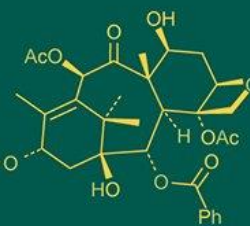
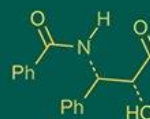


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Incidence and demographic characteristics of canine corneal ulcers in Karnataka, India: A prospective and retrospective study

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Abstract

This study investigated the incidence and demographic distribution of corneal ulcers in dogs presented to two Teaching Veterinary Hospitals in Karnataka, India. The study was conducted in two phases viz., prospective and retrospective. The first phase was prospective incidence, studied at Veterinary Clinical Complex (VCC), Bidar and Hassan from January 2022 to December 2023. The prospective incidence rate for ophthalmic affections and corneal ulcers in canines were 0.72% and 0.24%, respectively. Breed wise incidence of corneal ulcer was highest in Shih Tzu (30.91%, 17/55) and Pug (30.91%, 17/55) and least was found in German shepherd (1.82%, 1/55) and Boxer (1.82%, 1/55). Age wise incidence of corneal ulcer in dogs was highest in the age group of 0-3 years (72.73%, 40/55) and least was found in more than 9 years (5.45%, 3/55). Gender-wise incidence of corneal ulcer in dogs was highest in males (61.82%, 34/55) and the remaining were females (38.18%, 34/55). The second phase was retrospective incidence, studied at same locations viz., VCC, Bidar and Hassan from January 2019 to December 2021. The occurrence rate for ophthalmic affections and corneal ulcers in canines were 0.56% and 0.08% respectively. In conclusion, from both prospective and retrospective study for a period of five years, highest corneal ulcer incidence was observed in brachycephalic breeds and young male dogs less than 3 years.

Keywords: Brachycephalic, corneal ulcer, dogs, incidence, prospective, retrospective

Introduction

Vision plays an essential role in the daily activities and welfare of companion animals. For instance, canines heavily rely on visual cues to facilitate communication both within their own species and with humans. The evaluation of vision and ocular health in animals presents a heightened level of complexity in comparison to the human counterpart.

Among the prevalent ocular pathologies in canines, corneal ulcers emerge as a noteworthy affliction. The intricate composition of the cornea includes four discernible layers viz., an external stratified squamous epithelium, an internal collagenous stroma, Descemet's membrane and an endothelium (Shively and Epling, 1970) [9]. The manifestation of a corneal ulcer ensues from a breach in the integrity of the corneal epithelium, laying bare the underlying corneal stroma. Clinically, this gives rise to discernible symptoms, including excessive lacrimation, reflexive blepharospasm, heightened light sensitivity (photophobia), conjunctival hyperemia, corneal edema and potentially,

pupillary constriction (miosis) and haziness in the aqueous humor (aqueous flare). The definitive diagnosis of a corneal ulcer is established upon the scrutiny of these clinical indicators, complemented by the corneal stroma's capacity to retain topically administered fluorescein dye (Whitley and Hamor, 2021) [12]. The gravity of severe ulcerative keratitis elevates the risk of ocular loss, attributed to complications such as endophthalmitis, glaucoma, phthisis bulbi, or a confluence of these factors.

Corneal ulcers are categorized based on the extent of corneal engagement and their root cause. The initial focus is on assessing the depth of corneal involvement, encompassing superficial corneal ulcers, stromal corneal ulcers, descemetocoeles and perforations. Corneal ulcers of a complicated nature endure beyond a period of 7 days. The spontaneous rupture of Descemet's membrane can precipitate not only ocular rupture but also iris prolapse,

accentuating the severity of the condition (Maggs, 2008) [5]. Although canine ulcers have been investigated in several countries, published epidemiological data from India remain limited. So, this study was planned to assess the magnitude of corneal ulcer in dogs.

Materials and Methods

The study aimed to record the prospective incidence of ophthalmic conditions in dogs presenting at the Department of Veterinary Clinical Complex, Veterinary College, Bidar and Hassan from January 2022 to December 2023. Also, the retrospective incidence was studied at same locations from January 2019 to December 2021. The information related to breed, age, sex, and the specific nature of the eye condition were recorded. A thorough medical detail about the dog's age, gender, breed, the onset and duration of the affection, primary clinical signs and symptoms, alterations in behavior, possible instances of trauma and previous treatment were studied. Diagnosis of corneal ulcers was done by using ophthalmic tests, neuro-ophthalmic tests, behavioural tests for vision, Fluorescein dye test, Indirect ophthalmoscopy and Optical coherence tomography (OCT).

Results and Discussion

The present study was undertaken in two phases. The first phase was prospective study conducted at Veterinary Clinical Complex, Veterinary College, Bidar and Hassan from January 2022 to December 2023. In which a total of 23,391 were the canine patients. Out of these, the numbers of surgical canine patients were 5,943 dogs. Notably, within the cohort of surgical canine cases, 168 were afflicted with ophthalmic affections, with corneal ulcers registering as the predominant affection at 55 cases. The incidence of various ophthalmic affections in dogs was found to be 0.72% and corneal ulcer was found to be 0.24% out of all the canine cases presented. Specifically, corneal ulcers represented 32.74% of the total ophthalmic affections. Out of 76 cases of ophthalmic affections presented to VCC Bidar, the highest cases of corneal ulcer (56.58%, 43 cases), followed by cataract (9.21%, 7 cases), cherry eye (7.89%, 6 cases), conjunctivitis (3.95%, 3 cases) and proptosis (3.95%, 3 cases) were observed (Fig.1). Out of 92 cases of ophthalmic affections presented to VCC Hassan, the highest cases of conjunctivitis (13.04%, 12 cases) and corneal ulcer (13.04%, 12 cases), followed by cherry eye (11.96%, 11 cases) and cataract (9.78%, 9 cases) were observed (Fig.2). Similar observations were reported by Kumar *et al.* (2018) [4], Vidhyashree *et al.* (2022) [11] and Abdelkader *et al.* (2023) [1].

Among the canine breeds, the highest incidence of corneal ulcers was documented in Shih Tzu (30.91%, 17/55) and Pug (30.91%, 17/55), followed by Mongrel (20.00%, 11/55), Labrador Retriever (5.45%, 3/55), Pomeranian (5.45%, 3/55), Indian Spitz (3.64%, 2/55), German Shepherd (1.82%, 1/55), and Boxer (1.82%, 1/55) (Fig.3). These findings closely parallel those reported by Auten *et al.* (2020) [2] and Vidhyashree *et al.* (2022) [11], where the Shih Tzu breed exhibited the highest incidence. Additionally, the outcomes mirror the results obtained by Mishra *et al.* (2021) [7] and Mecvan *et al.* (2023) [6], highlighting the Pug breed with the highest incidence. This correlation can be ascribed to the widespread popularity of both the Pug and Shih Tzu breeds in urban areas, coupled with a congenital predisposition to corneal ulcers observed

in brachycephalic breeds. The distinct ocular anatomy characteristic of brachycephalic dogs, characterized by a large palpebral aperture and a shallow socket, contributes to increased corneal exposure, rendering their eyes more susceptible to ocular trauma (Mishra *et al.*, 2021) [7].

Among the age wise, the highest incidence of corneal ulcers was observed in dogs aged less than 3 years (72.73%, 40/55), followed by dogs aged 3-6 years (12.73%, 7/55), 6-9 years (9.09%, 5/55), and more than 9 years (5.45%, 3/55) (Fig. 4). This pattern of observations closely parallels the findings of Patel *et al.* (2020) [8] and Vidhyashree *et al.* (2022) [11]. The heightened susceptibility of young dogs to corneal ulcers may be attributed to their less sensitive cornea and exuberant, playful behavior, rendering them more prone to ocular trauma.

Among the gender wise, highest corneal ulcer incidence was observed in males (61.82%, 34/55) and followed by females (38.18%, 21/55) (Fig. 5). Similar observations have been reported by Patel *et al.* (2020) [8] and Vidhyashree *et al.* (2022) [11]. This gender-based discrepancy may stem from owners' proclivity towards male dogs, possibly influenced by the perceived challenges in managing female dogs during their estrous cycle.

The second phase was retrospective incidence (Table 1 and 2), studied at the Veterinary Clinical Complex (VCC) in Bidar and Hassan from January 2019 to December 2021, and recorded a comprehensive caseload totaling 49,057 instances. Among the total patients, canine patients constituting 23,384 cases. Out of these, the number of surgical canine patients was 5,899 dogs. Notably, within the cohort of surgical canine cases, 132 were afflicted with ophthalmic affections, with corneal ulcers registering as the predominant affection at 19 cases. The occurrence rate of ophthalmic affections and corneal ulcer in canines presented was 0.56% and 0.08% respectively. Whereas among the ophthalmic affections in canines presented, corneal ulcer accounts to 14.39%. Out of 40 cases of ophthalmic affections presented to VCC Bidar, the highest cases of corneal ulcer (22.50%, 9 cases) and cataract (22.50%, 9 cases), followed by conjunctivitis (20.00%, 8 cases), cherry eye (17.50%, 7 cases) and proptosis (15.00%, 6 cases) were observed. Out of 92 cases of ophthalmic affections presented to VCC Hassan, the highest cases of conjunctivitis (11.96%, 11 cases), followed by corneal ulcer (10.87%, 10 cases), cataract (10.87%, 10 cases), eyelid wound (8.70%, 8 cases), cherry eye (7.61%, 7 cases) and proptosis (7.61%, 7 cases) were observed. Consistent findings have been reported by Kumar *et al.* (2018) [4], Vidhyashree *et al.* (2022) [11] and Abdelkader *et al.* (2023) [1].

In the current study, clinical signs such as blepharospasm, conjunctival congestion, pawing of the affected eye, varied degrees of corneal opacity and corneal vascularization were observed in the majority of cases. Furthermore, additional signs including epiphora, ocular discharge, the presence of a creamy white deposit over the ulcer, blood clots, manifestations of irritation, and pawing at the affected eye were noted in a few of the cases. These findings closely mirrored those documented by Yang *et al.* (2018) [13], de Mello Arantes-Tsuzuki *et al.* (2019) [3], and Singh *et al.* (2022) [10], wherein conjunctival congestion, ocular discharge, corneal edema, blepharospasm, epiphora, creamy white deposits over the ulcer, signs of irritation, blood clots, and pawing at the affected side of the eyes were similarly reported.

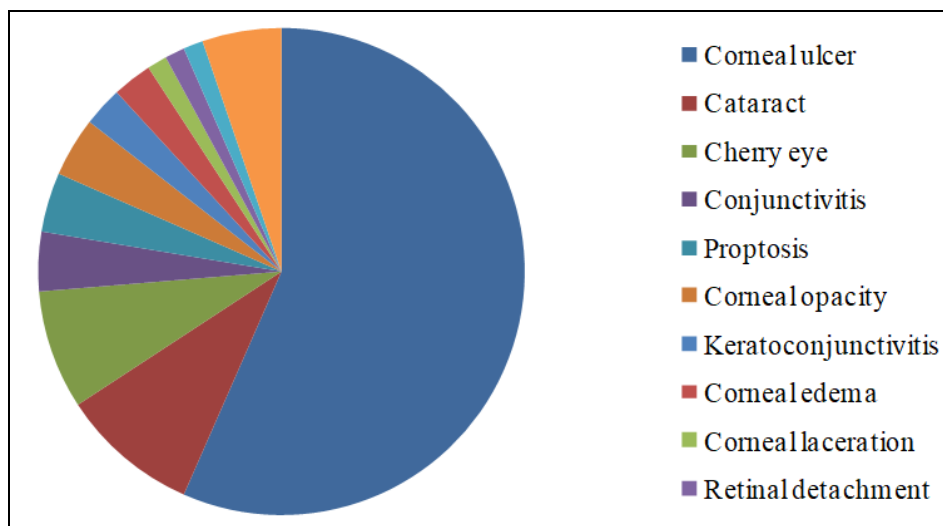


Fig 1: Prospective incidence of ophthalmic affections in dogs at Veterinary Clinical Complex (VCC), Bidar during January 2022 to December 2023

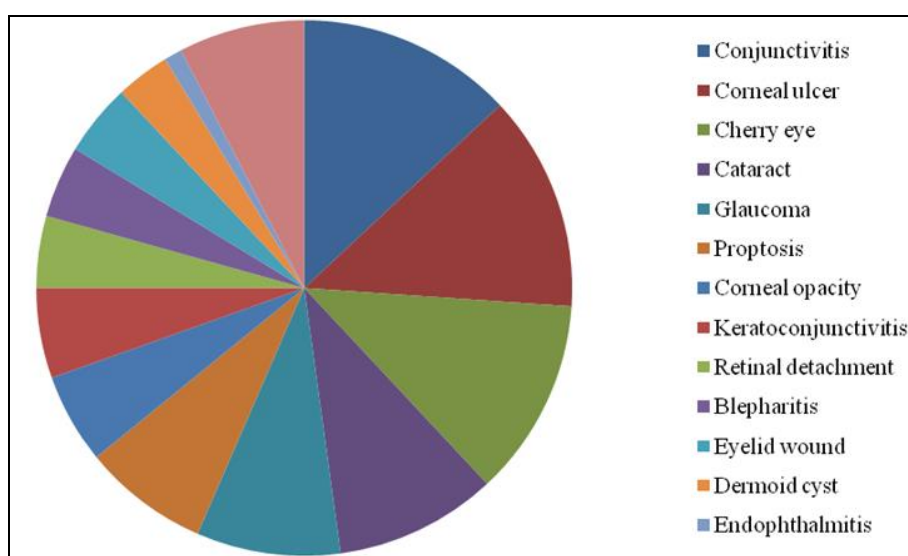


Fig 2: Prospective incidence of ophthalmic affections in dogs at Veterinary Clinical Complex (VCC), Hassan during January 2022 to December 2023

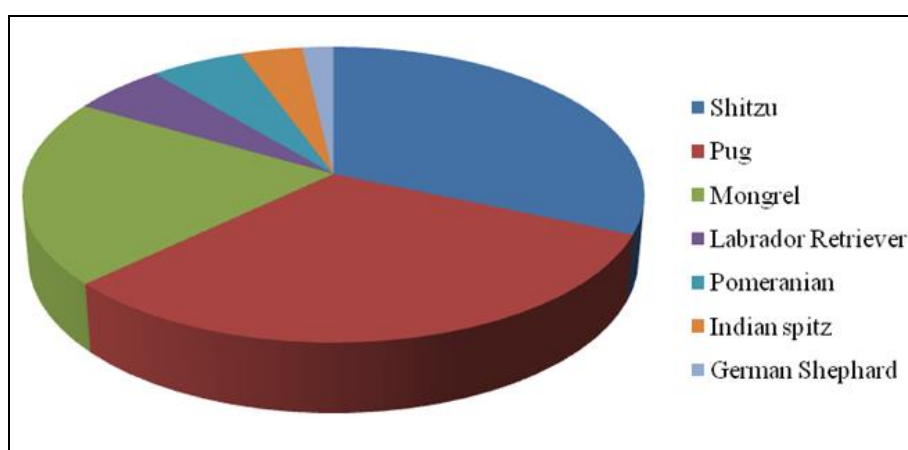


Fig 3: Breed wise prospective incidence of corneal ulcer in dogs at Veterinary Clinical Complex (VCC), Bidar and Hassan during January 2022 to December 2023

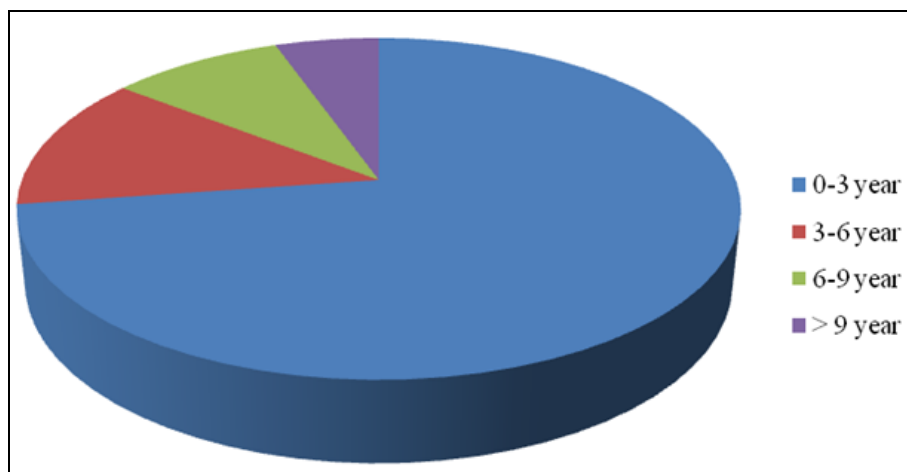


Fig 4: Age wise prospective incidence of corneal ulcer in dogs at Veterinary Clinical Complex (VCC), Bidar and Hassan during January 2022 to December 2023

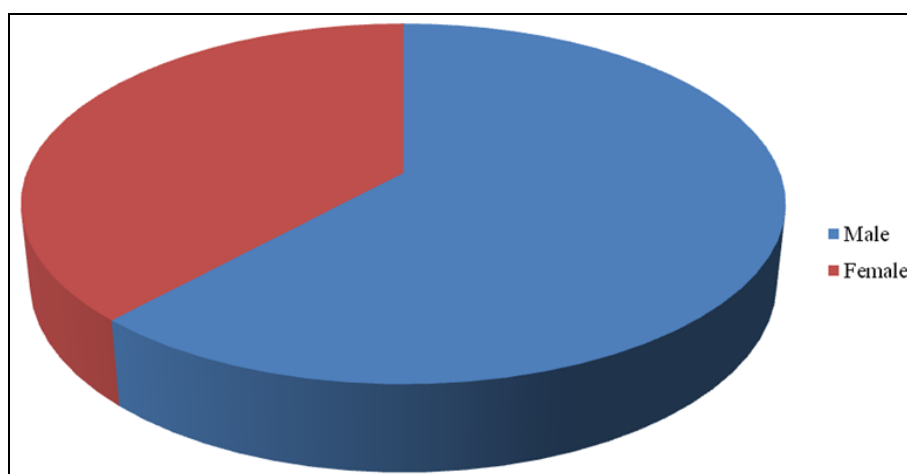


Fig 5: Gender wise prospective incidence of corneal ulcer in dogs at Veterinary Clinical Complex (VCC), Bidar and Hassan during January 2022 to December 2023

Table 1: Retrospective incidence of clinical cases presented during January 2019 to December 2021

VCC	Year 2019		Year 2020		Year 2021		Total
	Bidar	Hassan	Bidar	Hassan	Bidar	Hassan	
Number of patients presented to VCC	6920	6895	8296	7078	10140	9728	49057
Number of surgical patients	1424	2734	1918	2414	2248	2980	13718
Number of canine patients	1703	4392	2765	4341	4342	5841	23384
Number of canine surgical patients	518	1155	608	1178	845	1595	5899
Number of canine ophthalmic patients	11	24	14	39	15	29	132

Table 2: Retrospective incidence of corneal ulcers in dogs during January 2019 to December 2021

VCC	Total number of dogs presented to VCC	Total number of canine surgical patients	Total number of ocular affections in dogs	Total number of corneal ulcer cases out of total cases presented to VCC (canine)	Number of corneal ulcer cases among total ocular affections	Number of corneal ulcer out of total surgical canine patients
Bidar	8810	1971	40 (0.45%)	9 (0.10%)	9 (22.50%)	9 (0.45%)
Hassan	14574	3928	92 (0.63%)	10 (0.07%)	10 (10.86%)	10 (0.25%)
Total	23384	5899	132 (0.56%)	19 (0.08%)	19 (14.39%)	19(0.32%)

Conclusions

The Prospective and retrospective study over a period of five years on the corneal ulcer in dogs at VCC Bidar and Hassan, the overall incidence of corneal ulcer was found to be 0.24% and 0.08% respectively and its highest incidence in Shih tzu and Pug (30.91%), dogs aged less than three years (72.73%) and males (61.82%). Blepharospasm, conjunctival congestion, pawing of the affected eye and

varied degrees of corneal opacity were the most common clinical signs associated with corneal ulcer.

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