PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
Ministry of Higher Education and Scientific Research

Institute of
Veterinary Sciences

Saad Dahleb
University
-Blida 1-

End of studies project for obtaining the

Doctor of Veterinary Medicine degree

Survey of oral conditions in cats attending veterinary office in Blida

Presented by :

-Huseen Abdullah

-Shawahneh Moath

On : 07 /07/2025

In front of the jury :

President :	Akkou Madjid	MCA	ISV Blida
Examiner:	Ezzroug Rym	MCA	ISV Blida
Promoter:	Dahmani Asma	MCA	ISV Blida

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Dedications

In the name of Allah, the Most Gracious, the Most Merciful.

To the blessed land of Palestine, its sacred soil, and its steadfast people;
To the brave prisoners, the wounded heroes, and the pure souls of the martyrs who sacrificed their lives in the path of truth and dignity — may Allah grant them the highest ranks in Jannah.

To my beloved family, especially my mother and father, whose heartfelt prayers, unconditional love, and blessed presence have been a guiding light throughout my journey.

To my brothers and sisters, and to my dear friends and loyal companions, whose encouragement and support have always uplifted me may Allah bless you all and grant you success in both this life and the Hereafter.

I dedicate this humble work to all of you, with deep gratitude and a heart full of faith.

Shawahneh Moath

Dedications

All praise and thanks are due to Allah, the Most Gracious, the Most Merciful, the One who granted me the strength, patience, and determination to complete this journey. Without His divine guidance and countless blessings, none of this would have been possible.

I dedicate this humble work to the courageous and unyielding people of Gaza — a land of dignity, resilience, and unwavering faith. Despite the hardships, they continue to stand tall with pride, teaching the world what true strength and steadfastness mean. May Allah grant them peace, justice, and protection, and may their sacrifices never be forgotten.

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This work is a reflection of your support and love. I am forever grateful for each one of you, and I carry your love in every achievement I accomplish.

Huseen Abdullah

Abstact

Oral diseases are common problems in cats. The objectives of the present study were to determine the prevalence, clinical signs, the risk factors for these conditions. From 470 cats that presented to a private veterinary clinic located in the region of Blida, 76 cats (16.17 %) were diagnosed with oral pathologies and were included in the study. For each animal, potential risk data were obtained from medical record and cat owner interviews. The most frequent oral condition was gingivitis (60.52%), followed by stomatitis (44.73%), periodontitis (31.57%), eosinophilic granuloma complex (6.57%), jaw fracture (3.94%), mouth obstruction by chicken bone with (2.63%), hypodentia, prognatism and tooth caries with 1.31% for each clinical finding. The most common clinical signs of oral conditions were halitosis (85.52%), followed by pain (73.68%), anorexia (72.36%), presence of tartar (68.42%), dehydration (53.49%), ulceration (47.36%), palatoglossitis (40.78%), fever (34.21%), bleeding and dental mobility with 32.89% for each one. The breed, vaccination status, diet, home dental care, living environment and owner's knowledge of oral pathologies were found to be significantly associated with periodental diseases and stomatitis. Indeed, European breed, unvaccinated cats, cats fed a mixed diet, cats that did not receive home dental care, cats with outdoor access and whose owner's have not knowledge about oral diseases were most susceptible to these two conditions. The present study revealed a non-negligible prevalence of oral conditions particulary periodontal disease and stomatitis. Appropriate recommendations need to be introduced to control these diseases.

Key words : Oral diseases, cats, prevalence, clincal symptoms, risk factors.

ملخص

تُعد أمراض الفم من المشاكل الشائعة لدى القطط. هدفت هذه الدراسة إلى تحديد معدل انتشار هذه الحالات، وعلاماتها السريرية، وعوامل الخطر المرتبطة بها. من بين 470 قطة راجعت عيادة بيطرية خاصة في منطقة البليدة، شُخِّصت 76 قطة (16.17%) بأمراض فموية، وتم إدراجها في الدراسة. لكل قطة، تم الحصول على بيانات المخاطر المحتملة من السجلات الطبية ومقابلات أصحابها. كانت أكثر حالات الفم شيوعًا هي التهاب اللثة (60.52%)، يليه التهاب الفم (44.73%)، والتهاب دواعم السن (31.57%)، والتهاب الحبيبات اليوزيني (6.57%)، وكسر الفك (3.94%)، وانسداد الفم بعظم الدجاج (2.63%)، وانخفاض الأسنان، وبروز الأسنان، وتسوس الأسنان (1.31%) لكل نتيجة سريرية. كانت العلامات السريرية الأكثر شيوعًا لأمراض الفم هي رائحة الفم الكريهة (85.52٪)، تليها الألم (73.68٪)، وفقدان الشهية (72.36٪)، ووجود الجير (68.42٪)، والجفاف (53.49٪)، والتقرح (47.36٪)، والتهاب الحنك واللسان (40.78٪)، والحمى (34.21٪)، والنزيف وحركة الأسنان بنسبة 32.89٪ لكل منها. وُجد أن السلالة وحالة التطعيم والنظام الغذائي والعناية بالأسنان المنزلية وبيئة المعيشة ومعرفة المالك بأمراض الفم مرتبطة بشكل كبير بأمراض اللثة والتهاب الفم. في الواقع، كانت القطط الأوروبية والقطط غير الملقحة والقطط التي تتغذى على نظام غذائي مختلط والقطط التي لم تتلق رعاية أسنان منزلية والقطط التي يمكنها الوصول إلى الهواء الطلق والتي لا يعرف أصحابها أمراض الفم أكثر عرضة لهاتين الحالتين. كشفت الدراسة الحالية عن انتشار غير ضئيل لأمراض الفم وخاصة أمراض اللثة والتهاب الفم. يجب تقديم توصيات مناسبة للسيطرة على المرض.

الكلمات المفتاحية: أمراض الفم، القطط، الانتشار، الأعراض السريرية، عوامل الخطر.

Résumé

Les affections bucco-dentaires sont fréquentes chez le chat. Les objectifs de la présente étude étaient de déterminer la prévalence, les signes cliniques et les facteurs de risque de ces affections. Sur 470 chats consultés dans une clinique vétérinaire privée de la région de Blida, 76 chats (16,17 %) ont été diagnostiqués avec des pathologies bucco-dentaires et ont été inclus dans l'étude. Pour chaque animal, les données de risque potentiel ont été obtenues à partir des dossiers médicaux et des entretiens avec les propriétaires. L'affection bucco-dentaire la plus fréquente était la gingivite (60,52 %), suivie de la stomatite (44,73 %), de la parodontite (31,57 %), du complexe granulomateux éosinophile (6,57 %), de la fracture de la mâchoire (3,94 %), de l'obstruction buccale par un os de poulet (2,63 %), de l'hypodentie, du prognathisme et de la carie dentaire avec 1,31 % pour chaque anomalie. Les signes cliniques les plus fréquents étaient l'halitose (85,52 %), suivie de la douleur (73,68 %), de l'anorexie (72,36 %), de la présence de tartre (68,42 %), de la déshydratation (53,49 %), de l'ulcération (47,36 %), de la palatoglossite (40,78 %), de la fièvre (34,21 %), des saignements et de la mobilité dentaire (32,89 %). La race, le statut vaccinal, l'alimentation, les soins et l'hygiène dentaires à domicile, le cadre de vie et les connaissances du propriétaire en matière de pathologies bucco-dentaires étaient significativement associés aux maladies parodontales et aux stomatites. En effet, les chats de race européenne, non vaccinés, nourris avec une alimentation mixte, ne bénéficiant pas de soins dentaires à domicile, ayant accès à l'extérieur et dont le propriétaire n'a pas de connaissances en matière de maladies bucco-dentaires étaient les plus sensibles à ces deux affections. La présente étude a révélé une prévalence non négligeable des affections bucco-dentaires, en particulier des maladies parodontales et des stomatites. Des recommandations appropriées doivent être mises en place pour contrôler ces maladies.

Mots clés : Maladies bucco-dentaires, chats, prévalence, symptômes cliniques, facteurs de risque.

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List of abbreviations

- **C :** Canines
- **cm** : Centimeter
- **CRT :** Capillary Refill Time
- **EGC :** Eosinophilic Granuloma Complex
- **FeLV :** Feline Leukemia Virus
- **FHV-1** : Feline Herpesvirus-1
- **FIV :** Feline Immunododeficiency Virus
- **FME :** Full-mouth Extraction
- **FORL :** Feline Odontoclastic Resorptive Lesions
- **FOSCC** : Feline Oral Squamous Cell Carcinoma
- **HNSCC** : Head and Neck Squamous Cell Carcinoma
- **I :** Incisors
- **M :** Molars
- **mm :** Millimeter
- **PD** : Periodontal disease
- **PME :** Partial-mouth Extractions
- **PM :** Premolar

Introduction

Oral health is more important to maintain general well-being not only for the people but also for the domestic animals **(Chaubey et *al.,* 2021).** It is a fundamental but often neglected aspect of feline general health.

The oral cavity of cats can be affected by a number of diseases, ranging from tartar and plaque build up to more serious problems such as gingivitis, periodontal disease, tooth resorption, tumors, and chronic gingivitis and periodontitis **(Harvey, 2005).** These conditions are not only painful but can also lead to systemic complications affecting the heart, kidneys, and liver due to the transfer of oral bacteria into the bloodstream **(Niemiec, 2013).**

These oral diseases are among the most common health problems diagnosed in domestic cats, yet they are often not recognized by owners or even veterinarians. A survey in Finland reported that dental and oral diseases were the most prevalent disease category in cats (prevalence 28%), and dental calculus and gingivitis were the most prevalent clinical signs noted **(Vapalahti et *al.,* 2016).**

These inflammatory oral diseases in cats are complex and multifactorial conditions consisting primarily of local or widespread inflammation in the oral cavity **(Kornya et *al.,* 2014).** Viral diseases such as feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), calicivirus can present with signs of oral inflammation. Nutritional disorders also contribute to oral diseases. There is also evidence that some breeds are more commonly affected indicating a probable genetic predisposition **(Kenneth, 2007).**

The veterinary clinic in Algeria is a suitable setting for studying the prevalence of these diseases, as the country is experiencing a growing number of domestic cats and a gradual rise in animal health awareness. However, cats are often brought to the clinic only when they exhibit advanced symptoms such as excessive salivation, bad breath, bleeding from the mouth, or loss of appetite. Routine oral examinations and preventative care are also rare, leading to oral problems not being detected in their early stages **(Harvey, 2005 ; Bellows et *al.,* 2019).** Indeed, in most regions of the world, including Algeria, veterinary dental care is not usually given priority, and data regarding the prevalence and nature of feline oral diseases are still limited.

The current lack of information about these conditions in Algeria cats motivated this study. Therefore, a survey was conducted in order to determine the prevalence, clinical signs, and risk factors of oral conditions in cats in a veterinary office in Blida. The results of this survey will contribute to an improved knowledge of feline oral health within the region, and identify the importance of regular dental examinations and preventative care within veterinary practice.

BIBLIOGRAPHIC PART

CHAPTER I: ANATOMY AND CLINICAL EXAMINATION OF THE CAT'S ORAL CAVITY1.

1. Anatomy of the cat's oral cavity

1.1. The oral cavity

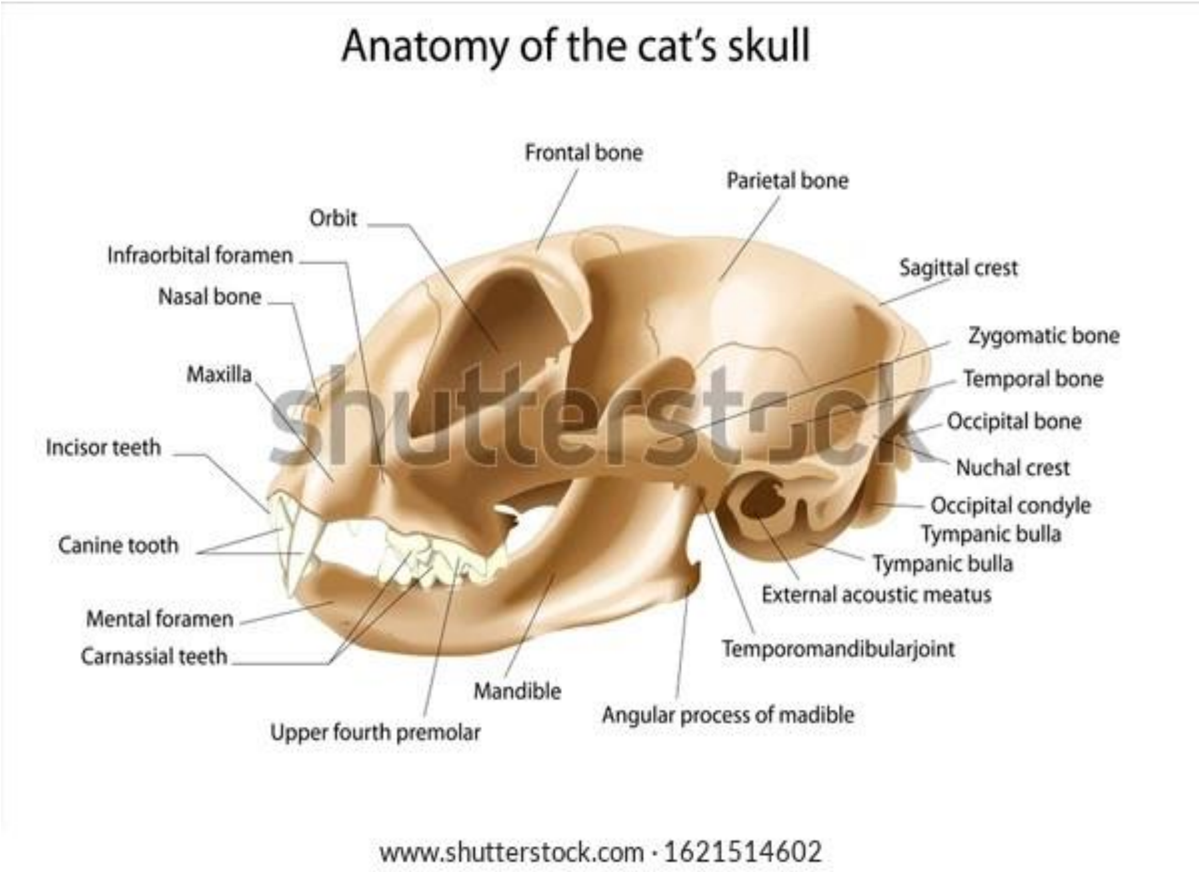
The cat mouth anatomy is defined externally by the lips and extends up to the entrance of the oropharynx. The essential organs or structures found in the cat's mouth cavity are the following:

- Lips
- Cheek
- The floor of the cat mouth – consists of the sublingual caruncle, sublingual fold, incisive papilla, incisive duct, and frenulum linguae
- The roof of the cat mouth – consists of palates (soft palate, hard palate), palatoglossal arch, palatoglossal muscles, palatine glands
- Teeth and gums
- Tongue
- Salivary glands **(Sonnet, 2023).**

1.1.1. Bones and joints

The upper jaw and face consist of the paired incisive bones, maxillae, palatine, nasal, zygomatic and temporal bones, and the unpaired vomer bone. The incisive bones carry the maxillary incisors, and the maxillae carry the maxillary canines, premolars and molars. The infraorbital canal contains the infraorbital artery, vein and nerve (sensory), and lies dorsal to the maxillary fourth premolar and first molar; the neurovascular bundle exits the canal at the infraorbital foramen about 1 cm dorsal to the maxillary third premolar.

The lower jaw consists of the paired mandibulae, carrying all the mandibular teeth. The mandibular canal contains the inferior alveolar artery, vein and nerve (sensory), which exit at the caudal, middle and rostral mental foramina. The mandibular symphysis, a fibrocartilaginous synchondrosis, connects the two mandibles rostrally. The condylar process of the mandible and the mandibular fossa and retroarticular process of the temporal bone form the temporomandibular joint **(Gracis, 2007; Reiter, 2012).**



<u>Figure 1</u> : Anatomy of cats skull **(Anonymous 1,2020)**

1.1.2. The oral mucosa

The oral mucosa **(Figure 2)** covers the surface of the mouth and offers protection during mastication and deglutition, the outer layer is composed of stratified squamous epithelium that may be keratinized. The submucosa is composed of loose connective tissue, salivary glands, blood vessels, muscle fibers, lymphatics, and salivary ducts. The submucosa of the palate is composed of dense collagen (**Bellows, 2010).**

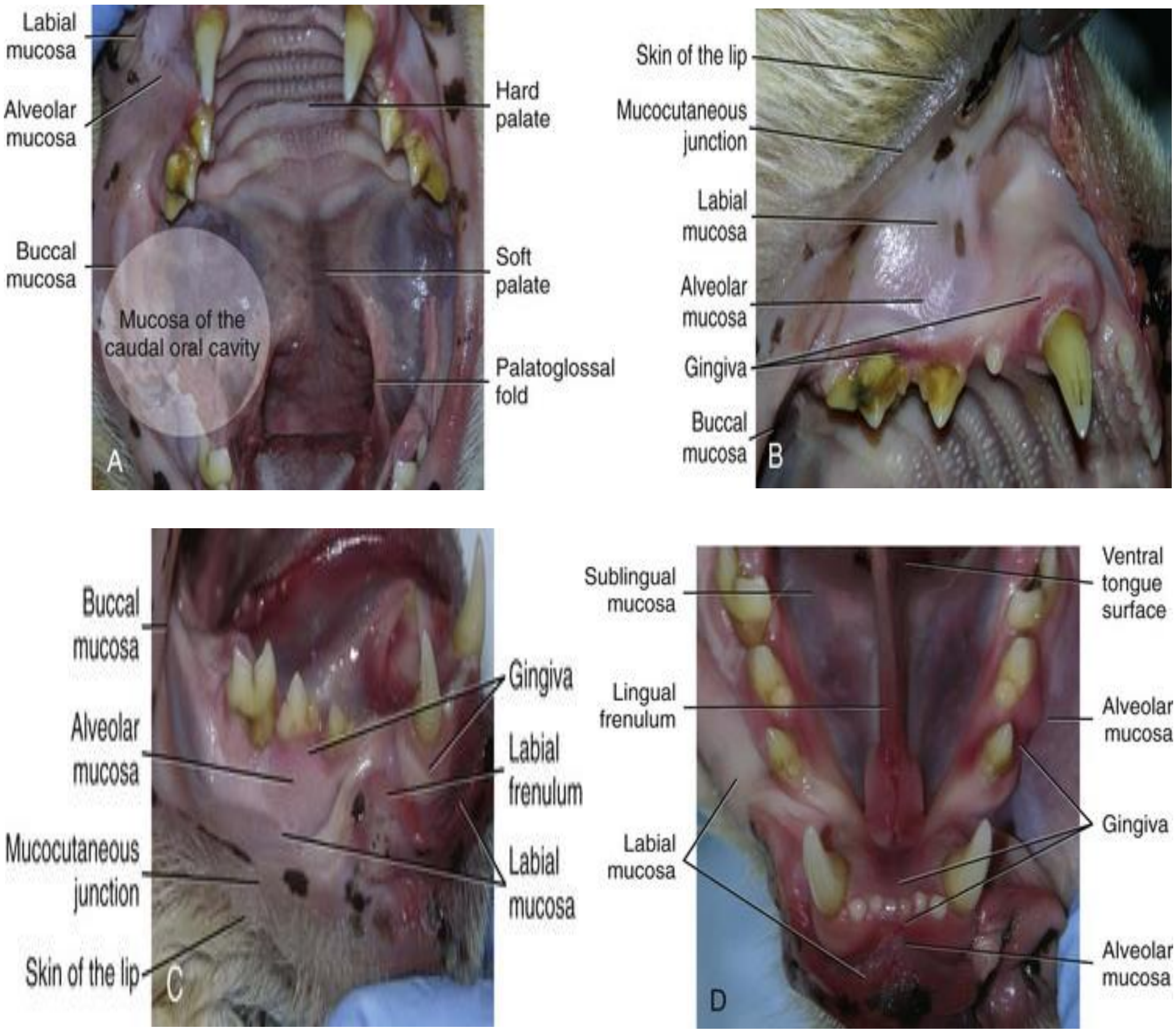


Figure 2: Oral mucosa of the roof of the mouth and caudal oral cavity **(A),** the upper jaw **(B),** the lower jaw **(C),** and the sublingual region **(D) (Reiter, 2012).**

1.1.3. Lips and cheeks

The lips are two cutaneous-mucosal folds that constitute the rostral wall of the oral cavity. The inner surface of the lips is made up of the oral mucosa, which joins the skin on the outer surface at the labial margins that contains long tactile hairs forming the whiskers **(Orsini and Hennet 1992)**. The upper and lower lips meet caudally at the level of the upper fourth premolars, forming the the commissure **(Orsini and Hennet 1992).** In cats, they are relatively small and not very mobile, unlike other species. However, they allow a large opening of the oral cavity, adapted to their carnivorous diet and predatory behaviors **(Dyce et *al.,* 2009).**

The cheeks form the lateral walls of the oral cavity. They are thin and small **(Orsini and Hennet 1992).** Their structure is similar to that of the lips: the buccinator muscle is covered by skin on the external surface, and the oral mucosa on the internal surface **(Dyce et *al.,* 2009).**

1.1.4. The hard and soft palates

- **Hard Palate:** The hard palate is the bony front portion of the roof of the mouth. It separates the oral cavity (mouth) from the nasal cavity (nose) and is composed of two bones: the palatine and maxillary bones that are covered by mucous membranes. The hard palate plays an important role in the ability to chew and swallow food. It provides a rigid surface against which the tongue can press to move food to the back of the mouth. It also helps in creating a seal that prevents food and liquids from entering the nasal passages during swallowing **(König and Liebich, 2012).**

- **Soft Palate:** The soft palate is the back, flexible part of the roof of the mouth. It consists of muscle and connective tissue and is covered by mucous membrane. The soft palate plays a vital role in both breathing and swallowing. It moves upwards during swallowing to prevent food from entering the nasal cavity. Additionally, it aids in vocalization and in managing airflow while breathing (**Landsbergn et *al.,* 2013).**

1.1.5. Tongue

The tongue constitutes the major part of the floor of the oral cavity. It is a mainly muscular structure with a free apex, allowing a multitude of movements (grasping food, grooming, drinking, panting, etc.). Its base is attached to the hyoid bone and its body is linked to the symphyseal region of the mandible **(Orsini and Hennet 1992).** It is covered, on its dorsal surface, by a lingual mucosa composed of different types of papillae, notably the conical papillae, which are very developed and hard in cats **(Dyce et *al.,* 2009).**

1.1.6. Salivary glands

Cats have three major types of salivary glands, each responsible for producing different components of saliva **(Abouelela et *al.,* 2022):**

- **Parotid glands**: located near the base of the ear, just below the zygomatic arch (cheekbone).

- **Submandibular glands**: found beneath the lower jaw, near the angle of the mandible.
- **Sublingual glands**: located beneath the tongue, on both sides of the mandible.
- **Minor salivary**: Cats also have several smaller salivary glands throughout the mouth, including those in the lips, cheeks, and palate. These glands produce a small amount of saliva that further aids in the lubrication and maintenance of oral hygiene.

1.2. Teeth

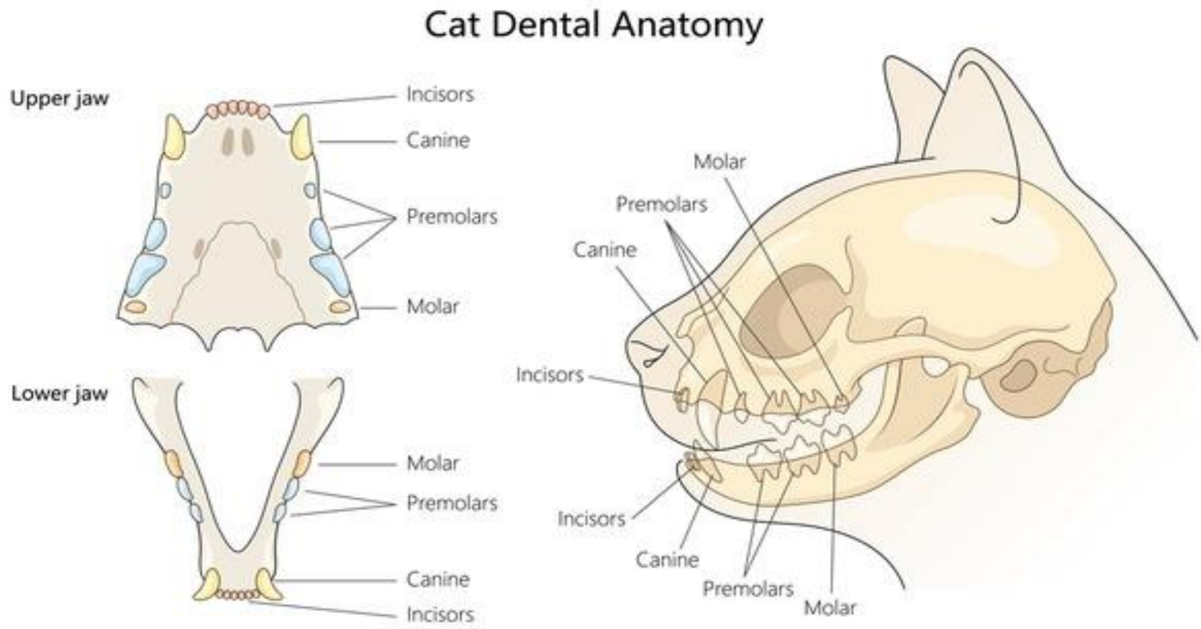
1.2.1. Dentition and dental formula in cats

Typical of the carnivore, the cat's teeth are modified appropriately to grab, pierce, and tear (cut) rather than for actual chewing. With the exception of dry food is "crunchy", cats do not chew or chew very little. There is no first premolars nor lower first or second premolars; molars are made up of a single tooth on each side, at the top and bottom. Because of this reduction of premolars and molars, the cat has the fewest teeth of all mammals common domestic servants whose dental formula is permanent:

2 (Incisors 3/3, Canines 1/1, Premolars 3/2, Molars 1/1) = 30.

The only permanent teeth that do not have deciduous predecessors are the four molars, so that the deciduous tooth formula is: **2 (I 3/3, C 1/1, P 3/2) = 26.**

Kittens usually start to have baby teeth during their third post-natal week, and their permanent teeth are all in place around six months of age. The only tooth with three roots is the upper (upper) P4. When the mouth is closed, the Upper sectoral tooth (P4) slides over the vestibular surface of the sectoral tooth (M1), producing an efficient scissor cutting action **(Hudson and Hamilton, 2010)**.



<u>Figure 3 :</u> Dentition and dental formula in cats **(Anonymous 2).**

1.2.2. Anatomy of cat teeth

Each tooth consists of two parts: the root and the crown. The crown is the part of the tooth that is visible above the gum, while the root is the part of the tooth that is located under the gum. The roots are attached to the socket of the jaw by a ligament called periodontal ligament. Some cat teeth have only one root so that others, such as the upper molars (called carnivorous teeth) have several roots. Each tooth is composed of the following structures **(Figure 4)**:

- **Pulp :** In the center of the tooth, the pulp is the vital and nutritious tissue of the tooth and contains most of the blood vessels and nerves of the tooth.
- **Dentin:** Dentin is less calcified than enamel; it covers the pulp of the tooth and is mainly composed of mineral salts and water. It is secreted by the odontoblasts, which are located on the surface of the dentin in the pulp tissue. Dentin makes up the bulk of the tooth and is responsible for the color white/ivory teeth **(Orsini and Hennet, 1992).**
- **Enamel**: Enamel is the outer coating of the crown of the tooth. It covers dentin and is the hardest tissue of the body. Cat enamel is less hard than dog and human enamel. It is usually pearly white in color and is composed of mineral salts and a small amount of water. The tooth enamel does not contain any nerves. However, the enamel of a cat's tooth is only 0.2 mm in size, and enamel damage exposes the dentin, which is very sensitive, which causes a lot of pain to the cat **(Orsini and Hennet, 1992).**

➢ **Cementum:** is an avascular bone tissue covering the the dentin along the root of the tooth, it is made up of mineral salts and water but is less calcified than enamel and dentin. The cementum deposition is continuous throughout the life. It is an important structure involved in the processes of resorption and repair **(Spielman, 2015).**

➢ **Periodontium:** The periodontium is made up of the tissues that invest and support the teeth, including cementum, periodontal ligament, alveolar bone, and gingiva or gum **(Fraser, 2003).**

• ***The periodontal ligament:*** fixes the tooth in its socket. It is composed of elastic collagen fibers that connect the cementum to the lamina dura of the alveolar bone. It also contains lymphatic and blood vessels, nerves, fibroblasts and mesenchymal cells **(Orsini and Hennet 1992).**

• ***Gum:*** is the part of the soft tissues of the mouth that covers the processes of the jaw bones and which surrounds the neck of the teeth. It is the first line of defense against mechanical aggressions due to chewing and bacterial invasion of the deep structures of the periodontium. Anatomically, it is divided into three regions: margin gingival or free, attached gingiva and interdental gingiva **(Fraser, 2003).**

• ***Alveolar bone :*** forms the jawbone and the cavities in which the roots extend teeth **(Fraser, 2003).**

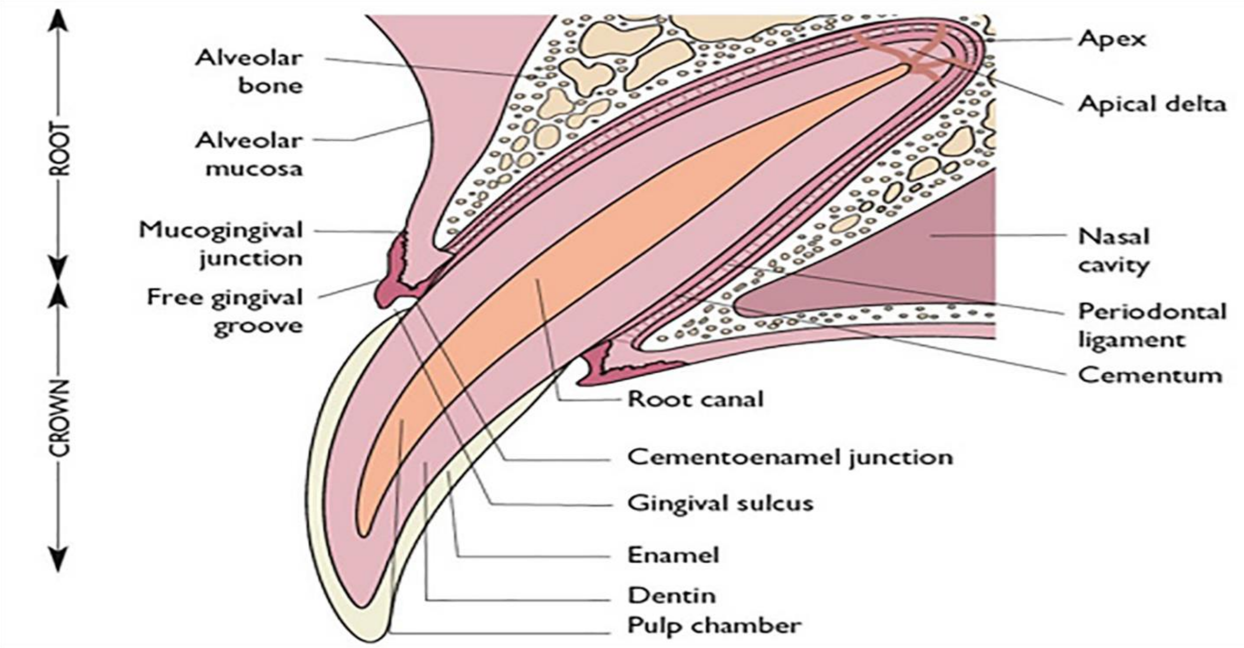


Figure 4: Anatomy of cat teeth **(Anonymous 3).**

2. Clinical examination of the oral cavity

2.1. Examination of the awake patient

2.1.1. Extra-oral examination

Visual observation and finger palpation of the cat's closed mouth allow to check facial symmetry and identify the presence of abnormal masses, swelling, etc. Palpation of the lymph nodes and salivary glands may reveal intraoral abnormalities. Palpation of the bony parts may reveal the presence of fractures. You have to try to open and close your mouth several times and look for any clicky or crackling sounds **(Kressin, 2009).**

2.1.2. Intraoral examination

The second part of the oral examination involves the visualisation of the oral cavity and internal structures while the patient is awake. Generally, this is performed in the examination room.

2.2. Examination of the patient under anaesthesia

An examination of the conscious cat may not always be possible, depending on the cat's temperament or degree of oral pain. It is helpful for an assistant gently to restrain the cat to allow the clinician to perform the intraoral examination. However, if the cat is strongly resisting it may be necessary to move on to the oral examination under general anaesthesia.

2.3. Clinical examination procedure

Initially with the mouth closed and teeth together, lift the upper lips and observe for the following:

➢ **Occlusion** Does the cat have normal occlusion (**Figure 5**) or a malocclusion (**Figure 6**)?

– do the incisors line up? Check that the incisal edges of the lower incisors rest on the cingulum of the upper incisor teeth and that there is no midline deviation on a front (rostral) view.

– Canine occlusion – is the mandibular canine sitting equidistant in the space between the maxillary third incisor and canine tooth?

– Premolar/molar relationship – the maxillary premolar/molar teeth should be lateral (buccal) to the mandibular premolar/molar teeth.

– Carnassial relationship – is there any traumatic occlusion and gingival irritation?

➢ **Number of teeth** – does the kitten have 26? The adult cat 30? When counting the teeth observe for extra (supernumerary) teeth, persistent deciduous teeth and missing teeth.

➢ **Tooth position** – is there any crowding of teeth or abnormally positioned teeth?

➢ **Inspection of intraoral structures :** hard and soft tissue structures should follow, focusing on the dentition, lips, gingiva, mucosa, tongue, hard and soft palate, incisive papilla, hard palate rugae, tonsils, palatine arches, fauces (lateral walls of the oropharynx, located medial to the palatoglossal folds) and sublingual tissues **(Clarke and Caiafa, 2014).**

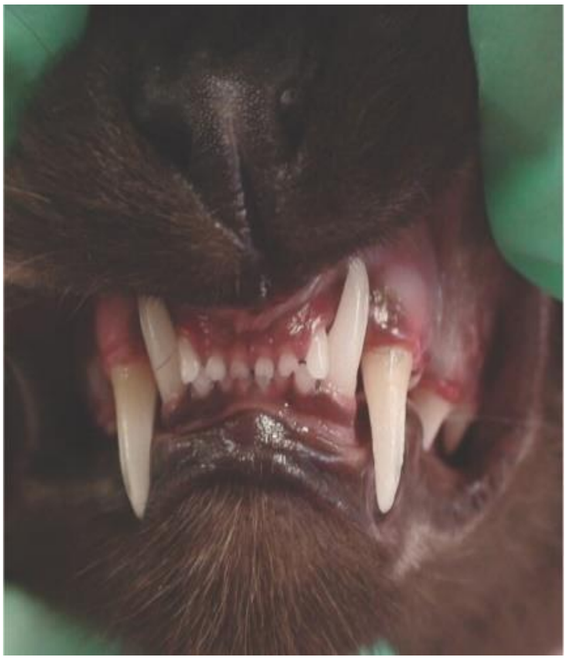


Figure 5: Front (rostral) view showing normal occlusion **(Clarke and Caiafa, 2014)**

Figure 6 : Lateral view showing malocclusion **(Clarke and Caiafa, 2014)**

2.4. Radiography

The use of X-rays is important to have a complete diagnosis. It is important to clean teeth from tartar as it is radio-dense and can lead to false interpretations. Some pathologies such as odontoclastic resorptive lesions do not can only be detected in the terminal stage of lesions without an X-ray**. (Gorrel, 2008).**

CHAPTER II: ORAL PATHOLOGIES IN CATS

1.Congenital oral diseases

Congenital oral diseases in cats include various conditions that may occur as a result of developmental problems during pregnancy. The conditions can lead to structural defects of the oral cavity, including the teeth, gums, and supporting structures.

1.1. Malocclusion

The general definition of malocclusion is any deviation from normal occlusion **(AVCD, 2018).** It may be purely cosmetic or cause occlusal trauma **(Niemiec et *al.,* 2018).** Three factors are considered: occlusion itself, position, size and shape of each tooth and the number of teeth present/missing **(Roux and Howard, 2010)**

Malocclusion of the cat is a severe feline dental disease because it entails misalignment of the teeth that may potentially cause trauma within the mouth, as well as the onset of secondary disease. It may be either congenital in nature due to genetic susceptibility or acquired secondarily to diverse etiologies like trauma, or dental drift **(Ziemann et *al.,* 2023).**

It is worth noting that malocclusion is also common in some breeds, such as brachycephalic breeds, where by normal occlusal relationships-that is, contact and alignment of maxillary and mandibular teeth-are interfered with. This interference will normally result in impingement of mandibular soft tissues by maxillary fourth premolars and the development of conditions like pyogenic granulomas **(Ziemann et *al.,* 2023).**

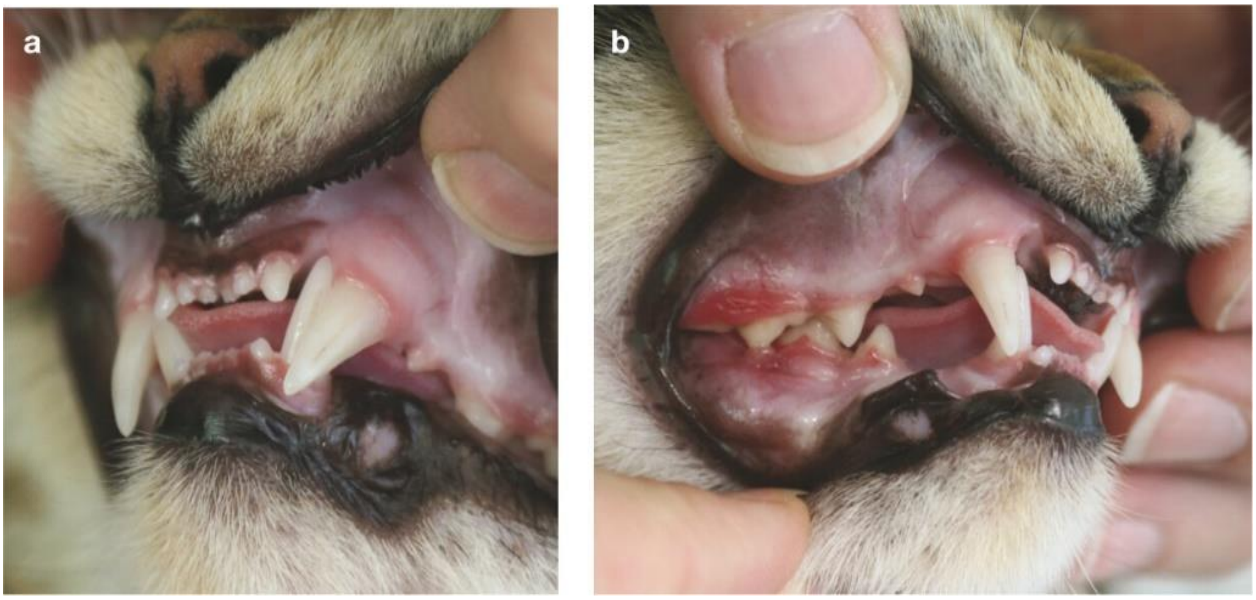


Figure 7: Mild case of mandibular distocclusion **(Milella, 2014).**

1.2. Hypodontia

Hypodontia in cats is defined as the loss of one or several teeth and can seriously affect their oral health as well as general health.

The effects of such anomalies are not aesthetic, but involve features such as occlusal fault and malalignment due to the absence of teeth. Intraorally, hypodontic cats can present with retroclined or over-erupted incisors, which will complicate any underlying orthodontic problem. The missing teeth also lead to a change in the way adjacent teeth occlude and can result in spacing or rotations that would be treated or need to be addressed with dental care.

This renders it vital for cat and dog owners as well as veterinary professionals to routinely check up on the dental health of cats that have hypodontia, with an aim towards preventing the onset of further issues and ensuring functionality **(Husam Al-Ani et *al.,* 2017).**

2. Periodontal disease

Periodontal disease is one of the most common among the health problems of cats, targeting mainly the teeth's supporting tissues **(Soltere Rivera et *al.,* 2023).** The aetiology of periodontal disease is multi-factorial because it involves interaction between the host immune response and sub-gingival plaque bacteria **(G O'Neill et *al.,* 2023).**

The disease is a range of conditions that start with gingivitis, which is an inflammation of the gingiva. It is mostly reversible at this point upon effective treatment by the veterinarian.

Nevertheless, as the inflammation develops to periodontitis, it becomes more serious, leading to possible irreversible tissue damage **(Soltere Rivera et *al.,* 2023).**

2.1. Etiopathogenic and clinical study

2.1.1. Dental plaque

Dental plaque is a soft, whitish to grayish, opaque deposit. It is initially deposited in the supragingival region but rapidly extends to the gingival margin and then becomes subgingival (in the gingival sulcus). Deposition of dental plaque occurs in 3 stages **(Perry and Tutt 2015):**

- Stage 1: Deposition of dental pellicle.

During the first few hours following tooth eruption or scaling, a dental pellicle is laid down on the tooth surface. The glycoprotein deposit is formed from the materials of saliva, sulcular fluid, and cellular bacterial as well as host debris. The pellicle can be considered as a lubricating barrier that covers the teeth **(Bernimoulin, 2003).**

- Stage 2: Colonization of dental pellicle by bacteria.

Bacteria colonize the pellicle after some hours. Early colonizers include gram-positive aerobic pathogenic organisms that possess specialized adhesive structures such as fimbriae **(Bernimoulin, 2003).**

- Stage 3: Plaque maturation.

There is a rise in attached species and colonization by other species. There are several species of bacteria found in mature dental plaque. As the biofilm thickens, oxygen supply is decreased, favoring the growth of anaerobic gram-negative bacteria **(Bernimoulin, 2003).**

2.1.2. Dental calculus (tartar)

Tartar is a tough dental deposit which is caused by the mineralization of plaque. Minerals present in tartar are derived from saliva and sulcular fluid **(Jepsen et *al.,* 2011).**

Like plaque, tartar can be supragingival or subgingival, and all the tartar deposits should be removed while scaling since they create a site of choice for the deposition of plaque **(Perry and Tutt, 2015).**

Tartar is not the causative agent of periodontal disease but an aetiological factor. It produces a rough surface for bacteria to attach and allow the accumulation of pathogenic plaque. The severity of periodontal disease should thus not be quantified in terms of dental calculus. Nevertheless, an abnormal amount of tartar is associated with minimal gingival inflammation and vice versa **(Perry and Tutt, 2015).**

2.1.3. Gingivitis

Gingivitis is inflammation of the gums **(Icatcare, 2025)**. It results from dental plaque microorganisms **(Murphy et *al.,* 2019).** It's extremely common, found in cats of all ages, and varies widely in severity **(Icatcare, 2025).**

- Mild gingivitis– is very common in cats of any age. It may develop quickly within 48 hours, when plaque formation might have already been initiated **(icatcare, 2019).**

- Moderate gingivitis – also very common. Sometimes gum recession can be seen at this stage, as can gingival "pockets"; this is where the gum has started to separate from the tooth, providing a perfect site for food, bacteria, plaque, and tartar to accumulate. If tartar and gingival pockets haven't already formed, again, it may be possible to reverse moderate gingivitis with dental home care **(Icatcare, 2025)**.

- Severe gingivitis is very severe in a cat with lots of plaque and tartar on the teeth. The cat will have hypersalivation, halitosis, dysphagia, and some bleeding from the mouth at times. Gum recession is normal as well but is not always visible because the gums are very inflamed. Gum pockets can be evident and are usually more than in moderate gingivitis. Severe gingivitis usually cannot be treated by brushing, and mouths are usually too painful to brush. The cat will usually require general anesthetic for scaling and polishing. In severe gum recession, unless the tooth root is covered, there may be a need to have the tooth extracted and regular brushing afterwards is most recommended to prevent a re-occurrence of the disease **(Icatcare, 2019).**

2.1.4. Periodontitis

Periodontitis is an adult periodontal disease characterized by chronic inflammation and destruction of the tooth-supporting structures, such as the gingiva, periodontal ligament, cementum, and alveolar bone **(Ingham and Gorrel 2001; Kortegaard et *al.,* 2008).**

The most common clinical signs of periodontitis are halitosis, increased salivation, dysphagia, pain on chewing and bleeding gingiva. Severe cases of attachment loss and bone loss can lead to exposure of furcation region of multirooted teeth **(Wiggs and Lobprise, 1997).** Attachment loss is measured either with probing of the clinical attachment level or using radiological determination of the distance of the alveolar margin from the cementoenamel junction relative to the length of the root **(Niemiec et *al.,* 2018).**

Stages of periodontal disease (PD) describe the severity of the disease **(Figure 8) (Niemiec et *al.,* 2018).**

Normal (PD0) : no clinical evidence of gingivitis or periodontitis.

Stage 1 (PD1) : only gingivitis is present, alveolar margin is normal and no attachment loss exists.

Stage 2 – early periodontitis (PD2) : there are early radiologic signs of periodontitis and less than 25% of attachment loss.

Stage 3 – moderate periodontitis (PD3) : there is 25-50% attachment loss.

Stage 4 – advanced periodontitis (PD4) : there is more than 50% attachment loss **(Niemiec et *al.,* 2018).**

2.2. Treatment

The main goal of periodontal therapy was to remove all the calculus and plaque materials lying over the teeth **(Klein, 2000).**Dental ultrasonic scaling was applied to the teeth surface first to remove the supragingival plaque and calculus, and then a subgingival curette was used to remove the subgingival plaque under the gingiva **(Grove, 1998).**

Oral Surgery (tooth extractions) might be the only choice of treatment if the surrounding tissue of the tooth is very damaged and tooth mobility exists **(Niemiec, 2013).**

Appropriate analgesic medications are indicated in most cases. In evaluating the most common bacteria associated with dental infections, the gram-positive aerobes include *Staphylococcus* and *Streptococcus* and the gram negative aerobes include *Pasterella* and enterics such as *E. coli*. The gram-positive anaerobes include *Clostridium* and *Peptostreptococcus* and the gram negative anaerobes include *Porphyromonas* and *Prevotella*. Bacteroides, the first choice antimicrobials include amoxillin, clavulanic acid and clindamycin. Topical doxycycline gel can also be very useful in treating advanced periodontal disease with periodontal pockets. For resistant or severe chronic infections, metronidazole is recommended in combination with clindamycin or amoxicillin-clavulanic acid or a fluoroquinolone (ciprofloxacin, difloxicin, enrofloxicin, marbofloxacin, orbifloxacin) **(Kenneth, 2007).**

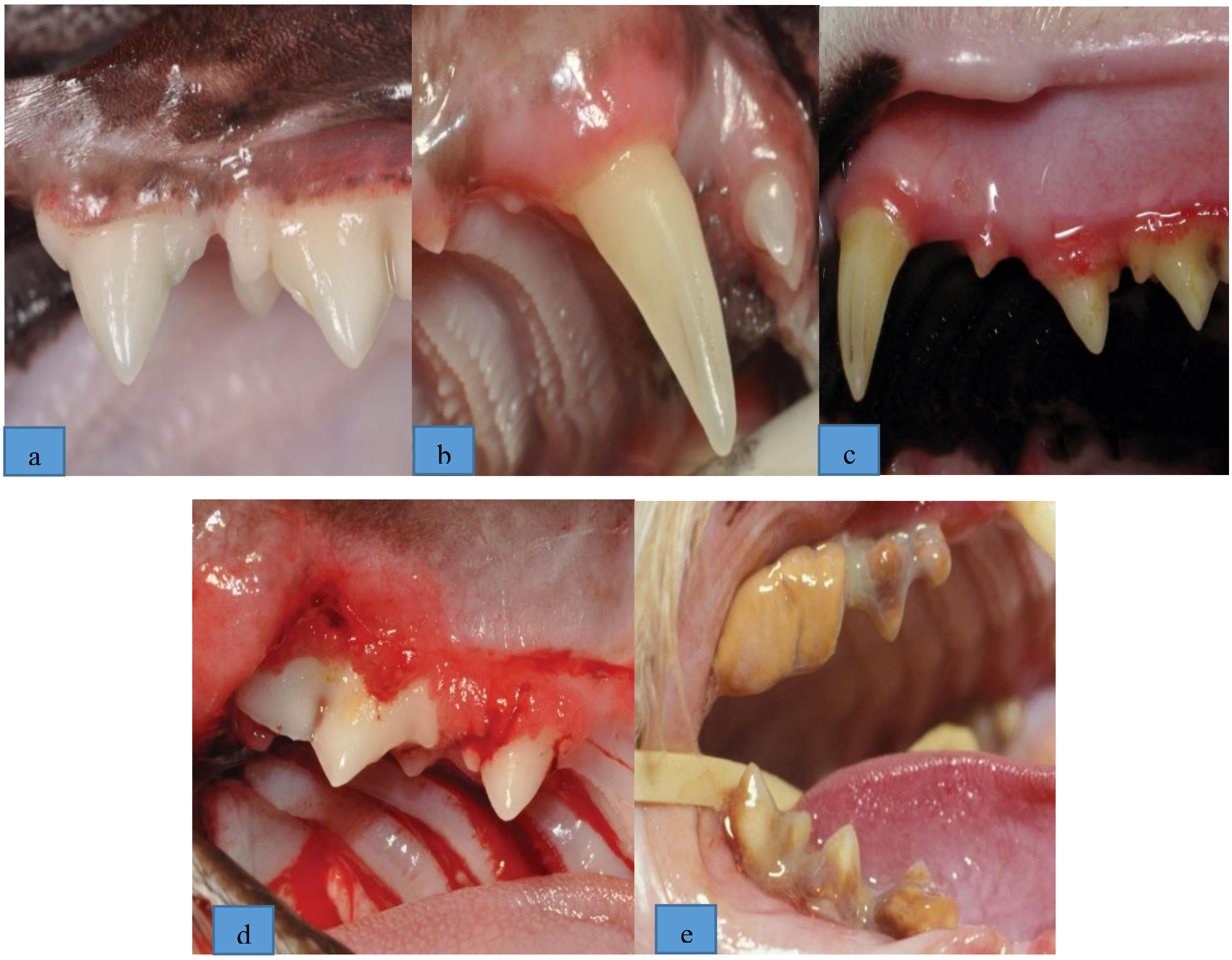


Figure 8 : Staging of periodontal disease (a) Stage 0 - Clinically normal : healthy-looking teeth. (b)Stage 1 -Gingivitis only : your cat may have bad breath, some tartar build-up, and reddening of the gums. (c) Stage 2 - Early Periodontitis : you may notice their breath smelling stronger, redder gums, more tartar, and some teeth discoloration. (d) Stage 3 - Moderate Periodontitis. This stage is characterized by very bad breath, a large build-up of tartar especially on molars, very discoloured teeth and very red gums. Your cat may favour chewing on one side. (e) Stage 4 - Advanced Periodontitis : you will likely notice your cat has severe bad breath and may show signs of pain, such as being head shy or dropping kibbles when they chew.

3. Feline Odontoclastic Resorptive Lesions (FORL)

Are a significant dental disease in cats characterized by progressive resorption of the dental hard tissues. This condition is usually described by painful lesions that are frequently related to dental loss and is most prevalent among adult cats.

3.1. Clinical sings

The FORL has the potential to be responsible for a variety of oral disorders, including loss of appetite, oral pain, gingivitis, and dental plaque. The teeth that are usually affected by lesions are the premolars and molars, and the lesions are multiple and affect similar groups of teeth **(Pistor, 2023).**

3.2. Diagnostic

Intraoral radiography is a crucial component of FORL diagnosis, as it enables veterinary professionals to see the extent of the resorptive lesions and to verify the diagnosis, especially when clinical signs are vague or nonspecific. Without such imaging, appropriate treatment plans can be overlooked or misdiagnosed, possibly impacting the quality of life of the cat **(Pistor, 2023).**

3.3. Treatment

Treatment of FORL usually requires personalized care depending on the character of the lesions and the feline patient's health status. Early detection of this condition can allow for prompt intervention, including surgical removal of involved teeth, which not only alleviates pain but also improves the cat's comfort in eating. Therefore, frequent dental check-ups and radiographic examinations should be given priority by pet owners and veterinarians to avoid the advancement of FORL and protect feline oral health **(Pistor, 2023).**

Figure 9 : Odontoclastic resorption lesions **(Hennet and Boutoille, 2013)**.

4. Stomatitis

Feline stomatitis is an intense and painful inflammation of the gums and mouth of the cat. It is characterized by the development of ulcers in the mouth in most cases. The ulcers may affect the back of the throat, tongue, lips, and gums and oral mucosa **(O'Hara, 2020).**

4.1. Causes and clinical signs

There is no one cause of stomatitis in cats. The most significant single cause of stomatitis in cats given is dental disease (more precisely periodontal disease). In the majority of cases, the cause is thought to be immune-mediated, i.e., the cat's immune system assaults its own tissues as reaction to bacteria in the mouth. Other infections like bartonellosis or viral infections can be linked with stomatitis like feline leukemia virus (FeLV), feline immunododeficiency virus (FIV) and Calicivirus **(O'Hara, 2020).**

Clinical signs include severe oral pain with reduced food prehension ability, ptyalism, mandibular lymphadenopathy**,** lack of grooming**,** dysphagia, pawing at the mouth, anorexia, crying out in pain when eating or yawning, unkempt appearance, halitosis, loss of appetite, depression, weight loss and (in severe cases) even dehydration**.** They can become very debilitated and because of the unknown pathogenesis of the disease and slow course, it is currently the most difficult to treat**.** Therefore, euthanasia is sometimes considered **(Lyon, 2005 ; Niemiec, 2012)**

4.2. Diagnostic

Oral infections and ulcers in cats are diagnosed beginning with the history of your cat. Physical examination is done on the cat's mouth to check the extent of ulceration. Sedation will be needed during a physical examination. Physical examination for the visual detection of inflammation and mucosal ulcers will provide the veterinarian with the diagnosis **(Kucera, 2019).**

4.3. Treatments

Treatment for feline stomatitis varies depending upon the severity and progression of the disease. Because there is no recognized definitive etiology for feline stomatitis, no specific treatment exists for this condition **(Kucera, 2019).**

In general, there are 2 approaches to the treatment: surgical and medical, often combined. However, on its own, medical treatment typically does not have favorable long-term outcomes and has been shown to only provide temporary improvement **(Jennings et *al.,* 2015).** Surgical treatment has demonstrated the best long-term outcome, with full-mouth (FME) or partial-mouth extractions (PME) when including premolar and molar teeth only**.** Approximately 80% of the cats submitted to dental extractions, FME or PME, obtained significant improvement, with some achieving complete remission of the clinical signs, with or without the need for combined medical treatment **(Reiter et *al.,* 2019).**

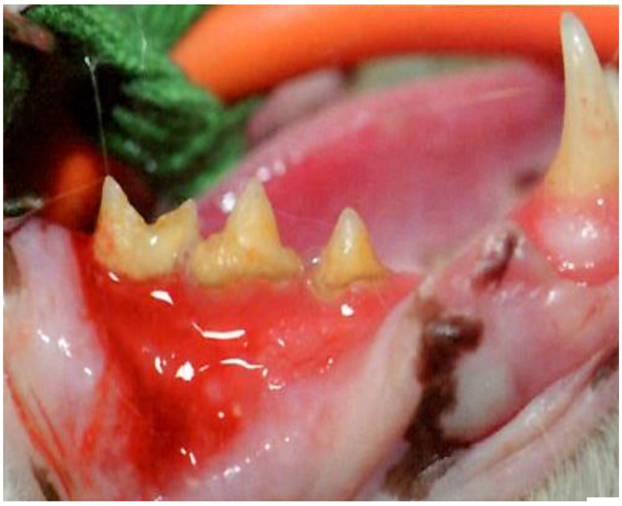


Figure 10 : Mandibular alveolar stomatitis **(Hennet and Boutoille 2013).**

Figure 11: Ulcero-proliferative lesions of caudal stomatitis **Hennet and Boutoille 2013).**

5. Dental fractures

Feline's dental fractures are a serious issue in veterinary dentistry, and prompt in most cases from head trauma or other traumatic injuries. Feline mandibular fractures in particular have high incidence, in light of the intrinsic vulnerability of a cat's dental structure to blows to the head (**Freeman and Southerden, 2023**).

5.1. Clinical signs and diagnostic

Clinical practitioners must determine the type of fracture, i.e., where it is and if it has concomitant injuries, to determine the treatment pathway. Notably, dental fractures must be evaluated for differential diagnoses such as feline tooth resorption, which have similar clinical manifestations, such as oral pain, gingivitis, and loss of appetite. A thorough intraoral radiographic examination is necessary in cases with poor transparency to determine the true status of the dental tissues and to aid an effective treatment plan **(Pistor, 2023).**

5.2. Treatment

In dental fracture cases, the treatment methods can range from non-invasive techniques to advanced surgical interventions. Utilization of cutting-edge technology, such as 3D printing, has been an exciting field for precise reconstruction of mandibular fractures **(Pistor, 2023).**

6. Eosinophilic granuloma complex (EGC)

It is a descriptive term for different disease manifestations characterized by infiltration of eosinophils into the skin and/or oral tissues, causing raised, typically ulcerated lesions **(Soltero-Rivera, 2023).**

6.1. Causes

The cause of ECG in dogs and cats remains unknown and the clinical presentation of these may be diverse. Suggested causes range from ectoparasites, environmental allergens, bacterial infections, to autoimmunity, but these investigations have largely examined the lip ulcer manifestation. Feline herpesvirus-1 (FHV-1) has also been implicated in EGC. Finally, pythiosis, a non infectious but potentially life-threatening disease caused by the fungus *Pythium insidiosum*, though rarely described in the cat, has been reported to cause a severe multifocal coalescing eosinophilic granulomatous oral inflammation **(Soltero-Rivera , 2023).**

6.2 Clinical signs

The literature reports that feline oral EGC can be clinically recognized by the appearance of white to yellow pinpoint spots on the surface of proliferative or ulcerated lesions due to mineralization of its collagen and eosinophil-derived proteins. The lesions can be seen in the tongue, buccal mucosa, gingiva, lip and palate. The clinical presentation of the disease in the oral cavity can lead to oral pain, loss of appetite, and oral, pharyngeal, and/or respiratory difficulty in eating, drinking, and breathing thus affecting their quality of life **(Soltero-Rivera, 2023).**

6.3. Diagnostic

Although lesions can be screened by cytology and histopathology for the establishment of eosinophilic disease diagnosis and the ruling out of other differential diagnoses of similar clinical appearance to these lesions, such as food allergy, squamous cell carcinoma, feline chronic gingivostomatitis, or other granulomatous, immune-mediated, and autoimmune diseases. EGC lesions are histopathologically diagnosed by the presence of a large number of eosinophils **(Soltero-Rivera, 2023).**

6.4. Treatment

The therapy includes hypoallergenic diet trial, ectoparasite treatment, systemic steroids or other immunosuppressants antimicrobials and surgery in certain cases. The success of these therapies, however, has been inconsistent and, at times, temporary **(Soltero-Rivera, 2023).**

Figure 12 : Lingual granuloma in the Feline Eosino-granulomatous Complex **(Niemiec, 2008).**

7. Oral tumors

Feline oral tumors are a significant component of veterinary oncology, with feline oral squamous cell carcinoma (FOSCC) being the most prevalent malignant neoplasm in this species. FOSCC is characterized by its aggressive nature, rapid growth rate, and local invasiveness, leading to extensive destruction of surrounding oral tissues **(Sequeira, 2022).** Despite advances in veterinary medicine, the prognosis for such cats is poor, with survival rates barely improving over the decades. Therapeutic maneuvers like surgery, radiation, and palliation often do not yield long-term benefits, reinforcing the necessity of identifying the biology of the tumor and risk factors involved. Research has attempted to define many etiologic factors involved in FOSCC, even though many are poorly defined. Environmental, dietary, and genetic factors have been under investigation but no causative agents have been well-defined **(Renzi, 2019).** The understanding of FOSCC not only is the basis for improved clinical management in felines but also has implications for human oncology because FOSCC has been proposed as a model for spontaneous head and neck squamous cell carcinoma (HNSCC) in humans **(Renzi, 2019).**

<u>Figure 13</u>: Oral squamous cell carcinoma in cat mandible **(Liptak, 2023).**

EXPERIMENTAL PART

Objectives of the study

This study aims to determine the prevalence of feline oral conditions in a veterinary office located in Blida, to identify associated clinical signs, to evaluate the risk factors that may have an influence on certain diseases, and also to determine the treatment which was applied to treat the animals.

MATERIALS and METHODS

1. Area and period of the study

This study was conducted over two months period from July 1st to August 30 2024 at a veterinary clinic located in the wilaya of Blida.

2. Materials

2.1. Biological (animals)

A total number of of 470 male and female cats of different ages and breeds were examined for oral diseases. The animals included in this study were those diagnosed with clinical signs of oral diseases (oral pain, halitosis, anorexia, tartar…) and whose owners completed the questionnaire provided face-to-face.

2.2. Non-biological

2.2.1. Materials used for the clinical exmination and the treatment

For clinical examination, treatment and case monitoring, we used the following equipment :

- Stethoscope
- Thermometer
- Disposable syringes
- Scissors
- Tweezers
- Dental forceps
- Ultrasonic scaler.

2.2.2. Drug substances

The products used are summarized in **table 1 and figure 14** below:

Table 1: Drug substances used in the experimental study.

Type of molecule	Trade name	Active ingredient	Dosage	Route of administration
Antibiotic	SHOTAPEN®	Benzyl penicillin	1 -2 ml/25 kg	IM / SC
Corticosteroid	DEXA-JECT®	Dexamethasone phosphate: 2 mg/ml	0.1 mg/kg	IM
Antiseptic	BERRALAB BLEU DE METHYLENE 1%	BLEU DE METHYLENE	62.5mg	Oral
Anesthesia	ZOLETIL 100®	tilétamine: 50 mg/ml zolazépam: 50 mg/ml	9.7-11.9mg/kg	IM/IV

Figure 14 : Drug substances used in the experimental study **(personal photo).**

3. Methods

3.1. Data collection procedures

Demographic data and risk factors were collected through questionnaires **(Appendix 1),** using face-to-face with the cats' owners. The following data were acquired:

- Identification of the cat (cat's name, gender, age, breed, body weight).

- Reason for consultation and clinical signs observed.

- Cat's lifestyle and environment (outdoor access, dental hygiene, vaccinations, hunting behavior, type of diet and the owner's knowledge of oral diseases).

Every questionnaire was given a number and the data were entered in Microsoft Office Excel for statistical analyses.

3.2. Clinical exmination

3.2.1.Anamnesis

Particular importance was given to the condition of the oral cavity, the animal's diet, and the presence of oral and dental symptoms**.**

3.2.2. General examination and evaluation of vital functions

Detailed clinical examination of each patient was carried out. Visual inspection was applied, while body temperature, heart rate (pulse), respiratory rate, mucous membrane color and Capillary Refill Time (CRT) were carefully recorded. Examination of different systems and organs was also applied.

3.2.3. Special examination (Examination of the oral cavity)

Veterinarian performed awake intraoral examination. It is a visual and physical examination of the mouth**,** including : teeth**,** gums (gingiva)**,** tongue**,** palate (roof of the mouth), inside of the cheeks, throat.

The oral cavity was evaluated as thoroughly as the pet allowed to do it. Attention was done to whether any gingivitis, stomatitis, plaque, calculus, persisting deciduous teeth, missing or mobile permanent teeth, dental defects, or malocclusions were discovered.

For each case, we collected clinical information as much as possible to establish the diagnosis. Medical follow-up was carried out after the clinical diagnosis, and hospitalization was required in severe cases.

<u>Figure 15</u>: Examination of the oral cavity **(personal photo).**

3.3. Surgical treatments

3.3.1. Descaling and polishing

Supra- and subgingival plaque and calculus are removed with mechanical scaling and hand scaling with different curettes. Dental ultrasonic scaling was applied to the teeth surface first to remove the supragingival plaque and calculus, and then a subgingival curette was used to remove the subgingival plaque under the gingiva. After scaling, the teeth are polished to smooth over the little scraches which may have been created by scaling.

<u>Figure 16</u> : Dental scaling device **(personal photo).**

3.3.2. Dental extraction

Tooth extraction **(Figure 17)** has been performed in some conditions:

-Tooth severely damaged or decayed.

- Tooth infected and cannot be saved by treatment.

- Teeth that may caused crowding or alignment problems, a source of chronic pain or gum disease.

-In cases of severe periodontal diseases.

Figure 17 : Dental extraction **(personal photo).**

Dental extraction was performed in clean oral environment after rinsing by an antiseptic solution (CHLORHEXIDINE) and using in some cases anesthesia **(**ZOLETIL 100®).

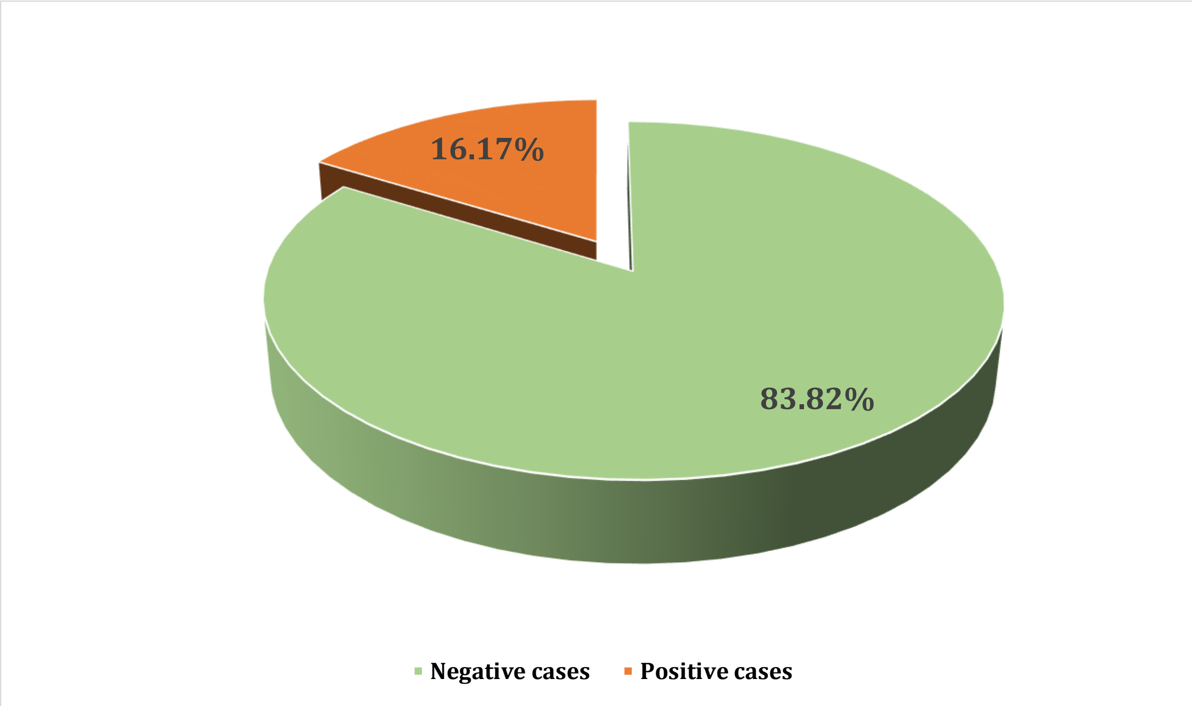
4. Statistical analysis

Data analysis was performed using Microsoft Excel 2010 and Statistical Data for Social Science (SPSS) 26 © IBM Copyright, IBM Corporation and its licensors 1989.2019 IBM, USA. The comparison of the distribution of different populations were analysed by using Chi-Square of homogeneity and independence test with the level of significance P <0.05.

RESULTS

1. Overall prevalence of feline oral conditions

From 470 cats inspected in veterinary office, 76 patients were diagnosed with oral affections with a prevalence of 16.17% **(Figure 18).**



<u>Figure 18</u>: Prevalence of feline oral conditions recorded in our study.

2. Reasons for consultation

The different reasons for consultation for the 76 cats that were diagnosed with oral diseases are summarized in the **table 2**.

The most common reasons for consultation were loss of appetite and weakness (32.05%) and oral problem (30.26%).

Table 2: Reasons for consultation of feline cases received at the veterinary office.

Reasons for consultation	**Number of cases (N°)**	**% of total populations**
Loss of appetite and weakness	25	32.89
Oral problem	23	30.26
Ocular problem	8	10.52
General consultation and vaccination	4	5.26
Trauma	4	5.26
Respiratory problem	4	5.26
Urinary problem	3	3.94
Genital problem	3	3.94
Digestive problem	2	2.63
Total	**76**	**100**

3. Different oral conditions recorded

3.1. Frequencies of different oral conditions recorded separately

Of the 76 diagnosed cases, the results showed that most of the cats in this study were suffering from gingivitis **(Figure 20)** (60.52%), followed by stomatitis **(Figure 19, 20)** (44.73%) and periodontitis **(Figure 19, 21, 22)** (31.57%). Eosinophilic granuloma complex **(Figure 23)** were present in 5 cats (6.57%), while very low frequencies were diagnosed for jaw fracture **(Figure 24)** and mouth obstruction by chicken bone with 3.94% and 2.63% successively, and also for hypodentia **(Figure 25)**, prognatism **(Figure 26)** and tooth caries with 1.31% for each clinical finding **(table 3).**

Table 3 : Number and frequency of oral conditions recorded separately in examined cats.

Clinical finding	N° of cats affected	% of cats affected
Gingivitis	46	60.52
Stomatitis	34	44.73
Periodontitis	24	31.57
Eosinophilic granuloma complex	5	6.57
Jaw fracture	3	3.94
Mouth obstuction by chicken bone	2	2.63
Hypodentia	1	1.31
Prognathism	1	1.31
Tooth caries	1	1.31

Figure 19 : Periodontal diseases and stomatitis **(personal photo).**

Figure 20 : Ulcero-proliferative lesions of stomatistis in tissues lateral to palatoglossal folds plus maxillary gingivitis and alveolar mucositis both sides **(personal photo).**

Figure 21 : Advanced periodontitis **(personal photo).**

Figure 22 : Tartar and periodontal disease **(personal photo).**

Figure 23 : Eosinophilic granuloma complex **(personal photo).**

Figure 24 : jaw fracture **(personal photo).**

Figure 25 : Hypodentia **(personal photo)**.

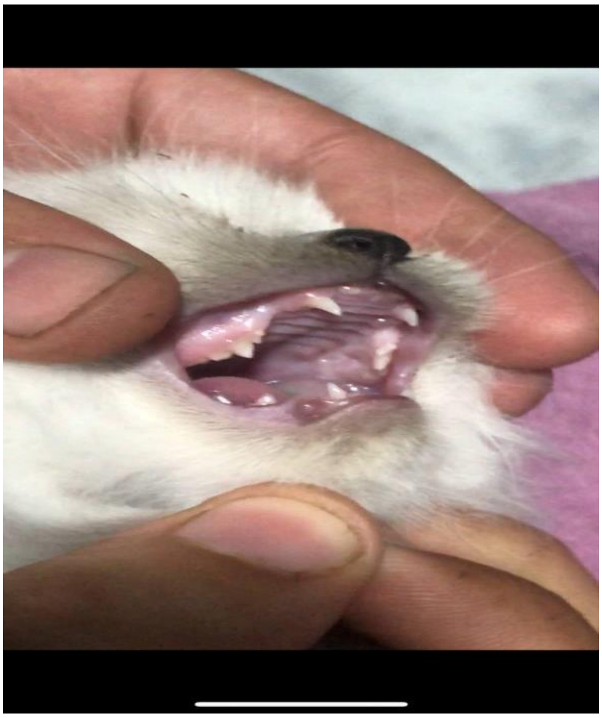


Figure 26 : Prognathism **(personal photo).**

3.2. Distribution of clinical cases among the cats examined

We recorded on all cats, either the presence of a single pathology per animal, which was found on 40 cats (52.63%), or the association of two pathologies, which are observed in 31 cats (40.78%), or also the association of three pathologies recorded in only 5 cats (6.57%)**.**

Periodontal diseases (gingivitis alone or periodontitis alone or gingivitis + periodontitis) were the most common pathologies and were found either alone in 36 cats (47.36%) or associated with other pathologies especially stomatitis in 32 cases (42.10%).

With the exception of two cases, stomatitis was always associated with periodontal pathologies in 32 cases (42.10%) **(Table 4).**

Table 4 : Distribution of clinical cases among the 76 cats examined.

	Clinical findings	N° of cats	%
Presence of one pathology	Periodontal disease	36	47.36
	Jaw fracture	1	1.31
	Mouth obstuction by chicken bone	1	1.31
	Prognathism	1	1.31
	Hypodentia	1	1.31
Total		**40**	**52.63**
Association of two pathologies	Periodontal disease + stomatitis	27	35.52
	Stomatitis + eosinophilic granuloma complex	2	2.63
	Periodontal disease + Jaw fracture	1	1.31
	Periodontal disease + mouth obstuction by chicken bone	1	1.31
Total		**31**	**40.78**
Association of three pathologies	Periodontal disease + stomatitis + eosinophilic granuloma complex	3	3.94
	Periodontal disease + stomatitis + Jaw fracture	1	1.31
	Periodontal disease + stomatitis + tooth caries	1	1.31
Total		**5**	**6.57**
Total		***76***	***100***

Periodontal diseases (gingivitis alone or periodontitis alone or gingivitis + periodontitis

4. Clinical symptoms recorded in cats

In all cats with diagnosed with oral conditions, the most common clinical signs were: halitosis (85.52%), followed by pain (73.68%), anorexia (72.36%), presence of tartar (68.42%), dehydration (53.49%), ulceration (47.36%), palatoglossitis (40.78%), fever (34.21%), bleeding and dental mobility with 32.89% for each one, glossite (19.37%) and ptyalism with a frequency of 6.57% **(Table 5).**

Table 5 : Proportion of clinical symptoms in cats.

Clinical signs	N° of cats affected	%
Halitosis	65	85.52
Pain	56	73.68
Anorexia	55	72.36
Tartar (calculus)	52	68.42
Dehydration	41	53.49
Ulcerations	36	47.36
inflammation of the palatoglossal arch (palatoglossitis)	31	40.78
Fever	26	34.21
Dental mobility	25	32.89
Bleeding	25	32.89
Glossite	15	19.37
Ptyalism	5	6.57

5. Association between tartar and periodontal diseases

Of the 70 cats with periodontal diseases, 50 (71.42%) had tartar and 20 (28.57%) did not.

Of the 52 cats with tartar, 50 (96.15%) had periodontal diseases and 2 (3.84%) did not.

That means that tartar plays a very important role in the onset of periodontal diseases since it is the main cause. However, periodontal diseases are not always associated with the presence of tartar **(Table 6).**

Table 6 : Association between tartar and periodontal diseases.

		Periodontal diseases		Total
		Presence	**Absence**	
Tartar	**Presence**	50	2	**52**
	Absence	20	4	4
Total		**70**	6	76

6. Associations of risk factors with the prevalence of periodontal diseases and stomatitis

6.1. Analysis of animal (intrinsic) factors

6.1.1. Age

Of the 70 cats affected by periodontal diseases, cats aged 1 year and over were the most affected with 43 (61.42%) cases.

While of the 34 cases of stomatitis, it was noted that the youngest cats aged less than 1 year were the most affected with 21 case (61.76%) **(Figure 27).**

The chi-square test showed no significant difference (P> 0.05) between age groups for the two pathologies **(Table 7).**

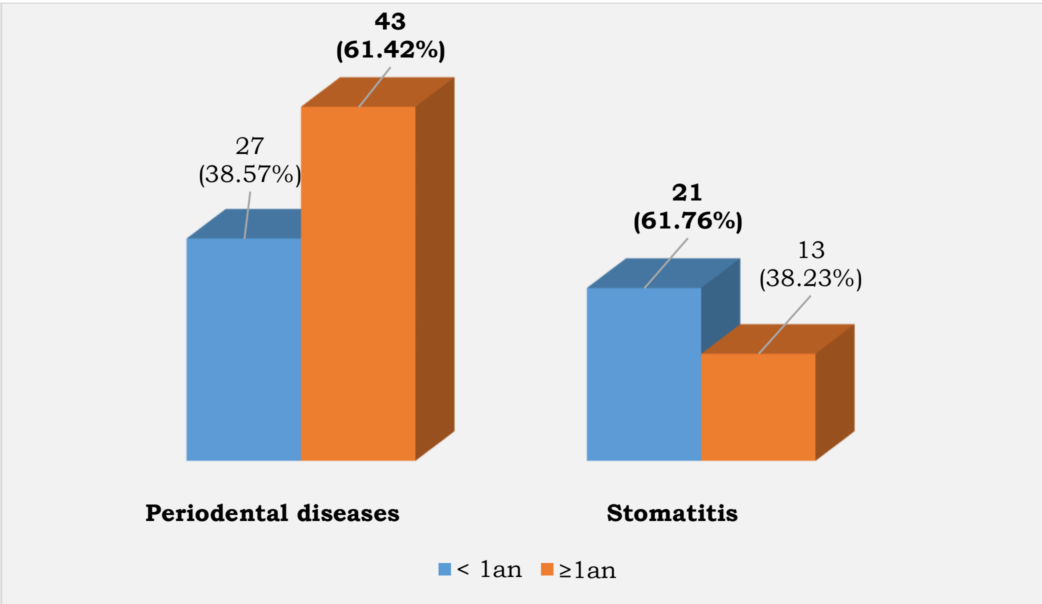


Figure 27 : The prevalence of periodontal diseases and stomatitis according to cat's age.

6.1.2. Sex

For both pathologies, females were slightly more affected than males with prevalence of 54.28 % for periodental diseases and 58.82% for stomatitis **(Figure 28).**

No significant difference (P> 0.05) was recorded for sex of cats for each pathology **(Table 7).**

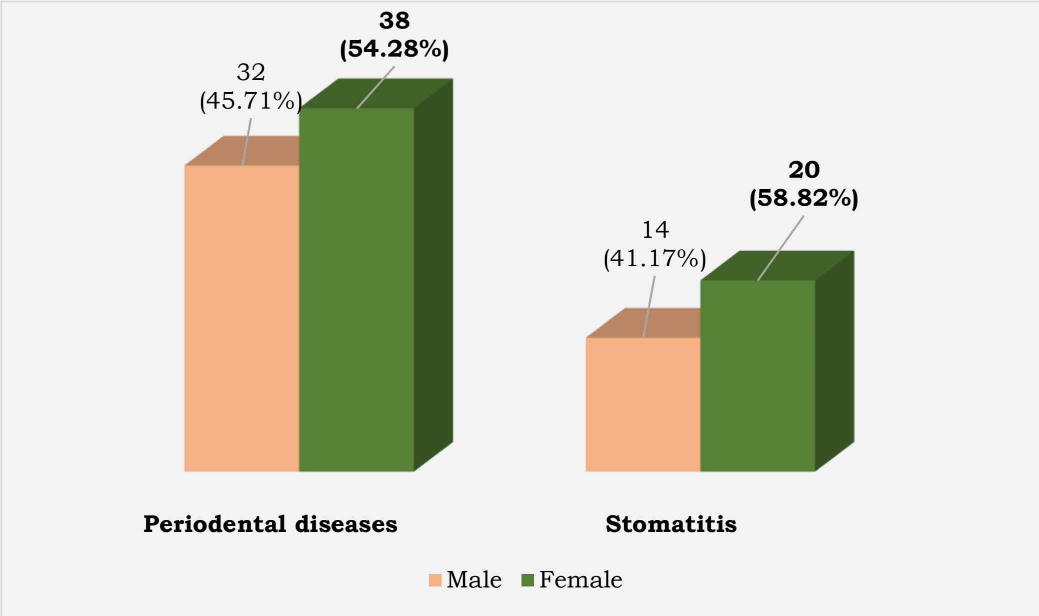


Figure 28: Prevalence of periodontal diseases and stomatitis according to the sex of cats.

6.1.3. Breed

Regarding breed, the European breed had a higher risk of periodontal diseases and stomatitis with prevalence rates of 78.57% and 94.11% respectively. While low pravalences were recorded for the others breed (Persian, Siamese and Angora)**(Figure 29).**

For each pathology, the chi-square test was highly significant (<0.0001) between the different breeds **(Table 7).**

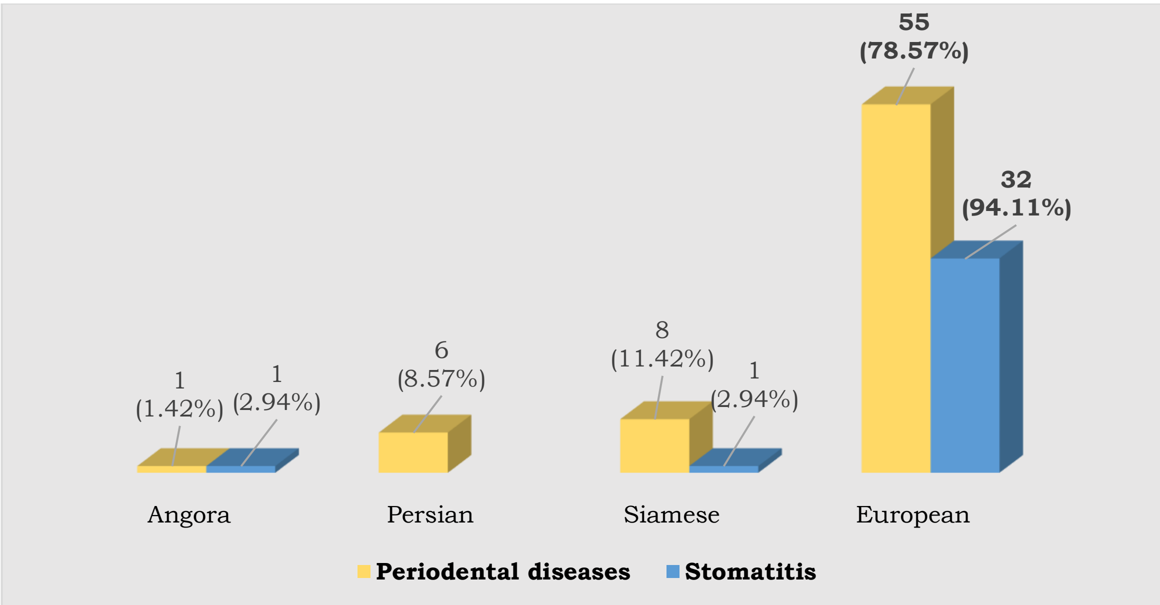


Figure 29 : The prevalence of periodontal diseases and stomatitis according to cat's breed.

Table 7 : Associations of of animal (intrinsic) risk factors with the prevalence of periodontal diseases and stomatitis.

Variable	**Periodontal diseases**			**Stomatitis**		
	N	%	P	N	%	P
Age						
< 1an	27	38.57	0.558	21	61.76	0.17
≥1an	43	61.42		13	38.23	
Sex						
Male	32	45.71	0.473	14	41.17	0.303
Female	38	54.28		20	58.82	
Breed						
Angora	1	1.42	<0.0001	1	2.94	<0.0001
Persian	6	8.57		0	0	
Siamese	8	11.42		1	2.94	
European	55	78.57		32	94.11	

6.2. Analysis of extrinsic risk factors

6.2.1. Vaccination

We recorded that cats that did not receive vaccination were more susceptible to periodontal diseases (64.28%) and stomatitis (94.11%) than cats that received vaccination **(Figure 30).** Statistical analysis showed that the difference between vaccinated and unvaccinated cats was significant for periodontal diseases (P<0.0168) and highly significant for stomatitis (P<0.00001).

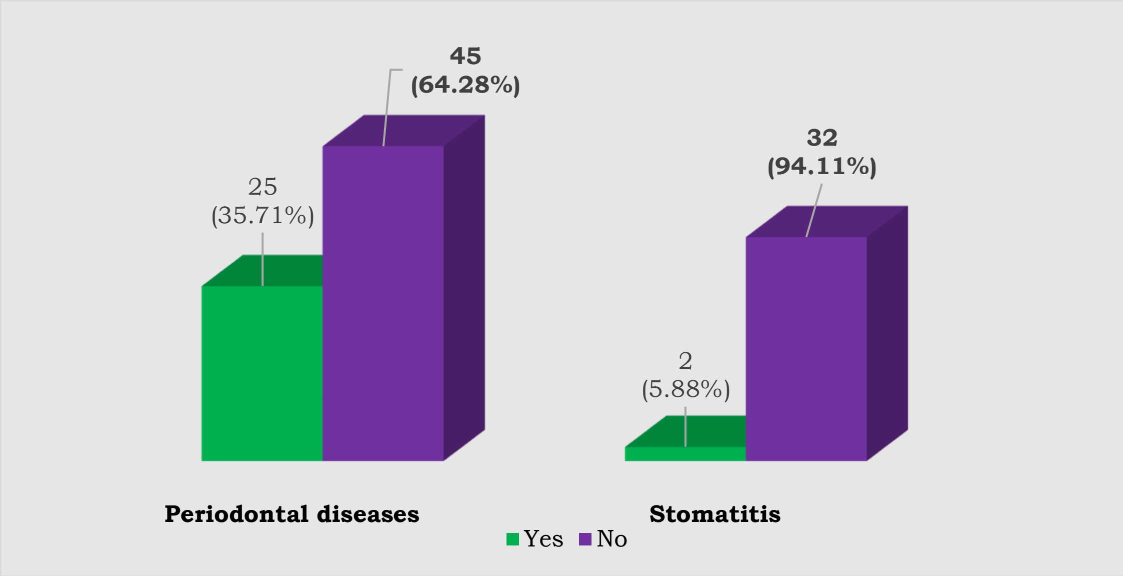


Figure 30 : The prevalence of periodontal diseases and stomatitis according to the vaccination status.

6.2.2. Diet

Cats fed a mixed diet had higher prevalence than those fed only a dry or wet diet with a prevalence of 77.14% for periodontal diseases and 64.70% for stomatitis **(Figure 31).**

The chi-square test was highly significant (P< 0.0001) for the both pathologies.

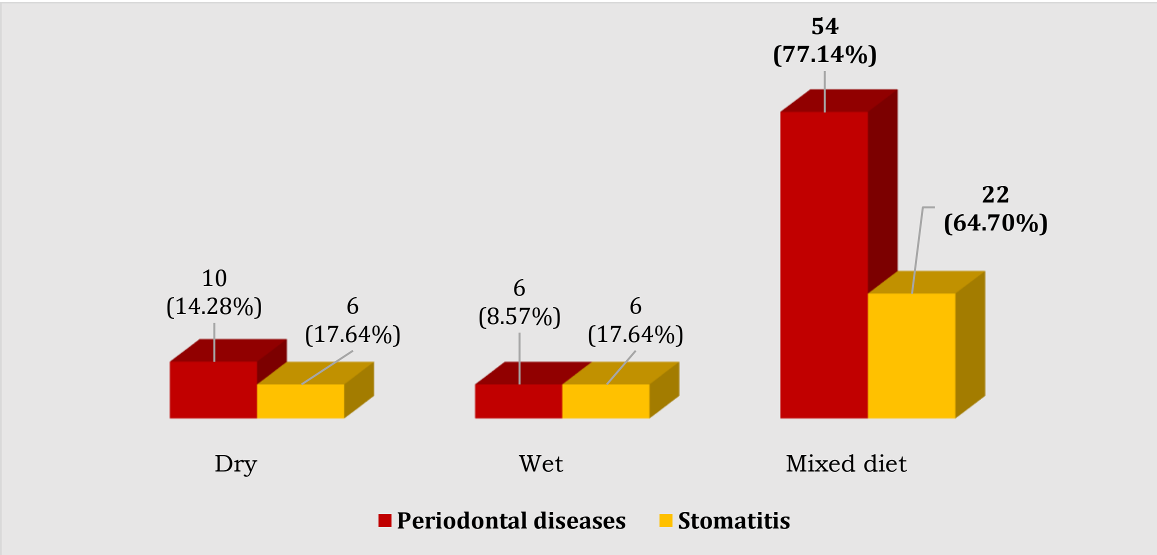


Figure 31 : Associations of vaccination with the prevalence of periodontal diseases and stomatitis according to the type of diet.

6.2.3. Home dental care

Regarding dental hygiene at home, the prevalence of both pathologies was too high for cats that did not receive home dental care with 97.14% for periodontal diseases and 100% for stomatitis **(Figure 32).** For each condition, we recorded a a highly significant difference (P< 0.0001).

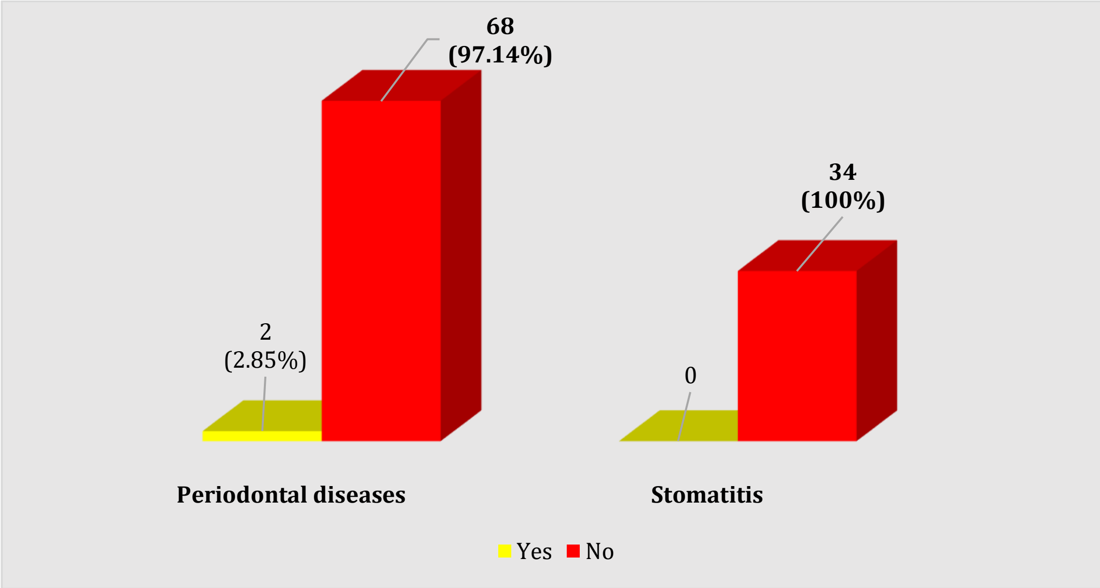


Figure 32: The prevalence of periodontal diseases and stomatitis according to home dental care.

6.2.4. Living environment

It was found that cats with outdoor access were more likely to have these diseases than cats with an indoor lifestyle. Disease rates were 67.14% and 79.41% for periodental diseases and stomatitis respectively **(Figure 33).**

Also, using the chi-square test, the statistical difference was very significant for the two diseases

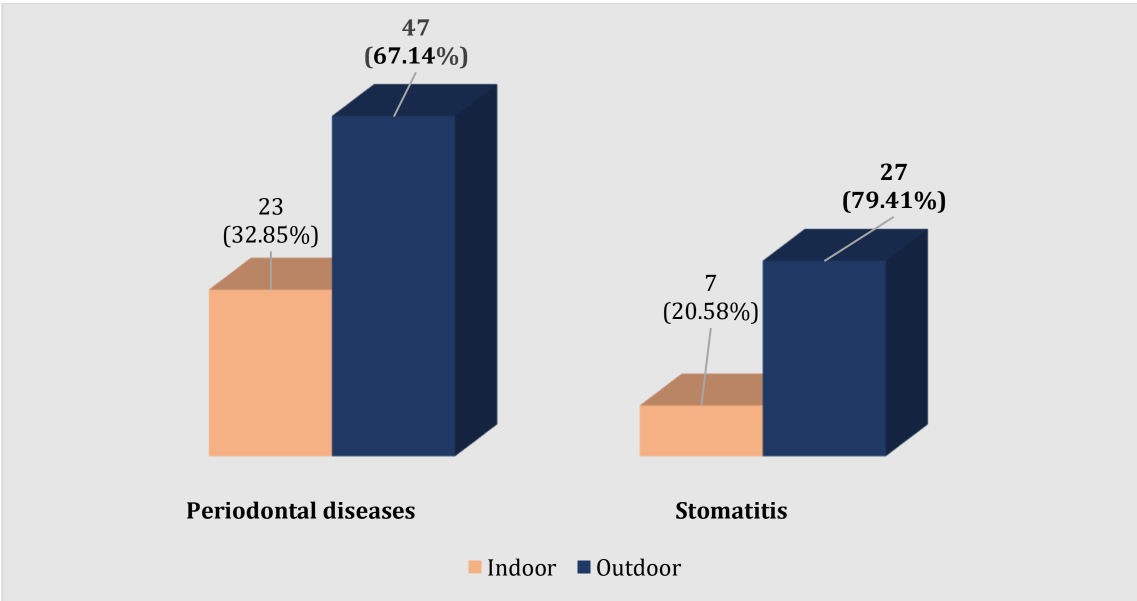
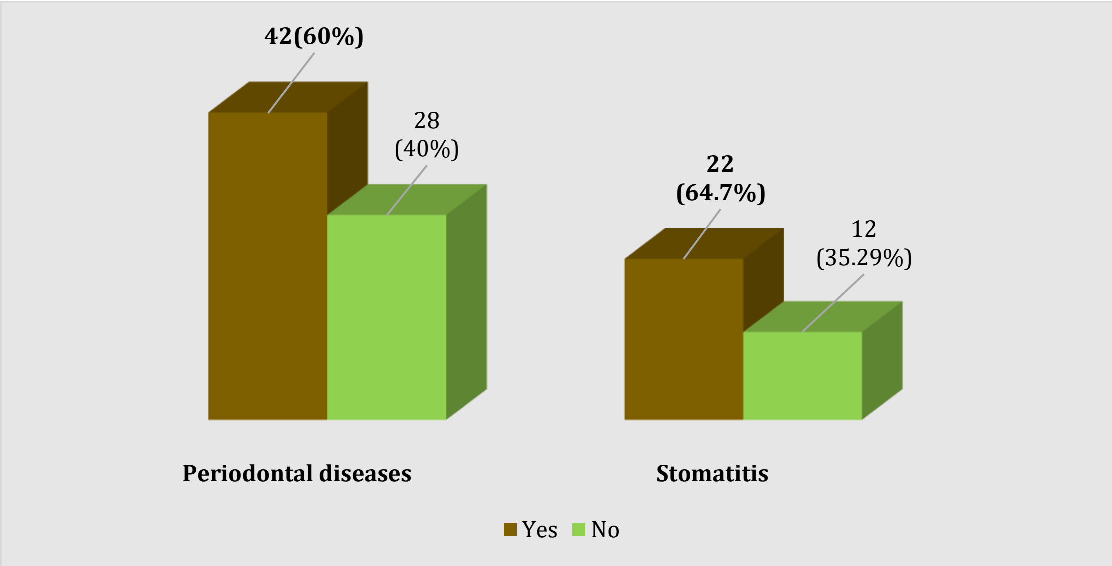


Figure 33: The prevalence of periodontal diseases and stomatitis according to the living environment.

6.2.5. Hunt

Cats that hunt seem to have a higher risk of developing periodontal disease (60%) and stomatitis (64.7%) than cats that do not hunt **(Figure 34),** but with no significant statistical difference for the both pathologies.



<u>**Figure 34**</u> : The prevalence of periodontal diseases and stomatitis according to the hunting factor.

6.2.6. Owner's knowledge of oral pathologies

We recorded that the owners' knowledge about oral diseases was limited and most of them (68.42 % for periodontal diseases and 73.52 % for stomatitis) did not have sufficient knowledge about oral pathologies in general **(Figure 35)**.

The statistical difference was highly significant for periodontal deases and very significant for stomatitis.

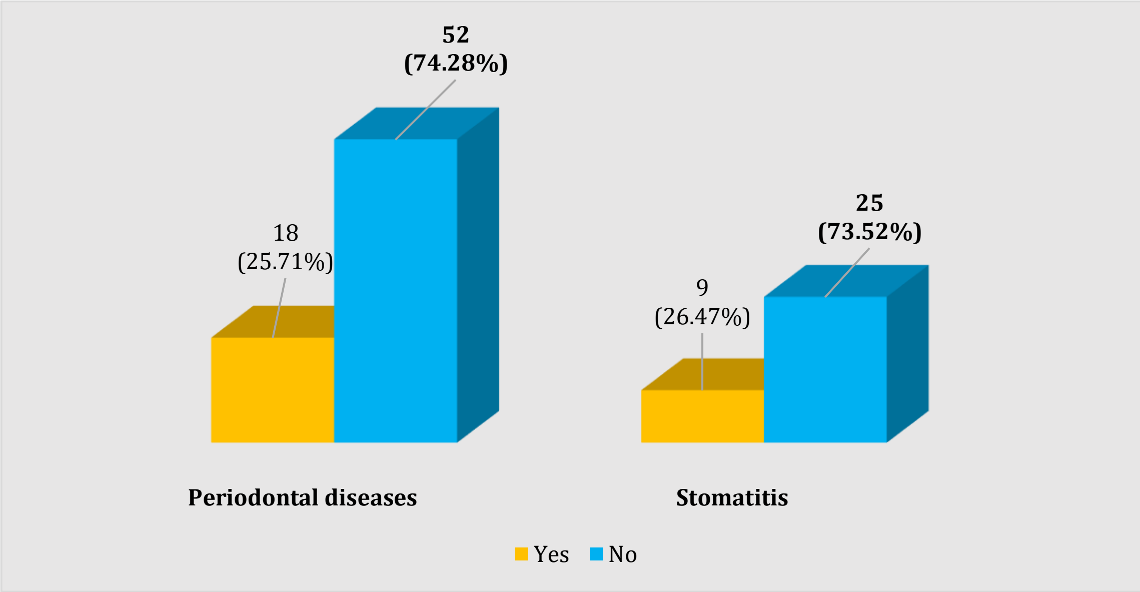


Figure 35 : The prevalence of periodontal diseases and stomatitis according to the hunting factor.

Table 8 : Associations of of extrinsic risk factors with the prevalence of periodontal diseases and stomatitis.

Variable	**Periodontal diseases**			**Stomatitis**		
	N	%	P	N	%	P
Vaccination						
Yes	25	35.71	<0.0168	2	5.88	<0.00001
No	45	64.28		32	94.11	
Diet						
Dry	10	14.28	<0.00001	6	17.64	<0.00001
Wet	6	8.57		6	17.64	
Mixed	54	77.14		22	64.70	
Home dental care						
Yes	2	2.58	<0.00001	0	0	<0.00001
No	68	97.14		34	100	
Living environment						
Indoor	23	32.85	0.0041	7	20.58	0.0006
Outdoor	47	67.14		27	79.41	
Hunt						
Yes	42	60	0.094	22	64.7	0.086
No	28	40		12	35.29	
Owner's knowledge of oral pathologies						
Yes	18	25.71	<0.00001	9	26.47	0.006
No	52	74.28		25	73.52	

7. Treatment

For medical treatment, the following medications were used: antibiotics (97.36%) followed by antiseptics (94.73%), vitamin B12 (84.21%), and anti-inflammatories (77.63%) **(Table 9).**

<u>Table 9 :</u> Medical treatment

Type of treatment	**N° of cats**	**%**
Antibiotic	74	**97.36**
Antiseptic	72	**94.73**
Vitamin B12	64	**84.21**
Anti-inflammatory	59	**77.63**

Surgical treatment was also used in certain conditions, with the following results: descalin (27.63%), tooth extraction (26.31%) and wound suture and fracture repair (3.94%)**(Table 10) .**

<u>Table 10 :</u> Surgical treatment

Type of treatment	**N° of cats**	**%**
Descaling	21	**27.63**
Tooth extraction	20	**26.31**
Wound suture and fracture repair	3	**3.94**

DISCUSSION

1. Overall prevalence of feline oral conditions

The prevalence of oral disorders in cats in this study (16.17%) was almost similar to 15.1% reported by **O´Neill et *al.* (2014)**, but lower than the 21.2% and 84% reported by **O'Neill et *al.* (2023)** and **Aula (2018),** respectively.

These different results may be due to the population (feral versus domestic cats), the examination methods (clinical examination versus radiographic examination) (**Verhaert and Van Wetter, 2004)**, diet, life style, popular breeds of cats in each country and duration of sample collection.

The present study used data only from conscious examinations and this method may underestimate the true prevalence of some diseases like odontoclastic resorptive lesions compared to an examination under general anaesthesia.

2. Different oral conditions recorded

In the present study, the periodontal disease (92.10%) was the most frequent diagnosis (60.52 % for gingivitis, 31.57% for periodontitis). Similarly, studies from different countries reported that the main oral diseases observed in felines are periodontal disease (**Clarke and Cameron 1998** ; **Perry and Tutt 2015**) with a reported prevalence ranging from 13.4 % to 92.75%. Indeed, our results are similar to 91.7% (gingivitis 73.2% periodontitis 18.5%) found by **Verhaert and Wetter (2004)** and to 92.7% found by **Elseddawy et al. (2023).** While, lower prevalences are noted by **Da Silva et *al.* (2019)** (65.11% : gingivitis 13.95%, periodontitis 51.16%), **Mathew et *al.* (2014)** (31.8% : gingivitis 20.7%, periodontitis 11.1%), **Whyte et *al.* (2022)** (30.9%), **O'Neill et *al.* (2023**)(15.2%), and **O'Neill et *al.* (2014)** (13.4%). This difference in prevalence between studies may be due to the criteria and method applied for diagnosis and the cohort demographics **(O'Neill et *al.,* 2023)**. According to **Long (2020)**, a important proportion of cats with true periodontal disease still go undiagnosed. Reasons for such underdiagnosis could include problematic patient temperament that can prohibit conscious clinical examination in some cats and the clinical signs from oral disease rarely being specific to the oral cavity **(Gorrel, 2013).**

The second most oral disease recorded in our study was stomatitis (44.73 %) which was close to the result of **Da Silva et *al.* (2019)** who noted a prevalence of 34.88% and **Öztürk Gürgen et *al.***

(2022) who recorded 45.76%. However, it was higher than the 12% reported by **Verhaert and Van Wetter (2004),** 5.5% recorded by **Girard et *al*. (2009)** and 0.7% noted by **Healey et *al.* (2007).** These studies have been done on cats that had no contact with the external environment or in which contact with other cats could be controlled. However, as the cats in the present study were exposed to the external environment, contact with other cats could not be controlled. This marks an important difference from other studies.

Eosinophilic granuloma complex was identified as the pathology of oral cavity in 6.57 % of the cats included in the present study. Our results were lower than 11.1% found by **Falcão et *al.* (2020),** but higher than 1.63% noted by **Scott et *al.* (2012).**

Bone fracture (3.94%), congenital and developmental problems (hypodentia and prognatism with 1.31% for each disease), tooth caries (1.31%) were not seen frequently in our study. Same findings were recorded by **Verhaert and Van Wetter (2004)** who reported low rates of malocclusion (4.9 %) and supernumerary tooth (1.2%), by **Aula (2018)** who noted a rate of 1% of retained deciduous teeth and **Elseddawy et *al.* (2023)** who found a prevalence of 0.40% of missing teeth, 1,61% of persistent deciduous teeth, 0.8% of tooth caries. While no case of bone fracture was noted by the above previous studies.

In the present study, the one case of prognatism is seen in Persian cats which are brachycephalic breeds. Brachycephalic cats have a shorter than normal upper jaw, while the lower jaw may have a normal length, leading to jaw discrepancy and malocclusion **Verhaert and Van Wetter (2004).**

3. Clinical symptoms recorded in cats

In all cats with diagnosed with oral conditions, the most common clinical signs were: halitosis, followed by pain, anorexia, presence of tartar, dehydration, ulceration, palatoglossitis, fever, bleeding and dental mobility, glossite and ptyalism. Results from different studies were noted almost the same clinical symptoms.

Wiggs and Lobprise, (1997) noted that the most common clinical signs of periodontitis are halitosis, increased salivation, dysphagia, pain on chewing and bleeding gingiva. For stomatitis, clinical signs include severe oral pain with reduced food prehension ability, ptyalism, mandibular lymphadenopathy **(Lyon,2005),** dysphagia, anorexia, unkempt appearance **(Wiggs and Lobprise,**

1997 ; Niemiec, 2012) halitosis, loss of appetite, depression, weight loss **(Dai et *al.,* 2024)** and (in severe cases) even dehydration **(Radford, 2007).**

4. Associations of risk factors with the prevalence of periodontal diseases and stomatitis

4.1. Analysis of animal (intrinsic) factors

4.1.1. Age

Prevalence of oral inflammatory disease differed with age, but all types of oral inflammatory disease were much more common in older cats than in young cats **(Kornya et *al.,* 2014).**

For periodontal diseases, we found that cats aged 1 year and over were the most affected (61.42%). Age was the strongest predictor of periodontal disease **(O'Neill et *al.,* 2023)** and seems to be the main factor because older cats are more susceptible to the development of oral pathologies **(Villegas-Ferre et *al.,* 2024).** In addition **Williams et *al.* (2024)** noted that significant proportion of young cats can develop gingival inflammation. It was documented in approximately a quarter of cats up to 1 year of age, and more than a third of cats assessed at 2 to 3 years of age **(Williams et *al.* 2024).** This infammation at a young age may be due to a syndrome called juvenile periodontal disease, which is the infammation of the gingiva occurring shortly after the permanent dental eruption **(Villegas-Ferre et *al.,* 2024).**

While for stomatitis, it was noted that the youngest cats aged less than 1 year were the most affected (61.76%).This could be explained by the fact that these young animals were not vaccinated and exposed to the outside environment. Stomatitis is most frequently seen in adult cats **(Healey et *al.,* 2007, Öztürk Gürgen et *al.,* 2022).** While, **Nakanishi et *al.* (2019)** showed that cats may be affected at an early age. In another hand some studies showed that there was no significant difference in the age distribution of cats with and without stomatitis **(Healey et *al.,* 2017 ; Dai et *al.,* 2024).**

4.1.2. Gender

For both pathologies, females were slightly more affected than males with no significant difference. which is similar to the findings by **Verhaert and Van Wetter (2004)** and **Girard et *al.* (2009)** who reported that the sex do not appear to be associated with the risk of periodontal disease in cats. Also, our results agreed with many studies that showed no significat correlation between stomatitis and sex **(Healey et *al.,* 2007 ; Öztürk Gürgen et *al.,* 2022 ; Dai et *al.,* 2024).**

While, **Villegas-Ferre et *al.* (2024)** showed that the sex of the cats seems to be associated with a predisposition to gingivitis and that males had the most predisposition, although there is not a precise explanation. **Martijn (2009)** noted that the male sex significantly positive associated with stomatitis. A higher prevalence of stomatitis was also identified in males than in females in a study done by **Kim et *al.* (2003)**, but the difference was not statistically significant.

Perhaps male cats are more exposed to infectious diseases, which might play a role in developing stomatitis, because in general they have a greater territory outside and are more aggressive towards other male cats **(Martijn, 2009).**

4.1.3. Breed

The European breed had a significant higher risk of periodontal diseases and stomatitis than the others breed (Persian, Siamese and Angora). According to the breed, studies showed differents results. **O'Neill et *al.* (2023)** noted that breed and therefore genetics play some role in periodontal disease development in cats. A study of colony cats sharing the same environment and fed the same diet reported a higher risk of periodontal disease for Burmese, Bengal, Somali, Maine Coon, Bobtail and Abyssinian cats **(Girard et *al.,* 2009**). It was also shown that some breeds (Himalayan, Siamese, Persian, Balinese, Oriental, Seychellois, Abyssinians, Ocicats and Somalis) are more likely to have dental diseases than other breeds or mixed breed cats **(Verhaert and Van Wetter 2004 ; Nakanishi et *al.,* 2019).** In another hand, **Healey et *al.* (2007)** and **Dai et *al.* (2024)** found that there is no significants correlation between the breed of cats and stomatitis. The variability in the results is probably due to the popularity of particular cat breeds at different times. This variability probably shows that in areas where pedigree cats are more common, they become affected.

4.2. Analysis of extrinsic risk factors

4.2.1. Vaccination

We recorded that cats that did not receive vaccination were more susceptible to periodontal diseases and stomatitis. Several viruses of worldwide distribution have been associated with stomatitis : Calicivirus (FCV) **(Healey et *al.,* 2017),** Felin Herpesvirus (FHV) **(Lommer and Verstraete, 2003)**, Feline Leukemia Virus (FeLV) and Feline Immunodeficiency Virus (FIV) **(Tenorio et *al.,* 1991)**, and with periodontal disease (FeLV, FIV, FCV) (**Kornya et *al.,* 2014**). Of these agents, FCV seems to have the most consistent evidence of being associated with FCGS **(Lommer and Verstraete, 2003).**

However, some studies have not been able to consistently prove that chronic infection by FCV is directly implicated in the pathogenesis of stomatitis **(Tenorio et *al.,* 1991 ; Reiter et *al.,* 2019)**, Indeed**, Möstl et *al.* (2013)** concluted that even if association had been found other factors must be considered in the occurrence of oral cavity lesions in cats **(Da Silva et *al.,* 2019).**

Most of cats infected in our study did not receive vaccination against these virus, so we concluded that there is consistent evidence that FCV and/or some of these virus are associated with the disease, also the infected cats in our study have free-roaming behavior, which is a known risk factor for FeLV, FIV, FHV and FCV infection **(Whyte et *al.,* 2017)**, this condition allow permanent exposure of cats to viruses shed by chronic carriers, favor high rates of viral evolution and facilitate cyclic reinfection of susceptible animals.

4.2.2. Diet

Cats fed a mixed diet had higher prevalence than those fed only a dry or wet diet. The type of diet that cat receives plays a significant role in the development of oral diseases. Soft or wet food does not provide enough mechanical action on the teeth to reduce plaque and tartar accumulation, which can lead to gingivitis and periodontal disease. In contrast, some specially formulated dry foods have been shown to help in reducing dental buildup. Moreover, low-quality commercial diets may lack essential nutrients needed for maintaining oral tissue integrity. Therefore, diet is a modifiable extrinsic factor that greatly impacts feline oral (**Girard et *al.,* 2009).**

4.2.3. Home dental care

Cats that did not receive home dental care were most affected the development of periodontal disease. However, in practice, most cat owners do not implement any oral hygiene routine at home, either due to lack of awareness or difficulty in handling the cat. This absence of daily or weekly dental hygiene allows oral bacteria to thrive, increasing the risk of inflammation, halitosis, and tooth loss. Education of cat owners about the importance of dental hygiene is essential to reduce the prevalence of dental conditions **(Bellows et *al.,* 2019)**.

4.2.4. Living environment

It was found that cats with outdoor access were more likely to have these diseases than cats with an indoor lifestyle.

The cat's living environment can influence its overall health, including oral health. Cats kept in crowded, stressful, or unsanitary environments are more likely to develop oral infections due to increased exposure to pathogens and weakened immune function. Outdoor cats or those living in groups without proper hygiene and veterinary supervision face higher risks of viral infections like calicivirus or herpesvirus, which are linked to chronic oral inflammation **(Lommer, 2013).**

4.2.5. Hunt

Some studies suggest that natural hunting behavior in cats—such as catching, tearing, and chewing prey—may help maintain the oral health. This is thought to result from mechanical abrasion that helps reduce plaque and tartar buildup on the teeth, potentially lowering the risk of gingivitis and other dental issues **(Van Winkle and Bruce, 2015).**

However, in our current study, we observed that cats who hunted frequently had a higher incidence of oral diseases than indoor cats that did not hunt. This finding may be explained by the fact that outdoor and hunting cats are more frequently exposed to viruses such as Feline Calicivirus (FCV), which has been shown to be strongly associated with stomatitis and periodontal disease **(Lommer and Verstraete, 2003).**

4.2.6. Owner's knowledge of oral pathologies

We recorded that the owners' knowledge about oral diseases was limited and most of them did not have sufficient knowledge about oral pathologies in general This finding aligns with previous literature which reported that many pet owners underestimate the importance of routine dental checkups, which leads to poor home care practices and missed early signs of disease. The home dental care was infrequently practiced despite its proven benefits in reducing plaque accumulation and improving periodontal health **(Ingham et *al.,* 2019).**The owners who receive adequate education from veterinarians regarding oral care are more likely to follow preventive protocols, including brushing, the use of dental diets, and regular clinical follow-ups **(Girard et *al.,* 2017).**

Conclusion and Recommendations

This study has put emphasis on oral health as a component of feline health. From the findings, it reveals that oral illness in cats, such as gingivitis, periodontal disease, and stomatitis are not only common but also have severe implications if not treated. These illnesses progress in a secretive manner, therefore, constant monitoring and early detection are imperative. Without dental care, cats can suffer from chronic pain, a decrease in appetite, behavior changes, and secondary infections impacting major organs.

This survey also highlighted the lack of knowledge among most cat owners regarding the role of dental care. Perhaps one of the leading causes of the excessive oral disease in cats is the lack of regular check-ups and prophylactic dental care. This addresses the need for immediate increased education and advocacy by veterinarians, animal welfare organizations, and society in general.

Preventive care, such as brushing the teeth on a regular basis, proper diet, dental chews, and professional dental cleaning, can reduce oral disease to a significant degree. Owners of cats should be able to identify early dental disease warning signs, such as halitosis, slobbering, refusal to eat, or face-pawing, and get the advice of a veterinarian early.

Finally, maintaining the oral health of cats is not so much about preventing dental issues, it is about promoting their overall wellness, longevity, and quality of life. Through an action that involves awareness, prevention, and professional care, we can ensure that cats live better and happier lives.

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APPENDIX 1 (Questionnaire)

- Animal number : - Date of admission :

- Reason for consultation :

➢ **Animal data :**

- Pet Name : - Age : - Sex : Male ☐ Female ☐
- Breed : - Weight : - Up to date vaccinations : Yes ☐ No ☐
- Up-to-date deworming : Yes ☐ No ☐
- Previous deseases: Yes ☐ No ☐ If Yes, please specify :........................
- Beginning of symptoms :< 24 h ☐ 24-48h ☐ > 48h ☐ specify :......
- Food : Dry ☐ Wet ☐ Prepared at home ☐ Commercial ☐
- Dental hygiene at home : Yes ☐ No ☐
- Previous dental care : Yes ☐ No ☐
- Access to the outside: Yes ☐ No ☐
- Cat hunting behavior : Yes ☐ No ☐
- Cat owner's knowledge of oral diseases and their prevention Yes ☐ No ☐

➢ **Clinical examination**

✓ General condition of the animal: ....

....

✓ Oral exam :

- Presence of tartar : Yes ☐ No ☐ - Dental mobility : Yes ☐ No ☐
- Ulceration : Yes ☐ No ☐ - Bleeding: Yes ☐ No ☐
- Dental abscesses : Yes ☐ No ☐ - Tooth resorption : Yes ☐ No ☐
- Halitosis (bad breath) : Yes ☐ No ☐
- Inflammation of the gums (gingivitis) : Yes ☐ No ☐
- Inflammation of the oral mucosa (stomatitis) : Yes ☐ No ☐
- Inflammation of the palatoglossian arch : Yes ☐ No ☐
- Inflammation of the tongue (glossitis) Yes ☐ No ☐

- Inflammation of the periodontium (periodontitis) Yes ☐ No ☐

- Other remarks regarding the oral examination :………………………………………

………

………

- **Complementary examination**
  - Radiographic findings : No ☐ Yes ☐ if yes : Results :……………………….

    …………………………………………………………………………………………

    -Laboratory investigations : No ☐ Yes ☐

    If yes : Analysis type :…………………………………………………………………..

    Results : ……………………………………………………………………………………

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- **Other clinical signs observed** : ……………………………………………………………

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- **Diagnosis (disease)** : ………………………………………………………………………..

- **Treatment** : - Medical treatment : ……………………………………………….

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  - Surgical interferences :……………………………………………

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  ………………………………………………………………………..

- **Follow-up and complications** : Healing ☐

  Presence of complications ☐ specify :……………

- **Other information to add** :……………………………………………………

  ……………………………………………………………………………………………