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Incidence of corneal affections in dogs

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Abstract
The present study was carried out on the dogs that were presented to the clinical wards with complaints related to the ocular system and were reported to be 2.39% of the total cases presented. Among these dogs, 26.19% presented with corneal affections, and of them, the majority had ulcerative keratitis. A higher incidence of corneal affections was seen in the Shih Tzu breed and in puppies. Males were often reported more frequently than females, with varied etiologies such as exposure keratopathy, lagophthalmos, and nasal fold trichiasis, followed by trauma/self-mutilation, protruding hairs, systemic infections, congenital abnormalities, metabolic (Diabetes mellitus), foreign bodies, and entropion.

Keywords: Corneal affections, dogs, incidence, etiology

Introduction
The cornea, the clear front part of the eye, plays a crucial role in reflecting light onto the retina for vision. The cornea consists of four layers: the stratified epithelium, collagenous stroma, endothelium, and Descemet's membrane (which is the endothelium's basement membrane) (Slatter, 2008) [13]. To ensure clear vision, the cornea must maintain a regular arrangement of collagen fibrils and stay avascular, unscarred, and transparent (Ashby *et al*., 2014) [3]. Any opacities, blood vessels, pigment, or surface irregularities indicate corneal disease. Affections of the cornea are commonly observed in brachiocephalic breeds due to inherent conditions like lagophthalmos, large palpebral fissure, and thinning of the precorneal tear film at the center (Antonia *et al*., 2014) [2]. This study aims to document the occurrence of corneal affections in dogs and identify the factors causing them.

Materials and Methods
The study has been conducted at the Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science in Gannavaram, and the SVVU Super Speciality Veterinary Hospital in Visakhapatnam which included cases presented from November 2022 to October 2023. Detailed signalment, such as the breed, sex, age, cause, and the affected eye, was gathered from the owners. Each patient underwent a thorough examination of the cornea to assess for growths, foreign objects, traumatic injuries, ulcers, opacity, vascularization, pigmentation, and loss of transparency (Such as edema and infiltrates). Fluorescein dye was employed to check the integrity of the cornea. The recorded observations were compiled and analyzed.

Results and Discussion
Out of a total of 43,765 general clinical cases presented in the clinical wards, 1050 cases (2.39%) were related to ophthalmic issues in dogs. Among these, 275 dogs (26.19%) exhibited a total of 362 affections associated with the cornea. These findings align with the results of Vidyashree *et al*. (2022) [15], who also reported a 2.39% incidence of ophthalmic affections. However, Akinrinmade and Ogungbenro (2015) [1] observed a higher incidence than our study, with 6.62% of total cases, while Pandey *et al*. (2018) [9] and Mishra *et al*. (2021) [8] reported lower incidences at 1.39% and 2.23%, respectively.
The incidence of corneal affections was determined to be 26.19% of all ocular affections. This incidence was higher than that reported by Antonia *et al*. (2014) [2] and Sarangom *et al*. (2014) [12], who noted rates of 48.83% and 71.42%, respectively. The increased incidence in our study was attributed to a higher number of brachycephalic breeds presented to the hospital. These breeds exhibit brachycephalic characteristics, such as a larger palpebral fissure, an inherent lagophthalmos condition, and nasal fold trichiasis.

Antonia *et al*. (2014) [2] also shared a similar view on the increased incidence of corneal affections.

The incidence of various corneal affections are presented in Table-1. Among the corneal affections, majority of dogs were diagnosed with ulcerative keratitis (32.3%) followed by pigmentary keratitis (20.7%). The incidence of other corneal affections were reported to be lesser in number during the study period. This finding aligns with Antonia *et al*. (2014) [2], Sarangom *et al*. (2014) [12], and Vidhyashree *et al*. (2022) [15], all of whom reported higher incidences of ulcerative keratitis. On the other hand, Patel *et al*. (2020) [10] noted higher incidences of corneal melanosis and pigmentary keratitis, respectively.

In the present study, Shih Tzu dogs had the highest incidence of corneal affections at 38.91%, followed by Pug (29.45%), Mongrel (6.91%), German Shepherd (5.45%), Labrador (5.09%), Spitz (3.64%), Lhasa Apso (3.64%), Rottweiler (2.91%), Beagle (1.82%), Bull Mastiff (1.09%), and Poodle (1.09%). This finding was in line with Chae *et al*. (2007) [4], who also reported a higher incidence of corneal diseases in Shih Tzu breeds. Previous reports have indicated a higher incidence of ocular affections in specific dog breeds, such as Shih Tzu (Kim *et al*., 2009; Vidyashree *et al*., 2022) [6, 15], Pug (Patel *et al*., 2020; Sarangom *et al*., 2014; Kumar *et al*., 2018; Mishra *et al*., 2021) [7, 10, 8, 12], German Shepherd (Akinrinmade and Ogungbenro, 2015) [1], non-descriptive breeds (Pandey *et al*., 2018) [9], and brachycephalic breeds (Soontornvipart *et al*., 2003) [14]. The higher incidence of Shih Tzu dogs in our study could be attributed to their overrepresentation and brachycephalic characteristics. This perspective is consistent with the views expressed by Kim *et al*. (2009) [6] and Patel *et al*. (2020) [10] regarding the increased incidence in that particular breed.

The highest incidence of corneal affections was recorded in puppies (33.82%) followed by young adults (17.81%), mature adults (17.45%), juveniles (16.36%), seniors (13.45%) and geriatrics (1.09%). These results were in concomitance with the observations of Kim *et al*. (2009) [6], Kumar *et al*. (2018) [7], Patel *et al*. (2020) [10], Mishra *et al*. (2021) [8], and who also reported a higher incidence in young animals. However, Chae *et al*. (2007) [4] reported a higher incidence in adult dogs, and Antonia *et al*. (2014) [2] reported a higher incidence in adult animals. The increased incidence in puppies in our study could be attributed to their playful nature, making them more prone to trauma. Similar opinions were expressed by Patel *et al*. (2020) [10] and Mishra *et al*. (2021) [8], while Antonia *et al*. (2014) [2] related their findings to the increased activity of adult animals.

The distribution of corneal affections based on gender showed a higher incidence in males (70.5%) compared to females (29.5%). This aligns with the findings of Ramani *et al*. (2013) [11], Antonia *et al*. (2014) [2], Kumar *et al*. (2018) [7], Pandey *et al*. (2018) [9], and Mishra *et al*. (2021) [8], all of whom reported a higher occurrence of ocular affections in male dogs. In contrast, Chae *et al*. (2007) [4] and Akinrinmade and Ogungbenro (2015) [1] noted higher incidence in females. The increased incidence in males in our study could be attributed to the higher population of male dogs compared to females. This assumption is similar to the views expressed by Pandey *et al*. (2018) [9] and Mishra *et al*. (2021) [8] regarding their findings. However, Sarangom *et al*. (2014) [12] observed no gender predispositions in the affected dogs during their study.

The main causes of corneal affections in our study were exposure keratopathy (21.85%), lagophthalmos (21.85%), and nasal fold trichiasis (21.85%), followed by trauma/self-mutilation (17.84%), protruding hairs (12.24%), systemic infections (1.60%), congenital abnormality (1.02%), metabolic factors (such as Diabetes mellitus) (0.91%), foreign bodies (0.45%), and entropion (0.34%). Detecting the onset of corneal issues early can be challenging for most pet owners, making it difficult to pinpoint the exact cause of the lesion. Akinrinmade and Ogungbenro (2015) [1] found that the etiology was unknown in 60.61% of cases with ocular diseases, supporting this difficulty. However, Chae *et al*. (2007) [4] identified trauma and keratoconjunctivitis sicca as the most common causes of corneal diseases. The prevalent etiological factors in our study were linked to the brachiocephalic characteristics of brachycephalic breeds, a viewpoint supported by Soontornvipart *et al*. (2003) [14], Mishra *et al*. (2021) [8], and Vidyashree *et al*. (2022) [15].

In the current study, corneal affections were more frequent in the left eye than the right. This aligns with the findings of Akinrinmade and Ogungbenro (2015) [1] and James-Jenks *et al*. (2023) [5], while Patel *et al*. (2020) [10] and Ramani *et al*. (2013) [11] observed a higher incidence in the right eye. However, it was established that the development of ocular affection is not influenced by the side of the eye. James-Jenks *et al*. (2023) [5] shared a similar perspective during their study on corneal ulcers.

Table 1: Incidence of different corneal affections in dogs

S. No	Name of the corneal affection	Number of cases	Percent
1	Ulcerative keratitis	117	32.3
2	Traumatic perforations	8	2.2
3	Corneal foreign bodies	3	0.8
4	Corneal oedema	12	3.3
5	Corneal opacities	51	14.1
6	Pigmentary keratitis	75	20.7
7	Dermoids	9	2.5
8	Keratoconjunctivitis sicca	42	11.6
9	Pannus	36	9.9
10	Pterygium	9	2.5
11	Total	362	100.0

Conclusion

Corneal affections constitute 34.47% of ophthalmic affections presented and 0.82 % of total cases presented. Among these, ulcerative keratitis is the most common, followed by pigmentary keratitis. Shih Tzu breeds, puppies, and male dogs show a higher incidence of corneal problems, with the left eye being the most commonly affected. Exposure keratopathy, lagophthalmos, and nasal fold trichiasis are the primary causes. The insights gained from this study on various corneal issues can be valuable for educating pet owners, early detection, and preventing and treating corneal disorders in dogs.

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