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Research Article

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Study on Prevalence and Location of Canine Oral Tumors in Shiraz City (2022 -2024)

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Abstract

Background and aim: A Rapid Increase in prevalence of canine oral tumors has caused more concerns about these disorders. The aim of the present study was to report the prevalence and distributions of lesions of canine oral tumors in Shiraz city, south of Iran.
Material and methods: Samples from oral lesions suspected to tumors were collected from Shiraz veterinary clinics and laboratory. Five-micron histopathology slides were prepared from these samples and were studied by light microscopy.
Results: Among 103 oral lesions, 57 cases (38 male and 19 female) were diagnosed with oral tumors. Melanoma was the most common malignant tumor (n=27, %47.4) and hemangioma and fibropapiloma (n=3, % 5.2) were the most common benign tumors. The gingiva was the most common site for both malignant and benign tumors.
Conclusion: The present study indicated a relatively high incidence of oral tumors in Shiraz city with a higher prevalence of oral malignant tumors compared to benign tumors in dogs in this area, Melanoma and squamous cell carcinoma were the most predominant malignancies. The gingiva exhibited the most common location of both malignant and benign lesions. Our study provides insights into the prevalence, macroscopic and microscopic picture of canine oral tumor in Shiraz city for both veterinary clinicians and pathologists.

Keywords: *Oral tumor, Dog, Shiraz*

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Introduction

Rapid growth of pet dog population in Shiraz city province along with advancements in veterinary care has increased lifespan of these dogs that has led to increased incidence and more attention to oral tumors in these animals.

Canine oral cavity masses represent common findings in dogs in clinical practice and include a wide range of abnormalities (Satthathum *et al.,* 2023). Based on the high prevalence, duration and severity of oral disorders. these lesions can affect the life quality of dogs (whyte, 2022).

Oral cavity tumors account for 70.4 per 100,000 cases in dog papulation and make up approximately 6–7% of all canine cancers in the dogs and most cases are malignant (Satthathum *et al.,* 2023, Cray *et al.,* 2020). Oral tumors can arise from any locations including the gingiva, periodontal structures, mucosa, tongue and tonsils. Chronic inflammation, mechanical injury or drug administration can lead to the development of neoplastic and tumor-like lesions (Satthathum *et al.,* 2023).

The most common oral malignancies in dogs include melanomas, squamous cell carcinomas, and fibrosarcomas. Less common tumors include osteosarcoma, acanthomatous ameloblastoma, and peripheral odontogenic fibromas (Cray *et al.,* 2020).

Canine oral tumors are often detected late in the course of the disease, necessitating radical surgeries frequently combined with adjuvant chemotherapy or radiotherapy for positive outcomes (Tipirneni *et al.,* 2024). Furthermore, cancers in dogs occur spontaneously. Since dogs have a shorter lifespan and develop tumors similar to those diagnosed in humans regarding both morphological and biological behavior, study of their tumors can provide useful information in the research on comparative epidemiology, pathophysiology, and therapeutics to equivalent human cancers. Canine species share a greater proportion of its genome with humans than rodents providing fresh insight into the genetic basis of tumor development (Pastor *et al.,* 2018).

Identifying the prevalence and classification of oral tumors are essential for treatment planning, estimating prognosis and incidence of this disease in canine populations. Classification of Oral cavity tumors and tumor-like lesions in dogs requires histopathological examination (Mikiewicz *et al.,* 2019).

The objective of the current study was to investigate the incidence, type and location of canine oral tumors in Shiraz city.

Material and methods

This study received ethical approval from Research Ethics Committees of Kazerun Azad University (IR.IAU.KAU.REC.1403.047). The current study was conducted from May 2022 to May 2024 in Shiraz city, south of Iran. Samples from dogs suspected to oral tumors were collected from veterinary clinics and laboratories in Shiraz city province.

Information about breed, sex, age and weight of each dog was obtained. Lesions in the oral cavity were recorded. If a lesion was suspected to be neoplastic, its shape, size and color was recorded. Any kind of ulceration, invasion to adjutants' tissue, necrosis or other lesions in the oral cavity were also recorded. The cases were also followed for possible metastasis. Sample collection was performed using incisional biopsy or punch biopsy techniques.

Histological specimens were also obtained from tumors surgically excised. Tissue samples were fixed in 10% neutral buffered formalin. Paraffin-embedded tissues were obtained from these specimens and were prepared using standard protocols for tissue processing. Then cut into 5-micron sections using a microtome and stained with hematoxylin and eosin (H&E) method. The histopathological slides were investigated by light microscopy.

Records from cases referred to laboratory and clinics during the same time period of the study were investigated simultaneously. For each sample, characteristics and other available data related to the lesion and the previous histopathological diagnosis were collected. The histological slides were studied once again by light microscopy. If there was no histological slide available the cases were excluded from the study. The categorization of the tumors was performed according to the adjusted World Health Organization (WHO) classification.

Results

From 103 oral lesions, 57 cases (38 male and 19 female) were diagnosed with oral tumors which included 51 dogs with malignant and 7 dogs with benign oral tumors. The histological diagnosis and gender distribution of malignant and benign tumors are presented in tables one and two respectively.

Frequency and percentage of locations for oral tumors in dogs is shown in table three. Melanoma was the most prevalent tumor, while Squamous cell carcinoma (SCC) accounted for 15.8% of the cases.

Tumor Type	Number	% of All Tumors	Male	Female
Melanoma	27	% 47.4	15	12
Squamous Cell Carcinoma	9	% 15.8	4	5
Fibrosarcoma	7	% 12.2	4	3
Hemangiosarcoma	4	% 7	3	1
Osteosarcoma	2	% 3.5	0	2
Total	49	% 85.6	26	23

Table 1. Distribution of malignant canine oral tumor types.

Tumor Type	Number	% of All Tumors	Male	Female
Hemangioma	3	% 5.2	2	1
Fibro Papilloma	3	% 5.2	2	1
Schwannoma[1]	1	% 1.7		
Papilloma	1	% 1.7		1
Total	8	% 14.1	4	3

Table 2. Distribution of benign canine oral tumor types. 1-The sex of the schwannoma case was not clear in the clinic archive.

Site	Malignant	Benign	Total
Gingiva	29	4	33
Lip	5	2	7
Buccal Mucosa	6		6
Tongue	4	1	5
Soft Palate	2	1	3
Hard Palate	3		3

Table 3. Frequency and percentage of locations for oral tumors in dogs.

Regarding to anatomical location, the gingiva was the most common site for canine oral cavity neoplasia (n = 32; 56.14 %), followed by the lip (n = 13; 22.8%).

Melanoma was the most common malignant tumor found in this study. Melanomas appeared as a protruding, poorly demarcated. Firm, brown to black pigmented masses between 2 to 6 centimeters, arising from different location within the mouth (Figure 1). The tumor masses were located on the maxillary gingiva (9 case), mandibular mucosa (8 cases), tongue (5 cases), labial mucosa (3 cases) and cheeks (2 cases). In some cases, ulceration was also present. A dermal melanoma was found in the one dog's back.

In microscopic view the neoplastic cells were polygonal to elongated shape with nuclear atypia. Pigmentation of the cells ranged from nonexistent to abundant. Melanophores were also present in a moderate to abundant numbers. In nineteen cases the tumor had invaded surrounding connective tissue (Figure 2).

Squamous cell carcinomas had a nodular to cauliflower-like appearance and were located in tongue of four dogs. Other locations included maxillary gingiva (3 cases) and mandibular gingiva (2 cases). Bone invasion was noted in all gingival tumors. Microscopically, cords and trabeculae of neoplastic cells extending into the dermis surrounded by a dense desmoplastic reaction with different amount of keratinization and intercellular bridges was the main feature (Figure 3).

Fibrosarcoma was seen in 7 dogs. The tumor appeared as pink-to-red solid irregular masses that were located on hard palate (3 cases), soft plate (2 cases) and maxillary gingiva (2 cases). Proliferation of highly cellular fibroblastic spindle shape cells separated by abundant to scant amounts of interstitial collagenous matrix was the main microscopic features of these tumors.

The most common benign tumors were hemangioma and fibropapiloma. In cases diagnosed with hemangioma proliferation of dilated, thin-walled vessels lined by a single layer of endothelial cells were noted. These vessels had different size and shape and were separated by fibrous tissue.

Figure 1. Melanoma on the maxillary gingiva: Note the black demarcation.

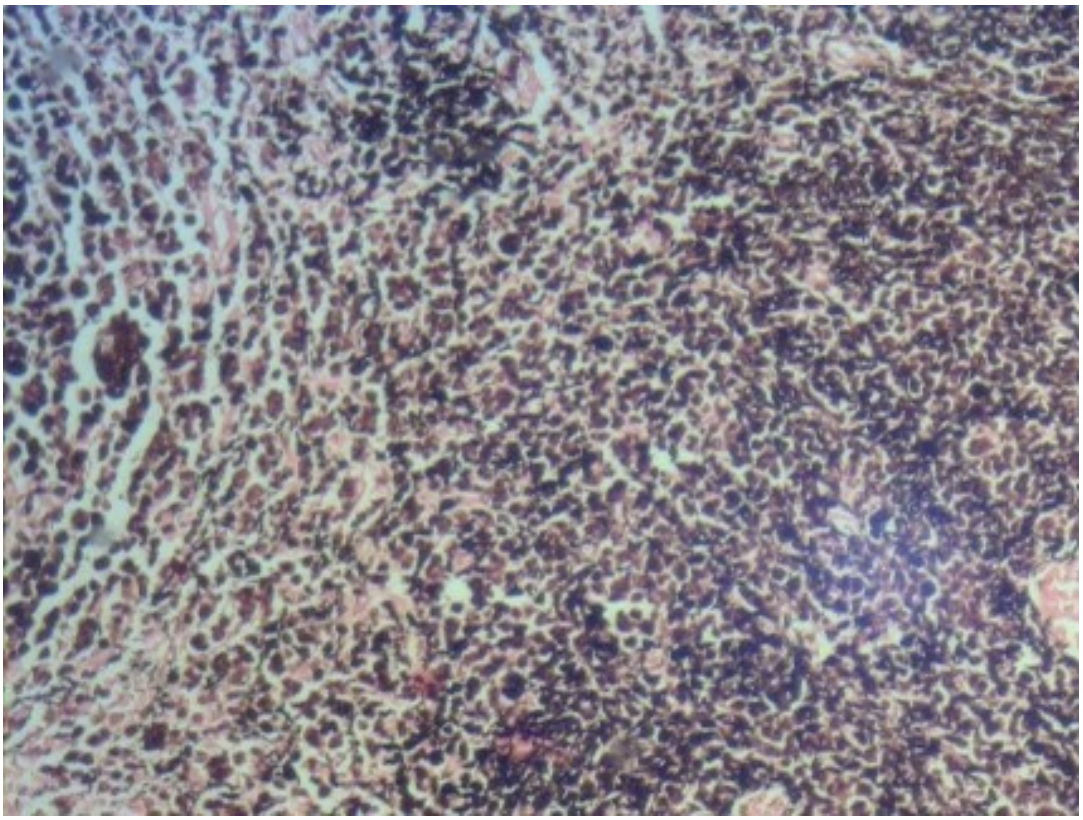

Figure 2. Melanoma: Melanocytes containing abundant amount of melanin that have invaded the dermis.

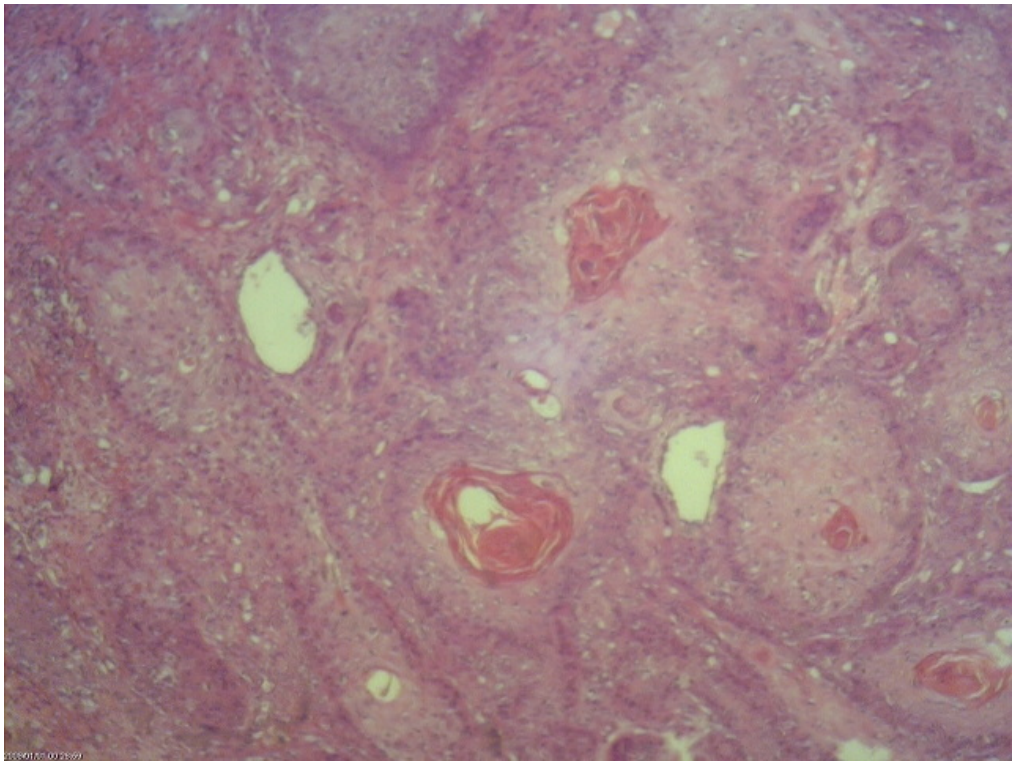

Figure 3. Squamous cell carcinoma: Nests of neoplastic keratinocytes extending into the submucosa. Note the corneal pearls.

Discussion

This aim of this study was to report contemporary prevalence information regarding oral tumors in dogs in Shiraz city. Cray *et al.,* have reported a 4.9 per 1,000 dogs (0.5%) incidence of oral tumors in dogs that 53.6% were classified as malignant and 25.4% as benign (Cray *et al.*, 2024). Tipirneni *et al.,* have reported a 4.59/1,000 incidence of canine oral tumors in California. These researchers noted that air quality index, geographical location, and periodontal disease were not associated with oral neoplasia (Tipirneni *et al.,* 2024).

In a ten-year retrospective analysis between 2012 to 2022 in Switzerland Gasymova *et al.,* found that peripheral odontogenic fibroma and malignant melanoma were the most common benign and malignant tumors respectively. Benign tumors constituted 63% of oral tumors in that study (Gasymova *et al.,* 2024). Some researchers have suggested an age-related increase in oral tumor incidence (Satthathum *et al.,* 2023, Mikiewicz *et al.,* 2019). Our findings showed that malignant tumors are more common in dogs in Shiraz that is consistent with the findings of other studies in other countries (Satthathum *et al.,* 2023; Cray *et al.,* 2020; Wingo, 2018). Among malignant tumors, melanoma was identified as the most prevalent oral tumor in the present study that is in line with previous publications. Melanoma is recognized as the most prevalent form of oral malignancy in dogs. Median survival times (MST) for oral melanoma in dogs have been reported between six and thirty months depending on treatment approach and a variety of prognostic factors (Smedley *et al*., 2011).

The location and size of canine oral melanoma are important when considering staging, which ultimately affects the curative intent of surgery (Silva *et al*., 2024). Several researches indicate that canine oral melanomas are often located on the gingiva, followed by the lip and buccal mucosa (Delgado *et al.,* 2023, Muñoz-Duque *et al.,* 2023, Wingo 2018). Gingiva was the most common location of melanoma in the present study followed by buccal mucosa but we have not seen melanoma on the lips. As the lips are more exposed to environmental stimulus, there is a high incidence of melanoma on the lips (Goldschmidt *et al.,* 2023).

Melanoma was not observed on the lips in the present study that might be related to Shiraz environment and this point that dog owners do not

take their pets outdoor for a long walk in Shiraz city compared to other places due to government regulations. There were also five melanoma cases located on the tongue in our study that is similar to what is reported by Rikel and Rissi, suggested that melanomas have a predilection for the dorsal aspect of the oral cavity and root of the tongue (Rikel & Rissi, 2025).

Fifty one percent of canine melanomas in our study occurred on dorsal part of the oral cavity confirming this anatomic predilection. The tumors on the dorsal part of the tongue and the more obvious parts of the oral cavity like gingiva are more detected by dog owners and veterinarians, previous studies indicate a higher predisposition to oral melanomas in male animals that was also observed in the present study (Satthathum *et al.,* 2023; Kudnig *et al.,* 2003).

Ramos-vara et al., have reported a 30.3 percent metastasis in oral melanoma cases (Ramos-vara *et al.,* 2000). We have seen only one dermal metastasis. It should be considered that the dogs in the present study were not followed or gone under necropsy so possible metastasis was not detected. The macroscopic and microscopic features of canine oral melanoma found in this study is same to those reported in other studies (Gasymova *et al.,* 2024; Lo Giudice *et al.,* 2024).

Squamous cell carcinoma (SCC) is the second most prevalent malignant oral neoplasm in dogs (Sharma *et al.,* 2021; Guscetti *et al.,* 2020). Oral SCCs are most commonly located on the rostral mandible and frequently demonstrate bone invasion (Sharma *et al*., 2021). Same results were seen in our study. A Previous study has suggested that SCC has a higher occurrence in male dogs (Satthathum et al., 2023). This is in contrast with our study that can be related to the small dog population size in the present study. Macroscopic and microscopic pictures of SCC found in the present study are similar to what is reported in previous studies (Gasymova *et al.,* 2024; Muñoz-Duque *et al.,* 2022; Nemec *et al.,* 2012)

Oral fibrosarcomas are invasive malignant mesenchymal tumors of the oral cavity of dogs, commonly found on the maxillary gingiva or hard palate (Martano *et al*., 2018). The location of canine oral fibrosarcoma in our study is in line with previous studies (Verma *et al.,* 2024; Delagado *et al.,* 2023).

In canines, osteosarcoma tends to occur in large breeds (Mirablo *et al.,* 2011). Satthathum et al., have reported most of the osteosarcoma cases in the mandible, followed by the maxilla and the hard palate (Satthathum *et al.,* 2023).

In the present study Hemangioma and fibropapiloma were the most frequent type of oral benign tumor that agrees with previous findings (*Gasymova et al.,* 2024; Satthathum *et al.,* 2023; Cray *et al.,* 2020). Van der Gaag et al. have reported a higher prevalence of hemangioma in male dogs. The microscopic and macroscopic features of hemangioma in our study is same to previous reports (Schöniger *et al.,* 2008; Schoofs, 1997; Van der Gaag *et al.,* 1989).

There was no previous data to compare the incidence of oral tumor in Shiraz or Iran with previous studies but the clinic veterinarian stated increase in oral tumor referrals in recent years that can be due to more attention of dog owners and improvements in veterinary care such as routine oral care and regular preventive health cares in Shiraz city.

A relatively significant percentage of oral tumor metastasis and secondary abnormalities are reported in some studies (Goldshmi *et al.,* 2023) that was not seen in present study. Tumors seen in the oral cavity are easily detected by both owners and clinicians during physical exams but detecting metastasis needs more specialized and expensive diagnostic procedures that its expenses is not usually covered by dog owners in Shiraz city.

The two most important limitation of this study are the small sample size of this study and the quality of the clinical records provided by clinical practitioners. Other limitations can be underreporting oral tumors by dog owners due to treatment expenses and limited access to diagnostic facilities. These limitations can make the prevalence values found in this study to be underestimated. Nevertheless, our results can add recent and clinical pathology-based information for prevention and treatment of canine oral neoplasms in Iran.

Conclusion

The results of this study presented a relatively high incidence of oral tumors in dogs in Shiraz city. Malignant canine oral tumors had a much higher prevalence compared to benign tumors. Among malignancies melanoma and SCC were the most predominant lesions. The gingiva and the lip

exhibited the highest number of involvements of both malignant and benign neoplasia, respectively.

The results of this study can be used by clinicians to design more efficient treatment and prevention protocols for canine oral lesions In Iran. In addition, this study provides practical information for future studies on pathology-based oral neoplastic studies.

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Conflict of interest

Nil.

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مطالعه میزان شیوع و محل قرار گرفتن تومورهای محوطه دهانی در سگ در شهرستان شیراز (۱۴۰۱-۱۴۰۳)

امیر اشکان مهجور*، حانیه هنردان

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تاریخ دریافت: ۱۴۰۳/۱۱/۲۷ اصلاح نهایی: ۱۴۰۴/۰۲/۰۱ تاریخ پذیرش: ۱۴۰۴/۰۲/۳۱

چکیده

زمینه و هدف: افزایش قابل توجه شیوع تومورهای محوطه دهانی در سگ باعث توجه روز افزون به این ناهنجاری ها شده است. هدف از انجام مطالعه حاضر بررسی شیوع تومورهای محوطه دهانی و پراکندگی آنها در شهر شیراز بود.

مواد و روش ها: نمونه های مشکوک به تومور محوطه دهانی از کلینیک ها و آزمایشگاه های شهر شیراز جمع آوری شد. از نمونه ها، مقاطع هیستوپاتولوژی با قطر ۵ میکرون تهیه شده و مورد مطالعه قرار گرفت.

یافته ها: از ۱۰۳ مورد ضایعات دهانی مورد مطالعه ۵۷ مورد (۳۸ سگ نر و ۱۹ سگ ماده) میتلا به تومور دهانی تشخیص داده شد. ملانوما شایعترین تومور بدخیم (۲۷ مورد، ۴۷/۴٪) و همانژیوم و فیبروپاپیلوم (هر کدام سه مورد، ۵/۲ درصد) شایعترین تومورهای محوطه دهانی در سگ ها بودند. لثه بالایی شایعترین محل مشاهده تومورهای خوش خیم و بدخیم بود.

نتیجه گیری: این مطالعه می تواند اطلاعات مفیدی برای شناخت شیوع و تصویر ماکروسکوپیک و میکروسکوپیک تومورهای محوطه دهانی در اختیار کلینیسین‌ها و پاتولوژیست های دامپزشک قرار دهد.

واژه‌های کلیدی: *تومورهای محوطه دهانی، سگ، شیراز*

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