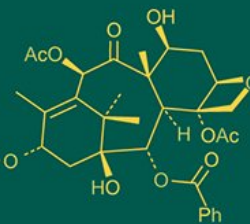
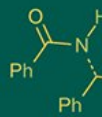


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(8): 543-545
www.biochemjournal.com
Received: 25-06-2026
Accepted: 30-07-2026

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Soft tissue tumours in German Shepherd dogs: An incidence

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i8g.9659>

Abstract

The present study was undertaken with the objective of recording the incidence of soft tissue tumours in German Shepherd dogs presented at the Department of Veterinary Surgery and Radiology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh. A total of 40 cases of different neoplastic conditions were recorded during the period of April 2024 to May 2025; out of these cases, 13 neoplastic cases were found in German Shepherd dogs. Among them, the highest frequency was found in mammary gland tumours and was observed in the 9 to 12 years of age group.

Keywords: Canine mammary gland tumours, incidence, histopathology, German Shepherd

Introduction

A neoplasm is considered benign when there is a localized, uncontrolled increase in cell numbers without invasion into surrounding tissues. In contrast, a malignant neoplasm is characterized by abnormal cells that invade nearby normal tissues and may spread to distant sites in the body through metastasis (Kitchell and Dervisis, 2010) [8]. The causative agent of tumours in dogs is multifactorial (Arya *et al.*, 2018) [1], which includes the participation of sex hormones, genetic, oncogenic viruses, immunological factors, environmental factors, and carcinogens as well. Most researchers believe that cancer results from genetic derangement in a cell that retains replicative potential (Roshini *et al.*, 2013) [10]. The highest incidence rate of neoplasia in females is found in the mammary gland and in the skin. Similarly, the majority of the neoplasms in males are found in the skin, oral cavity and digestive organs. While the majority of tumours in the digestive and respiratory system are malignant, the majority of tumours in the ocular system are benign (Choi *et al.*, 2016) [5].

Materials and Methods

This study was conducted on 40 clinical cases of different soft tissue tumours that were presented for surgical management at the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, between April, 2024 to May 2025. To assess the epidemiological characteristics of soft tissue tumours, data on age (categorized as 0 to ≤ 3 years, 4 to 8 years, 8 to 12 years, and above 13 years), sex (male and female), types of tumours, location of tumours, and histopathology were also gathered and analysed.

Results and Discussion**Overall Incidence**

A total of 40 cases of various neoplastic conditions were reported between April, 2024 to May, 2025 at the Veterinary Clinical Complex, Kamdhenu University, Junagadh. Out of these, 13 cases were found in German Shepherds, which were further investigated.

Age-wise Incidence

Among the 13 German Shepherd dogs diagnosed with soft tissue tumours, the highest incidence was observed in the 9 to 12 years age group, accounting for 7 cases (53.85%) (Table 1). This was followed by the 4 to 8 years group with 6 cases (46.15%); the over 12 years group and the under 4 years group had 0 cases in this study. Similar findings have been reported by Da Silva *et al.* (2018) [6] and Bhimani *et al.* (2024) [3], all of whom observed that

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years. Witsch *et al.* (2010) ^[14] explained that ageing increases the likelihood of genetic mutations and the accumulation of tumour-promoting factors, raising the probability of mammary gland tumour development in older dogs.

Table 1: Age-wise distribution of cases showing soft tissue tumours in dogs

	Age groups (Years)			
	≤ 3	4-8	9-12	>13
No. of cases	0	21	15	0
Percentage (%)	0%	46.15%	53.85%	0%

Sex Wise Incidence

The incidence of soft tissue tumours was found to be higher in females (10/13, 76.92%) as compared to males (3/13, 23.08%) during this study (Table 2). Similarly, Hussain *et al.* (2020) ^[7] have made similar observations that the incidence of neoplasm was higher in females (55.36%) than males (44.64%). Roshini *et al.* (2013) ^[10] found an almost equal occurrence of canine tumours in male and female dogs, which may be due to a higher population of male dogs in a particular area. Hormonal interactions and gastrin-releasing peptide receptors are more common among female than male canines, which might be the reason for affecting a greater number of female cases than males in the present study.

Table 2: Sex wise distribution of cases showing soft tissue tumours in dogs

	Female	Male
No. of cases	10	3
Percentage (%)	76.92%	23.08%

Incidence According to Site of Occurrence

A total of 40 cases of canine soft tissue tumours were diagnosed. The highest numbers of canine mammary gland tumours were diagnosed, with 7 cases (53.84%), abdominal tumours (3/13, 23.08%), cutaneous tumours (2/13, 15.38%) and epulis (1/13, 7.7%) (Table 3). Sostaric-Scase *et al.* (2013) ^[12] recorded the highest incidence of tumours of skin and subcutis (45.73%), followed by mammary gland (21.75%) and genitalia (7.97%). Roshini *et al.* (2013) ^[10] recorded that mammary gland was the most preferred site for tumour development with the frequency of about 21.8%, followed by skin of leg region (20%), vagina and abdominal cavity (7.27%), testicle (5.45%), interdigital space (3.63%), gum (3.63%), perianal gland (3.63%), genital organs (3.63%), skin of chest region (3.63%). The least affected sites were ovary, vulva, eyelid, skull bone, ear canal, skin of mandible, rudimentary mammary gland, base of the tail, scrotal skin and skin of neck region, with 1.7% cases each.

Table 3: Various types of soft tissue tumours in dogs observed during the study period

Sr. No.	Type of tumours	No. of cases	Percentage (%)
1	Mammary gland tumours	7	53.84
2	Abdominal tumours	3	23.08
3	Cutaneous tumours	2	15.38
4	Epulis	1	7.7

Histopathological Classification

During this study, Out of 12, 8 cases were found benign which includes fibroma (2 cases), adenoma (1 case),

adenochondroma (2 cases), hemangioma (1 case), lymphoma (1 case) & plasmacytoma (1 case), and 5 cases of malignant tumours tubular carcinoma (1 case), ductal carcinoma (1 case), adenocarcinoma (2 cases) & squamous cell carcinoma (1 case).

In this study, out of 13 cases, 7 cases of mammary gland tumours, four were histopathologically diagnosed as malignant, including adenocarcinoma (2 cases), tubular adenocarcinoma (1 case), and ductal carcinoma (1 case), while the remaining three cases were benign tumours, including adenochondroma (2 cases) and adenoma (1 case). Lopuszynski and Hellmen (2015) ^[9] reported 66 cases of canine mammary gland tumours, with the most common benign tumours being adenoma, papilloma, and benign mixed tumour, while ductal and tubular carcinomas were the most common malignant types.

In this study, out of 13 cases, one case was found to be of epithelial origin, which was Squamous cell carcinoma. SCC is characterized by cords or nests of proliferating neoplastic cells, with immature polyhedral cells at the periphery and eosinophilic, lamellated keratin pearls at the centre. In well-differentiated types, keratin production is abundant. The neoplastic cells display moderate pleomorphism, large vesicular nuclei, prominent nucleoli, variable mitotic activity, and distinct intercellular bridges (Chandrashekaraiiah *et al.*, 2011) ^[4].

Also, in this study, out of 13 cases, three were found to be of mesenchymal origin. Out of which, two cases were fibroma, and one case was hemangioma. Histopathological examination revealed bland, spindle-shaped cells embedded within a scant to moderately abundant fibrovascular stroma (Soltero-Rivera *et al.*, 2015) ^[11]. While, hemangioma is a vascular tumour that arises within the collagen-rich dermis. They are unencapsulated but distinctly demarcated, often presenting as multilobular or coalescing masses. Histologically, they are composed of clusters of small blood vessels with concentric thickening formed by a few cellular layers (Warren *et al.*, 2007) ^[13].

In this study, 2 cases of round cell tumours were also observed. Out of which, 1 case was lymphoma, and 1 case was plasmacytoma. Lymphoma is classified based on multiple morphological parameters, including growth pattern, nuclear size, nuclear features such as chromatin distribution and nucleolar number and positioning, mitotic activity, and immunophenotypic profile (Zandvliet, 2016) ^[15]. Plasmacytoma was consistent with a completely excised round-cell tumour, with Mott cell differentiation as the leading differential diagnosis. Electron microscopy revealed uniformly electron-dense intracytoplasmic granules with relatively smooth surfaces upon ultrastructural examination (Auch *et al.*, 2024) ^[2].

Table 4: Various types of tumours based on their origin

Category of tumours	Name of tumours	No. of Tumours
Epithelial tumours	Squamous cell carcinoma	1
Mesenchymal tumours	Fibroma	2
	Hemangioma	1
Round cell tumours	Lymphoma	1
	Plasmacytoma	1
Mammary gland tumours	Tubular carcinoma	1
	Ductal carcinoma	1
	Adenocarcinoma	2
	Adenoma	1
	Adenochondroma	2

Table 5: Various types of tumours diagnosed with histopathology

Sr. No.	Breed	Sex	Age	Particulars of tumours	Histopathological findings
1.	GSD	Female	7 years	Canine mammary gland tumours	Tubular Carcinoma
2.	GSD	Female	6 years	Canine mammary gland tumours	Adenocarcinoma
3.	GSD	Female	12 years	Canine mammary gland tumours	Ductal carcinoma
4.	GSD	Female	5 years	Canine mammary gland tumours	Adenocarcinoma
5.	GSD	Female	12 years	Canine mammary gland tumours	Adenochondroma
6.	GSD	Female	10 years	Canine mammary gland tumours	Adenoma
7.	GSD	Female	12 years	Canine mammary gland tumours	Adenochondroma
8.	GSD	Male	4 years	Abdomen tumours	Plasmacytoma
9.	GSD	Female	12 years	Abdomen tumours	Hemangioma
10.	GSD	Male	10 years	Abdomen tumours	Lymphoma
11.	GSD	Male	8 years	Epulis	Fibroma
12.	GSD	Female	10 years	Elbow tumours	Fibroma
13.	GSD	Male	7 years	Face tumours	Squamous cell carcinoma

Conclusions

Canine soft tissue tumours were found more frequently in the age group of 9 to 12 years, with German Shephard was commonly affected breed; females are more prone to this type of tumour. The most common type of tumours in such breeds are mammary gland tumours. Surgical excision was considered a suitable technique for the management of benign tumours with short recovery time and without any major side-effects or complications. In the cases of malignant tumours, surgical management along with chemotherapy was found to be better, with the highest probability of cure, increased survival time and improved quality of life.

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