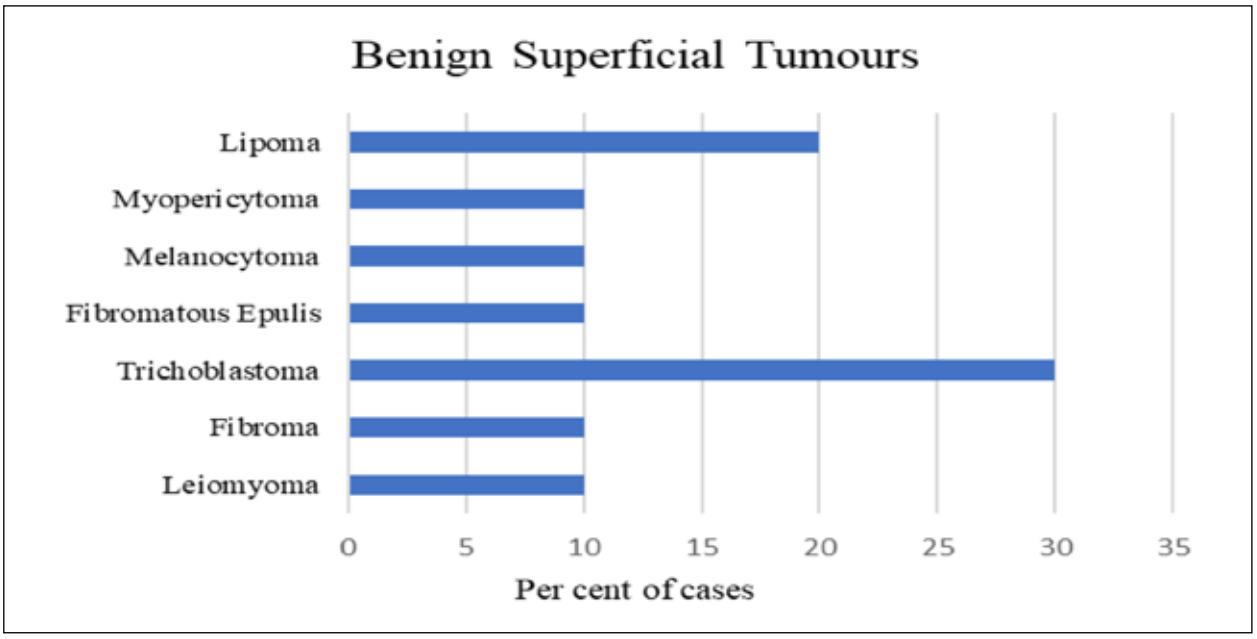

Fig. 2. Benign superficial tumours (n=10)

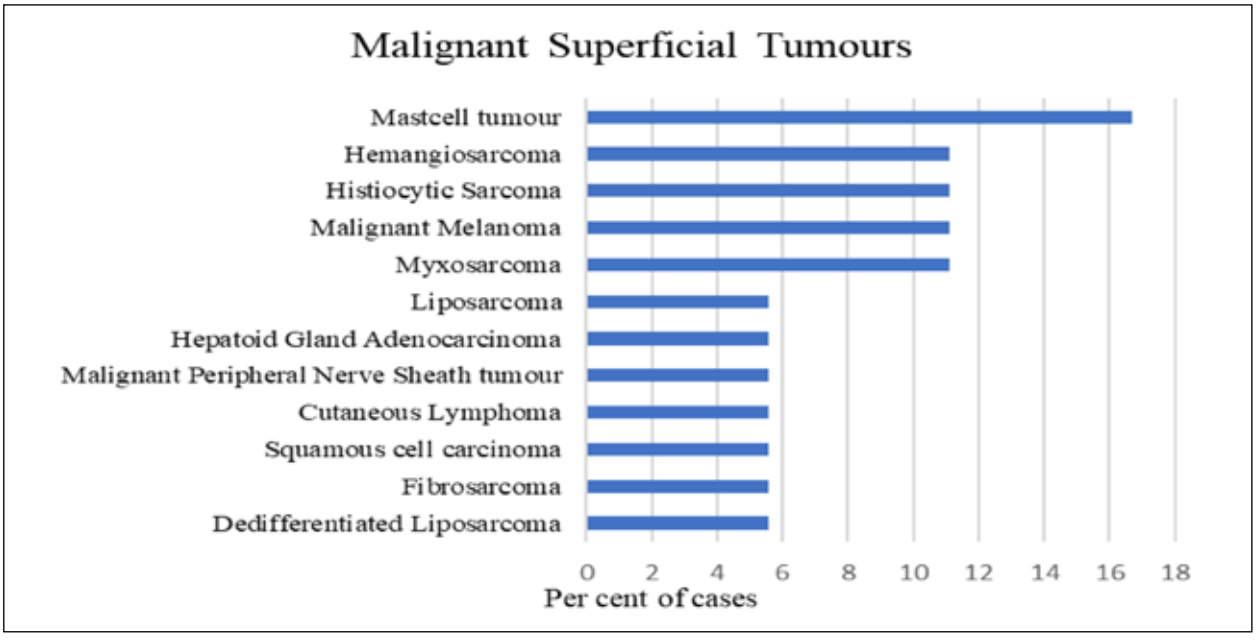

Fig. 3. Malignant superficial tumours (n=18)

improved longevity of animals and subsequent increased incidence of old age diseases.

A similar study was conducted by Athira et al. (2024) from June 2022 to June 2023 in the Wayanad region on the occurrence and pathology of cutaneous tumours in dogs, where they also observed epithelial, mesenchymal and round cell tumours. The epithelial tumours reported were similar to those in the present study; however, variations were noted in the mesenchymal and round cell types. They recorded six types of mesenchymal and two types of round cell tumours, whereas the present study revealed thirteen mesenchymal and three round cell types. Malignant cases accounted for 33.33 per cent in their study, while the present study had 64.28 per cent malignant tumours. Unlike Athira et al. (2024), who studied the occurrence of only cutaneous tumours, the present investigation encompassed all superficial tumours and recorded one case of fibromatous epulis and two cases of malignant melanoma from the gum region in addition to cutaneous tumours. The different subtypes of benign and malignant superficial tumours observed in this study are given in Fig.2 and Fig.3.

Lipoma

The two cases of lipoma, with one case on the abdomen and other on the perianal region consisted of

mature adipocytes with uniform, large and vacuolated cytoplasm (Fig.4A). The tumour cells exhibited minimal atypia with small uniform nuclei and mitotic figures were absent (Dadhich et al., 2018).

Liposarcoma

Liposarcoma was composed of atypical adipocytes and lipoblasts with significant anisocytosis, anisokaryosis and nuclear hyperchromasia. Varying amounts of collagenous stroma was observed between the atypical adipocytes (Fig.4B). Due to the relative rarity of malignant lipomatous tumours, their misdiagnosis and subsequent improper excision can lead to tumour recurrence. Accurate differential diagnosis of these lipomatous tumours is thus critical for the disease-free survival of the patients (Makovicky et al., 2020).

Malignant melanoma

Malignant melanoma displayed infiltrative sheets and nests of pleomorphic melanocytic cells with epithelioid morphology. The tumour cells featured prominent nucleoli and occasional mitotic figures, often accompanied by minimal intracytoplasmic melanin pigment (Fig.4C). Malignant melanoma or the amelanotic melanoma cells are cytologically similar to that of many malignant epithelial and spindle cell tumours. Clinical, pathomorphological and molecular features like colour of the tumour, round or dendritic cells containing intracytoplasmic brownish black coloured melanin pigments aided in differential diagnosis (Ramos-Vara et al., 2000).

Melanocytoma

Melanocytoma consisted of well-differentiated, heavily pigmented polyhedral cells exhibiting minimal cellular pleomorphism and low mitotic activity. The neoplastic cells had abundant cytoplasm densely packed with melanin granules that obscured nuclear details (Fig.4D). Differential diagnosis of melanotic melanoma from other pigmented cancer subtypes is crucial (Ramos-Vara et al., 2000).

Squamous cell carcinoma

Well-differentiated squamous cell carcinoma (SCC) was characterised by cords or nests of neoplastic polyhedral cells with peripheral immature layers and central keratin pearls, exhibiting moderate pleomorphism, prominent intercellular bridges and abundant lamellated keratin (Fig.4E). Differential diagnosis of SCC from other cutaneous malignant, pre-malignant, benign and inflammatory lesions is important. It is also essential to understand the prognostic factors like size of the tumour, extent of tumour invasion into underlying tissues, including lymphovascular and perineural invasion (Chandrashekaraiah et al., 2011).

Histiocytic sarcoma

Histologically, histiocytic sarcoma was composed of densely packed sheets of large, pleomorphic round to oval cells. The tumour cells have abundant eosinophilic to vacuolated cytoplasm and irregular, vesicular nuclei with prominent nucleoli. Multinucleated giant cells and areas of necrosis were observed (Fig.4F). A high mitotic index with frequent atypical mitoses reflects its aggressive biological behaviour. Differential diagnosis of neoplastic and reactive or inflammatory lesions is critical for the clinical diagnosis and treatment of these cases (Mullin and Clifford, 2019).

Hemangiosarcoma

Capillary subtype hemangiosarcoma was characterised by irregular, anastomosing vascular channels lined by atypical endothelial cells. The neoplastic endothelial cells were plump to spindle-shaped, with hyperchromatic nuclei and frequent mitotic figures (Mullin and Clifford, 2019). The vascular spaces were narrow and resembled capillaries, often infiltrating into adjacent dermal or subcutaneous tissue (Fig.4G). Hemangiosarcoma is reported mostly in large sized breeds of dog and similar to most other skin cancers, exposure to ultraviolet radiation is considered the prime etiology (Pirie et al., 2006). It also has poor prognosis but can be improved with early surgical excision and hence early diagnosis is critical for the improved clinical outcome.

Myopericytoma

Myopericytoma was characterised by distinctive perivascular growth pattern, with ovoid to spindle shaped cells forming concentric layers around the blood vessels (Fig.4H). The cells showed minimal cellular atypia (Avallone et al., 2007). Though most cases of myopericytoma are benign, histologic differentiation from malignant myopericytoma and multicentric myofibroma, which have aggressive clinical outcome is pivotal in clinical diagnosis.

Trichoblastoma

The ribbon subtype of trichoblastomas exhibited a characteristic multilobulated architecture with the presence of ribbon-type cords composed of branching and anastomosing basaloid keratinocytes. These cellular cords were consistently two to three cell layers thick, forming an intricate network. A moderate quantity of stroma was observed separating and supporting these cords of neoplastic cells (Fig.4I). Recently, the significance of tumour stroma and its interaction with cancer cells, which aid in the malignant progression of tumours has been reported (Wiener, 2021). Trichoblastoma, which is a hair follicle germ cell derived tumour, mimics basal cell carcinoma grossly and histologic differentiation is crucial in designing treatment and predicting prognosis.

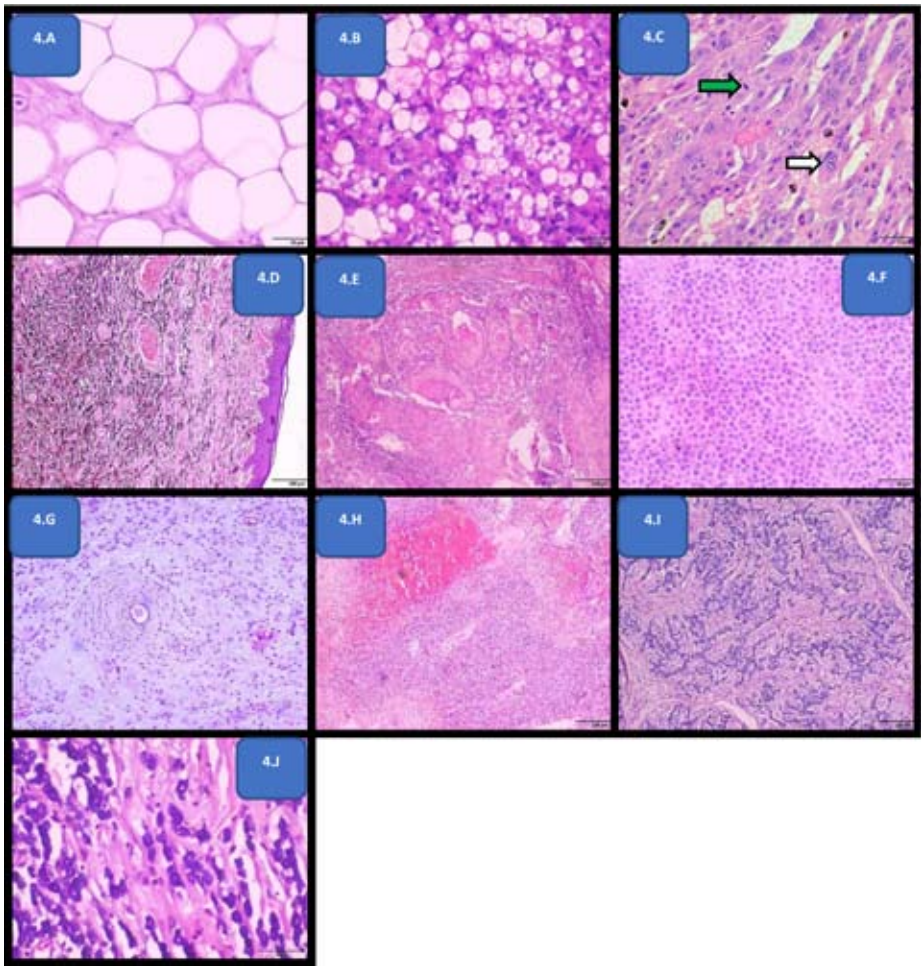

Fig.4. A) - Lipoma- Mature adipocytes with minimal cellular atypia (H&E x400). **B)**- Liposarcoma – presence of lipoblasts and marked cellular atypia (H&E x400). **C)** - Malignant melanoma- mitotic figure (green arrow) and double nuclei (white arrow) (H&E x400). **D)** - Melanocytoma – Neoplastic melanocytes with high pigmentation (H&E x100). **E)** - Squamous cell carcinoma – The tumour consisted of cords of atypical squamous cells and keratin pearls (H&E x40). **F)** - Histiocytic sarcoma - sheets of pleomorphic round cells with marked nuclear atypia, (H&E x400). **G)** - Hemangiosarcoma- Small, capillary-like vascular channels lined by plump endothelial cells with hyperchromatic nuclei and scant cytoplasm (H&E x100). **H)** - Myopericytoma- Concentric, perivascular growth pattern of oval to spindle shaped cells (H&E x100). **I)** - Trichoblastoma (Ribbon type)- neoplastic basaloid cells arranged in ribbon like pattern (H&E x100). **J)** - Mast cell tumour- neoplastic cells with minimal cellular atypia and minimal mitosis (H&E x400).

Mast cell tumour

Low-grade mast cell tumours were composed of moderately cellular, well-circumscribed dermal to subcutaneous masses. The neoplastic cells were round with abundant pale cytoplasm containing distinct metachromatic granules. Nuclei were small, round and uniform, with minimal atypia and a low mitotic index. Scattered eosinophils and mild stromal collagen deposition were frequently present (Fig.4J). Mast cell tumours are reported to be the most common malignant superficial tumour in dogs and is associated with systemic disease in a subset of cases and so clinical outcome is highly variable (Misdorp, 2004).

Conclusion

The present study was undertaken to document the occurrence and gross morphological features of canine superficial tumours. A total of 28 cases were identified and histopathological examination confirmed that the majority were malignant, while also facilitating classification into distinct histotypes. Epidemiological factors such as age, breed, sex and anatomical location were analysed to understand their influence on tumour distribution. The findings generated from this work provide a useful reference for veterinary practitioners in making preliminary diagnoses of superficial tumours in dogs. Among the 28 canine superficial tumours examined, mesenchymal malignancies were predominant. The observed patterns of age, breed and tumour location indicate a multifactorial etiology likely influenced by genetic predisposition and environmental factors. These results underscore the importance of regional monitoring and routine histopathological screening to facilitate early detection.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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