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Epidemiological study of neoplasm in canine population

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Abstract

The epidemiological occurrence of canine neoplasm was recorded during 11 months (November 2024 to September 2025) in Madras Veterinary College Teaching Hospital and Department of Veterinary Pathology, Madras Veterinary College, Chennai. Among the 102 tumour tissue samples, epithelial tumours were 64.7 percent, 22.55 percent mesenchymal tumours and 12.75 percent round cell tumours. Highest age group affected was above 5 – 10 years (51.96%) followed by above 10 years (30.4%) and 0-5 years (17.64%). Tumours predominantly occurred in the pure breed (66.67%) when compared to the non-descript (33.33%) dogs. Tumours occurred predominantly in females (56.86%) than in males (43.14%).

Keywords: Dogs, neoplasm, epidemiology

1. Introduction

Canine neoplasms constitute a significant health concern in veterinary medicine, representing a leading cause of morbidity and mortality in companion animals while serving as valuable comparative models for human cancer research ^[1, 5]. The increasing recognition of canine tumours reflects advances in diagnostic techniques, enhanced clinical awareness, and evolving demographic patterns in dog populations ^[2, 3, 10]. Comprehensive epidemiological characterization is crucial for understanding disease burden, determining incidence patterns, and identifying key risk determinants including age, breed, sex, hormonal status, and environmental factors that influence tumour development ^[1, 6, 12, 13]. Recent studies have documented considerable regional variations in tumour prevalence, with mammary and skin neoplasms predominating across diverse geographical locations ^[8, 11, 13]. Understanding these epidemiological patterns is essential for implementing targeted surveillance programs, developing preventive strategies, improving prognostic assessments, and optimizing therapeutic interventions in veterinary oncology ^[4, 9]. This article provides a comprehensive epidemiological analysis of neoplastic diseases in the canine population, synthesizing current evidence to guide clinical practice and future research direction.

2. Materials and Methods

Tumour tissue samples were collected as surgically excised biopsies from clinical cases of dogs presented at the Outpatient - Small Animal Clinics, Department of Veterinary Surgery and Radiology, Madras Veterinary College Teaching Hospital, Chennai and from dogs referred to necropsy at the Department of Veterinary Pathology, Madras Veterinary College, Chennai during the study period from November 2024 to September 2025.

The particulars of animal such as breed, age and sex were recorded. Specific data such as history, clinical manifestation, feeding habit were recorded. Gross examination of tumour was assessed clinically based on its location, size, shape, colour, contour, consistency, ulceration, haemorrhage, pigmentation and appearance of cut surface. Confirmation of tumour type was made by histopathological evaluation.

3. Results and Discussion

During the study period of November 2024 to September 2025, 102 tumour tissue samples were collected, consisting of 98 excisional biopsies and 4 necropsy specimens; all 102 cases were confirmed as neoplasms. A total of 18, 556 clinical canine cases were examined during the seven months study period at Madras Veterinary College Teaching Hospital, Chennai, of which 431 were suspected tumour cases, giving a population occurrence of 2.32 percent. Of the 102 confirmed tumour samples, epithelial tumours were most common at 66 cases (64.70%; benign 16, malignant 50), followed by mesenchymal tumours at 23 cases (22.55%; benign 6, malignant 17) and round cell tumours at 13 cases (12.75%; benign 7, malignant 6). Overall, malignant tumours predominated, accounting for 73 cases (71.56%) against 29 benign cases (28.44%). The occurrence of tumours in dogs is presented in Table 1.

Table 1: Occurrence of tumours in dogs

Nature of tumours	Benign		Malignant		Total	
	No.	Percent	No.	Percent	No.	Percent
Epithelial tumours	16	15.69	50	49.01	66	64.70
Mesenchymal tumours	06	5.88	17	16.67	23	22.55
Round cell tumours	07	6.87	06	5.88	13	12.75
Total	29	28.44	73	71.56	102	100

Table 2: Age wise occurrence of tumours in dogs

Type of tumours	Age in years			Total	Percentage
	0-5 (%)	Above 5 – 10 (%)	Above 10 (%)		
Epithelial tumours	10 (9.80)	35 (34.31)	21 (20.59)	66	64.70
Mesenchymal tumours	03 (2.94)	13 (12.75)	07 (6.86)	23	22.55
Round cell tumours	05 (4.90)	05 (4.90)	03 (2.94)	13	12.75
Total	18 (17.64)	53 (51.96)	31 (30.40)	102	100

This predominance of neoplasms in middle aged to older dogs aligns with Saranya R (2022) ^[4] and Kumar *et al.* (2020) ^[2] who reported peak incidence in the 6 to 10 years and 6 to 9 years age respectively. The epithelial tumour mean age of 9.15 years is consistent with Kumar V (2022) ^[9] recorded 8.2 years and the perianal gland tumour mean age of 9.75 years matches the middle age predominance (5–10 years) reported by Kumar *et al.* (2017) ^[7]. The mesenchymal tumour findings (8.89 years overall; fibrosarcoma - 8.5 years, melanosaarcoma 8 years) are broadly consistent with Karnik *et al.* (2020) ^[1] reported a peak at 9–12 years with a mean of 8.3 years. For round cell tumours, the mast cell tumour mean age of 8.33 years is comparable to the 8 years mean reported by Fonti *et al.* (2024) ^[13] for the same tumour type. Bhandari *et al.* (2022) ^[10] reported higher tumour incidence in dogs below 5 years and Ishenbaeva *et al.* (2024) ^[5] found no significant age association. Most literature including the present findings supports the conclusion that canine tumours occur predominantly in middle-aged to older animals.

3.2 Breed-wise occurrence

The occurrence of tumours in different breeds of dogs is given in Table 3 and 5. Tumours occurred predominantly in pure-bred dogs (66.67%) compared to non-descript dogs (33.33%). Labrador Retriever was the most affected breed (24.53%) followed by Spitz and Golden Retriever (10.78% each). Epithelial and round cell tumours were more frequent in pure breeds while mesenchymal tumours were nearly evenly split between pure breed (11.76%) and non-descript (10.78%) dogs. Among mammary tumours, Labrador (31.25%) was followed by non-descript (25%) and Spitz (15.63%).

These findings corroborate the report of Kumar *et al.* (2020) ^[2] who documented 265 superficial neoplasms among 14, 140 clinical cases screened over three years of which 137 (51.7%) were canine mammary neoplasms and 128 (48.3%) were skin/subcutaneous neoplasms. Karnik *et al.* (2020) ^[1] similarly recorded a high proportion of malignant tumours (84%) against benign tumours (16%) among 68 clinical cases. In contrast, Ishenbaeva *et al.* (2024) ^[5] reported a higher proportion of benign cases (53.9%) among 360 dogs and Karnik *et al.* (2020) ^[1] also noted a higher incidence of mesenchymal tumours (76.47%) than epithelial tumours (23.53%) in their series, differences that may reflect variation in case mix, geography or diagnostic criteria across studies.

3.1 Age-wise occurrence

The age wise occurrence of tumours in dogs is presented in Table 2. Tumour occurrence was most frequent in dogs above 5–10 years of age (53 dogs, 51.96%) followed by those above 10 years (31 dogs, 30.40%) and 0–5 years (18 dogs, 17.64%) with an overall mean age of 8.83 years. This pattern held across tumour types: epithelial tumours showed a mean age of 9.15 years (mammary gland - 9.06 years, perianal gland - 9.75 years), mesenchymal tumours with mean age of 8.89 years (fibrosarcoma - 8.55 years, melanosaarcoma - 8 years) and round cell tumours with 7.15 years (cutaneous histiocytoma - 6.36 years, mast cell tumour - 8.33 years) indicating that round cell tumours tend to occur in relatively younger dogs than epithelial or mesenchymal tumours.

Table 3: Breed wise occurrence of tumours in dogs

S. No.	Type of tumours	Breeds	Total	Percentage
1.	Epithelial tumours Non-descript - 22 Pure Breeds - 44	Non-descript	22	21.57
		Labrador	18	17.67
		Spitz	7	6.86
		Dobermann	4	3.92
		Golden retriever	4	3.92
		German shepherd	3	2.94
		Dachshund	3	2.94
		Beagle	1	0.98
		Boxer	1	0.98
		Cocker spaniel	1	0.98
		ShihTzu	1	0.98
		Great Dane	1	0.98
2.	Mesenchymal tumours Non-descript - 11 Pure Breeds - 12	Non-descript	11	10.78
		Labrador	2	1.96
		Spitz	2	1.96
		Golden Retriever	2	1.96
		Dobermann	1	0.98
		German Shepherd	1	0.98
		Shih Tzu	1	0.98
		Beagle	1	0.98
		Siberian Husky	1	0.98
Rottweiler	1	0.98		
3.	Round cell tumours Non-descript - 1 Pure Breeds -12	Non-descript	1	0.98
		Labrador	5	4.90
		Spitz	2	1.96
		Great Dane	2	1.96
		German Shepherd	1	0.98
		Beagle	1	0.98
		Pug	1	0.98
Total			102	100

The Labrador predominance agreed closely with Karnik *et al.* (2020) ^[1] reported Labrador Retriever (22.06%) as the leading affected breed followed by non-descript (19.12%) and Golden Retriever (17.65%). Nair *et al.* (2021) ^[8] and Ishenbaeva *et al.* (2024) ^[5] found higher tumour occurrence in pure breeds overall (87.16% and 78% respectively) particularly Labrador Retriever and Rottweiler. Saranya R (2022) ^[4] identified Labrador Retriever and Spitz as the breeds most affected by cutaneous epithelial tumours and Kumar V (2022) ^[9] reported an 80:20 pure-breed to non-descript for epithelial tumours, matching with the present study. For mammary tumours, Gangwar *et al.* (2024) ^[12] found German Shepherds most affected followed by Labrador Retriever, differed from the present study (Labrador, then non-descript, then Spitz). Chandini *et al.* (2025) ^[14] reported Labrador Retriever accounting for 14.63% of perianal gland tumours among 41 dogs. Conversely Bhandari *et al.* (2022) ^[10] found non-descript dogs to be the most commonly affected group, underscoring that breed distribution findings can vary with local population structure.

3.3 Sex-wise occurrence

Sex wise occurrence of tumours in dogs is given in Table 4 and 5. Tumours were more common in females (56.86%) than males (43.14%). Epithelial tumours were the leading type in both sexes occurring in 36.28% of females and 28.43% of males with the same pattern (epithelial > mesenchymal > round cell) holding for each sex. Among affected females, Labrador (27.58%) followed by non-descript (24.14%) and Spitz (12.07%). Among males, non-descript dogs were most affected (45.45%) followed by Labrador (20.45%) and Spitz (9.09%). Mammary gland tumours were overwhelmingly a female phenomenon (29 of 32 cases) and perianal gland tumours skewed heavily in male (83.33% male, 16.66% female).

Table 4: Sex wise occurrence of tumours in dogs

S. No	Type of tumours	Sex	Total	Percentage
1.	Epithelial tumours	Male	29	28.43
		Female	37	36.28
2.	Mesenchymal tumours	Male	10	9.80
		Female	13	12.75
3.	Round cell tumours	Male	4	3.92
		Female	9	8.82
Total			102	100

This sex-related pattern, greater overall female predisposition

matched with earlier reports by Kumar *et al.* (2020) ^[2], Karnik *et al.* (2020) ^[1], Nair *et al.* (2021) ^[8] and Bhandari *et al.* (2022) ^[10] which is consistent with a hormonal influence tied to spaying status and number of estrous cycles. The strong female skew in mammary tumours mirrors Zheng *et al.* (2022) ^[6] who found 97.42% (491/504) of canine mammary tumours occurred in females. The male predominance in perianal gland tumours agreed with Kumar *et al.* (2017) ^[7] and Saranya R (2022) ^[4] attributed this to testosterone's promotion of perianal gland tissue growth. Chandini *et al.* (2025) ^[14] found 38 of 41 perianal gland tumour cases were male. Together, these findings reinforce a consistent hormonally-linked, tumour-type-specific sex predisposition: females toward mammary tumours and males toward perianal gland tumours.

Table 5: Overall Breed-age-sex wise occurrence of tumours in dogs

S. No	Breed	Age in years			Sex		No.	Percent
		0-5	Above 5 - 10	Above 10	Male	Female		
1	Non-descript	4	16	14	20	14	34	33.33
2	Labrador	4	14	7	9	16	25	24.53
3	Spitz	1	5	5	4	7	11	10.78
4	Golden Retriever	1	3	2	3	3	6	5.88
5	German Shepherd	3	2	0	3	2	5	4.90
6	Dobermann	1	3	1	1	4	5	4.90
7	Beagle	3	0	0	1	2	3	2.94
8	Great Dane	0	2	1	0	3	3	2.94
9	Dachshund	0	3	0	0	3	3	2.94
10	Shih Tzu	1	1	0	1	1	2	1.96
11	Boxer	0	1	0	1	0	1	0.98
12	Cocker Spaniel	0	1	0	1	0	1	0.98
13	Pug	0	0	1	0	1	1	0.98
14	Rottweiler	0	1	0	0	1	1	0.98
15	Siberian Husky	0	1	0	0	1	1	0.98
Total		18	53	31	44	58	102	100

3.4 Organ-wise occurrence

Organ wise occurrence of tumours in dogs is given in Figure 1. Tumours occurred most frequently in the skin (30.39%) and mammary gland (30.39%), followed by the anal/perianal region (8.82%) and oral cavity (6.86%). Within cutaneous sites, the ventral abdomen was most affected (7.84%) followed by the thorax (3.92%) and right thigh (2.94%). In mammary gland tumours, the right caudal abdominal gland was most affected (8.82%) followed by the left inguinal (7.84%) and right cranial abdominal (4.90%) glands.

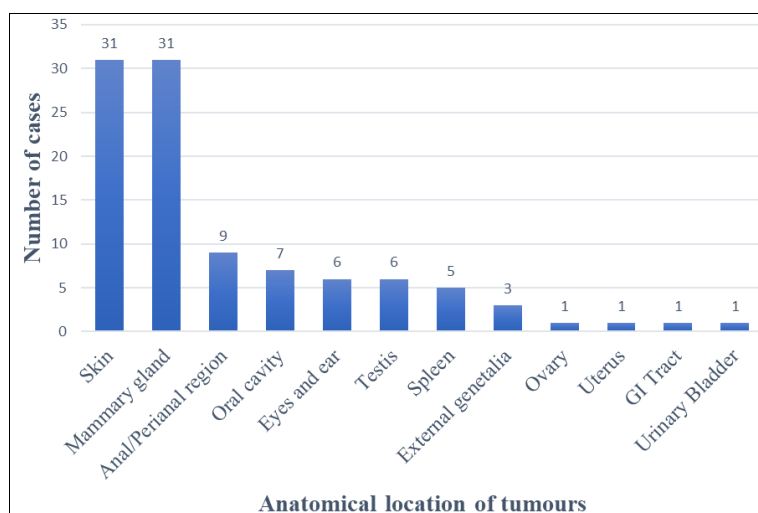


Fig 1: Organ-wise distribution of tumours in Dogs

The cutaneous distribution pattern is consistent with Saranya R (2022) ^[4] reported that the trunk/ventral abdomen (36.16%) and perianal region (17.02%) to be the leading sites for cutaneous epithelial tumours. The overall predominance of skin and mammary sites also aligns with Ishenbaeva *et al.* (2024) ^[5] reported skin (32%) and mammary gland (43%) as the leading tumour sites (with skin tumours concentrated on the trunk 61.6%) and with Fonti *et al.* (2024) ^[13] identified skin (34.5%) and mammary gland (23.9%) as the most frequent locations. The caudal gland predominance within the mammary chain is consistent with Sneha *et al.* (2024) ^[11] reported the caudal abdominal (40%) and inguinal (24%) glands as most affected, attributed to their greater glandular tissue mass and more prolonged secretory activity relative to the cranial pairs and with Zheng *et al.* (2022) ^[6] found the last two mammary gland pairs most frequently affected.

4. Conclusion

The highest occurrence of tumours was observed in the skin and mammary glands, with epithelial tumours being the most frequently recorded among all tumour types. Overall, malignant tumours were high in number than benign. With respect to demographic patterns, females were more commonly affected than males and dogs in the age group above 5-10 years showed a higher tumour occurrence compared to those above 10 years. Among breeds, non-descript dogs showed the greatest occurrence of both epithelial and mesenchymal tumours, Labradors recorded the highest occurrence of epithelial tumours among pure breeds. Pure breeds also exhibited a higher prevalence of round cell tumours than non-descript dogs. Regarding specific tumour types, mammary gland adenocarcinoma was the most common epithelial tumour. Fibrosarcoma and cutaneous histiocytoma were the most frequently encountered mesenchymal and round cell tumours respectively.

Conflict of Interest

Not available

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Not available

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