



Incidence of Ocular Affections in Dogs with Special Reference to Pigmentary Keratitis

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ABSTRACT

Background: The aim of current study was to record the Incidence of ocular affections in dogs with special reference to pigmentary keratitis.

Methods: Total 6,863 animals were registered at Veterinary Clinical Complex (VCC), Co.V.Sc Jabalpur during a period of six months (May to October, 2024). Out of these animals 5,148 were of dogs, in which 300 (5.82%) dogs were suffered from various ocular affections. Pigmentary keratitis was recorded in 42 (0.81%) dogs after clinical examination.

Result: Among the various ocular affections cataracts being the most common at 20.0%, followed by pigmentary keratitis, corneal ulcers, conjunctivitis, corneal edema, eyelid masses and other ocular affections were observed in decreasing order. Labrador Retriever was mostly affected among all breeds representing 25.33% of cases, with male dogs showing a higher distribution at 61.33% compared to females at 38.66%. The age group of 3 to 7 years (36.33%) suffered the most. The incidence of pigmentary keratitis in the study was 14.0%, cases of severe pigmentary keratitis (52.63%), with diffuse pigmentation pattern presented the most, Pug being the most affected breed, accounting for 69.04% of cases. Male dogs were more commonly affected than females, with a distribution of 66.66% and 33.33% respectively. Dogs aged between 3 to 7 years were the most affected, comprising 42.85% of the cases.

Key words: Dog, Ocular affections, Pigmentary keratitis, Prevalence.

INTRODUCTION

The main objective is to record the Incidence of ocular affections in dogs with special reference to pigmentary keratitis. The present research work was carried out in Veterinary Clinical Complex (VCC) College of Veterinary Science and Animal Husbandry, (N.D.V.S.U.), Jabalpur, Madhya Pradesh (M.P.) Pigmentary keratitis, also referred to as corneal melanosis or corneal pigmentation (Maggs, 2008), is an ocular disorder in which, due to persistent corneal irritation and inflammation, normal limbal melanocytes migrate, resulting in the deposition of melanin into the corneal epithelium and occasionally into the anterior stroma. It grossly appears as a dark brown to black discoloration of the cornea. Pigmentation that crosses the visual axis can result in severe visual impairment and in extreme situations, blindness. A number of factors contribute to the pigmentary keratitis, includes frictional irritation (distichiasis, entropion, trichiasis), tear film abnormalities (keratoconjunctivitis sicca) and prolonged corneal exposure (logophthalmos, facial nerve disfunction, macropalpebral fissure etc.) (Maggs *et al.*, 2018). Among livestock and poultry, dogs are the most susceptible and birds are the least susceptible. In dogs, Pug (Maini *et al.*, 2019), Shih-Tzu, Lhasa Apso, Pekingese, Bulldog, German Shepherd, Boxer and Beagle are more susceptible to pigmentary keratitis because of their skull anatomy and more melanotic limbus (Gelatt and Plummer, 2022).

MATERIALS AND METHODS

The present research work was carried out in the Department of Veterinary Surgery and Radiology, Veterinary

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Clinical Complex (VCC), College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University (N.D.V.S.U.), Jabalpur, Madhya Pradesh (M.P.). All the dogs presented to VCC Jabalpur in six months duration was examined irrespective of age, sex and breed to record the incidence of eye affection. Detailed ophthalmic examination was performed along with palpebral reflex, menace response and pupillary light reflexes. Special diagnostic procedures like Schirmer's tear test, Fluorescein dye test, Tear film break-up time and Slit lamp biomicroscopy were also done. The corneal photographs were assessed for pigmentation levels based on the grading system proposed by Maini *et al.* (2019) (Table 1, Plate 1).

RESULTS AND DISCUSSION

Total 5,148 dogs were registered at Veterinary Clinical Complex (VCC), Co.V.Sc Jabalpur during a period of six months (May to October, 2024). Out of which 300 (5.82%) dogs were suffered from various ocular affections (Plate 2). Pigmentary keratitis was recorded in 42 (0.81%) dogs after clinical examination. The incidence of ocular affections in dogs has varied over the years. Makode (2024) reported an incidence of 4.36%, Beniwal (2022) 2.08%, Das *et al.* (2019) 1.39% and Mishra *et al.* (2021) 2.23%. Overall, the reported rate of various eye problems in the dog population being observed with higher rates in recent years potentially due to changes in pet ownership trends and greater owner vigilance regarding pet eye health.

Distribution of various ocular affections and corneal affections

Among ocular affections, majority of the dogs were diagnosed with cataract (20.0%), consistent with previous finding by Das *et al.* (2019) followed by pigmentary keratitis (14.0%) and corneal ulcer (8.33%). The incidence of other ocular affections was lesser in number (Table 2).

According to recent studies, Makode (2024) reported an incidence of pigmentary keratitis at 10.66%. Likewise, Beniwal (2022) and Mishra *et al.* (2021) recorded an incidence rate of 7.29% and 5.68%, respectively.

In the present investigation, corneal disorders revealed a specific distribution pattern, with pigmentary keratitis accounting for 49.41% of cases, followed by corneal ulcers at 29.41%, corneal opacity at 17.64% and corneal dystrophy at 3.52% (Table 2).

These findings closely corroborate with the results of Rajasekaran (2021) and Ratnu (2017), who similarly documented pigmentary keratitis as the most frequently occurring corneal disorder, with percentages of 52.94% and 19.4% respectively.

Age wise distribution of ocular affections and pigmentary keratitis

In the present research, the prevalence of ocular affections varied across different age groups, with adult dogs showing the highest percentage (36.33%) followed by young dogs (34.0%) and geriatric dogs (29.66%) (Table 3).

These findings align with the observations of Pandey *et al.* (2018), who documented that the majority of animals

with ocular conditions were predominantly in the age group of 6 to 10 years (47.54%). However, these results are in contrast with the findings of Tamilmahan *et al.* (2013), who reported a different distribution, with animals over 5 years of age exhibiting the highest incidence at 47.68%.

Ocular affections were more common in adult dogs, which may be attributed to their larger population, higher frequency of clinical presentation and the effects of the aging process.

Pigmentary keratitis was most prominent in adult animals (42.85%), while young and elderly age groups showed an equal distribution of cases at 28.57% each (Table 3).

Consistent with these findings, Rajasekaran (2021) reported the mean age of animals was 5.27 ± 0.29 years, with their ages ranging from 0.4 months to 10 years. Corneal pigmentation was most frequently seen in the adult group (57.29%), followed by the elderly group (29.17%) and the younger age group (13.54%). Contrary to these findings, Anoop *et al.* (2015) reported pigmentary keratitis was most frequently seen in dogs aged between 1 and 3 years (53%).

Sex wise distribution of ocular affections and pigmentary keratitis

The distribution of ocular affections showed a notable gender disparity, with 61.33% of cases observed in male dogs and 38.66% in females, indicating a higher prevalence among males (Table 4). The incidence was slightly higher in females (6.75%) as compared to males (5.36%).

This pattern of predominance of ocular affections in males is consistent with the findings by Tamilmahan *et al.* (2013), who similarly reported a higher distribution of ocular conditions in males at 60.32% versus females at 39.29%. However, Akinrinmade and Ogungbenro (2015) documented a contrasting scenario with a higher distribution of ocular affections in females (42.42%) as compared to males (35.49%).

The greater distribution of ocular affections in male dogs in the current study may be attributed to their typically larger population.

In the present study, 66.66% of the affected dogs were male, while the remaining 33.33% were female, indicating a higher prevalence of pigmentary keratitis in males (Table 4).

Table 1: Grading of corneal pigmentation.

Characteristics of pigmentation	Points awarded
Single line of pigmentation in a clock hour	½ point
Pigment affecting a clock hour	1 Point
Pigment extending up to the resting pupil edge	1 Additional point
Pigment extending beyond the resting pupil edge, affecting the visual axis	2 Additional point
Pigment extending just beyond the limbus	1 point per clock hour affected
The grey-white corneal lesions were considered a precursor to the corneal pigmentation and points allotted similar to the corneal pigmentation.	

(Maini *et al.*, 2019).

Note: Grading score: 0.5 – 14; Mild - 0.5-4.5; Moderate - 5.0-9.5; Severe - 10.0-14.0.

These findings align with those of Labelle *et al.* (2013) who observed that male dogs more frequently exhibited moderate to severe corneal pigmentation as compared to female dogs. However, in contrast, Maini *et al.* (2019) reported a higher incidence of pigmentary keratitis in females (57.7%) than in males (42.3%).

These findings might be attributed to the preference of male dogs as pets by the majority of owners.

Relationship between the presence of ocular affection with sex of the animal

The study analyzed the association between sex and ocular affection. Among males (3,432), out of 5,148 dogs, 184

cases were found to have ocular affection. While, females (1,716), 116 of them were found to have ocular affection. The chi-square value was 4.0776, with a P value of 0.043**, indicating a statistically significant relationship between sex and ocular affection (Table 4).

Breed wise distribution of ocular affections and pigmentary keratitis

Among different breeds of dogs, the highest distribution of ocular affections was in Labrador Retriever (25.33%) followed by Non-descript (17.33%), Pug (11.66%), German Shepherd (9.66%), Pomeranian (8.66%), Shih Tzu (7.66%), Beagle (4.33%), Spitz (3.66%), Golden Retriever (3.00%),

Table 2: Distribution of various ocular affections and corneal affections.

Name of ocular affection	Number of dogs	Per cent (%)	Number of dogs with corneal affections	Per cent (%)
Cataract	60	20.00	-	-
Pigmentary keratitis	42	14.00	42	49.41
Corneal ulcer	25	08.33	25	29.41
Conjunctivitis	25	08.33	-	-
Corneal edema	15	05.00	15	17.64
Eyelid mass	14	04.66	-	-
Epiphora	13	04.33	-	-
Keratoconjunctivitis sicca	13	04.33	-	-
Cherry eye	10	03.33	-	-
Glaucoma	09	03.00	-	-
Lens luxation	09	03.00	-	-
Retinal detachment	08	02.66	-	-
Traumatic injury	08	02.66	-	-
Blepharitis	07	02.33	-	-
Eyeball prolapsed	06	02.00	-	-
Entropion	05	01.66	-	-
Dermoid	04	01.33	-	-
Ectropion	04	01.33	-	-
Iris prolapsed	04	01.33	-	-
Periorbital lesions	04	01.33	-	-
Corneal dystrophy	03	01.00	03	03.52
Hyphema	03	01.00	-	-
Uveitis	02	00.66	-	-
Microphthalmia	02	00.66	-	-
Asteroid hyalosis	01	00.33	-	-
Aqueous flare	01	00.33	-	-
Distichiasis	01	00.33	-	-
Horner's syndrome	01	00.33	-	-
Hypopyon	01	00.33	-	-
Total	300	100	85	100

Table 3: Age wise distribution of ocular affections and pigmentary keratitis.

Age (years)	Number of dogs with ocular affection	Distribution (%)	Number of dogs with pigmentary keratitis	Per cent (%)	Incidence (%)
0-3	102	34.00	12	28.57	11.76
3-7	109	36.33	18	42.85	16.51
>7	89	29.66	12	28.57	13.48
Total	300	100	42	100	14.00

Table 4: Sex wise distribution of various ocular affections, pigmentary keratitis and relationship between the presence of ocular affection with sex of the animal.

Sex	Number of ocular cases	Cases without ocular affection	Total	X ² , P value	Distribution (%)	Incidence (%)	Number of dogs with pigmentary keratitis	Per cent (%)	Incidence (%)
Male	184	3,248	3,432	4.0776,	61.33	5.36	28	66.66	15.21
Female	116	1600	1,716	0.043**	38.66	6.75	14	33.33	12.06
Total	300	4,848	5,148		100	5.82	42	100	-

Lhasa Apso (1.66%), Chow-Chow and Rottweiler (1.00% each), Dalmatian, American Bully, French Bulldog, Great Dane and Saint Bernard (0.66% each), Belgian Shepherd, Boxer, Siberian Husky, French Mastiff and Poodle (0.33% each) (Table 5).

These findings were in contrast with findings of Kalaiselvan *et al.* (2009) identified Spitz breeds as the most commonly affected at 35.86%, while Kumar *et al.* (2018) found that Pugs to be the most prevalent at 28.3%.

These variations primarily may be attributed to the higher population of Labrador Retriever dogs in and around the Jabalpur region, suggesting that breed-specific ocular affection may be influenced by local canine demographics. In the present study, majority of dogs diagnosed with pigmentary keratitis were Pug (69.04%), followed by Labrador Retriever (16.66%), German Shepherd (9.52%), French Bulldog (2.38%), Lhasa Apso (2.38%), Non-descript (2.38%) and Shih Tzu (2.38%) (Table 5).

These results were closely similar with Anoop *et al.* (2015) who reported that Chinese Pugs showed the highest incidence (92.7%), followed by Lhasa Apso (4%), Cocker Spaniel (2%) and Bull Mastiff (2%). Vallone *et al.* (2017) also found a high incidence of pigmentary keratitis in Pugs. The increasing prevalence of corneal pigmentation in Pugs can largely be attributed to the breed's growing popularity and distinctive anatomical traits, including shallow eye sockets, breed-specific exophthalmos and a large palpebral fissure. Additional contributing factors include nasal folds that frequently contact the cornea and caruncular trichiasis, both of which promote corneal irritation and pigmentation (Van der Woerd, 2004).

Distribution of ocular affections and pigmentary keratitis based on eye affected

The distribution of bilateral ocular affections was (35.00%), followed by right eye affections (34.00%) and left eye affections (31.00%) (Table 6).

These finding aligns with the observations of Akinrinmade and Ogungbenro (2015), who reported an even more pronounced bilateral prevalence, with 54.98% of the cases involving both eyes compared to 21.11% for the right eye and 13.42% for the left eye. However, these results are in contrast with the findings of Pratap *et al.* (2005), who observed no significant difference between left (45.7%) and right (42.4%) eye involvement, with a markedly lower rate of bilateral cases at 12.00%.

In the current study, 80.95% of the dogs exhibited bilateral pigmentary keratitis, while 19.04% of them were affected unilaterally. These findings suggest that bilateral manifestation of pigmentary keratitis is the most common (Table 6).

Supporting this observation, Maini *et al.* (2019) also reported that 91.2% of pugs displayed bilateral pigmentary keratitis, while only 8.8% were affected unilaterally.

Distribution of ocular affections based on anatomical location

The investigation revealed that corneal conditions were the most common (28.33%), followed by lens-related

issues (23.00%), eyelid and nictitating membrane involvement (13.66%). Other affected areas included the orbit and globe (12.00%), conjunctiva (9.66%), lacrimal system (8.66%), fundus (2.66%) and uvea (2.00%) (Table 7).

These findings align with the findings of Pratap *et al.* (2005) and Tamilmahan *et al.* (2013), who similarly reported corneal conditions as the most frequent, with percentages

of 40% and 28% respectively. However, this pattern diverges from the observations of Sale *et al.* (2013) who identified lens-related conditions with the highest incidence.

Corneal affections were more common than other ocular conditions, likely because the cornea is the most exposed part of the eye, making it highly vulnerable to trauma, environmental irritants and infections.

Table 5: Breed wise distribution of various ocular affections and pigmentary keratitis.

Name of the breed	Number of dogs with ocular affection	Distribution (%)	Number of dogs with pigmentary keratitis	Per cent (%)
Labrador retriever	76	25.33	05	11.90
Non-descript	52	17.33	01	02.38
Pug	35	11.66	29	69.04
German shepherd	29	09.66	04	09.52
Pomeranian	26	08.66	-	-
Shih Tzu	23	07.66	01	02.38
Beagle	13	04.33	-	-
Spitz	11	03.66	-	-
Golden retriever	09	03.00	-	16.66
Lhasa apso	05	01.66	01	02.38
Chow-chow	03	01.00	-	-
Rottweiler	03	01.00	-	-
Dalmatian	02	00.66	-	-
American bully	02	00.66	-	-
French bulldog	02	00.66	01	02.38
Great dane	02	00.66	-	-
Saint bernard	02	00.66	-	-
Belgian shepherd	01	00.33	-	-
Boxer	01	00.33	-	-
Siberian husky	01	00.33	-	-
French mastiff	01	00.33	-	-
Poodle	01	00.33	-	-
Total	300	100	42	100

Table 6: Distribution of ocular affections and pigmentary keratitis based on eye affected.

Affected eye	Number of dogs with ocular affection	Distribution (%)	Number of dogs with pigmentary keratitis	Per cent (%)
Bilateral	105	35.00	34	80.95
Unilateral Right eye	102	34.00	08	19.04
Left eye	93	31.00		
Total	300	100	42	100

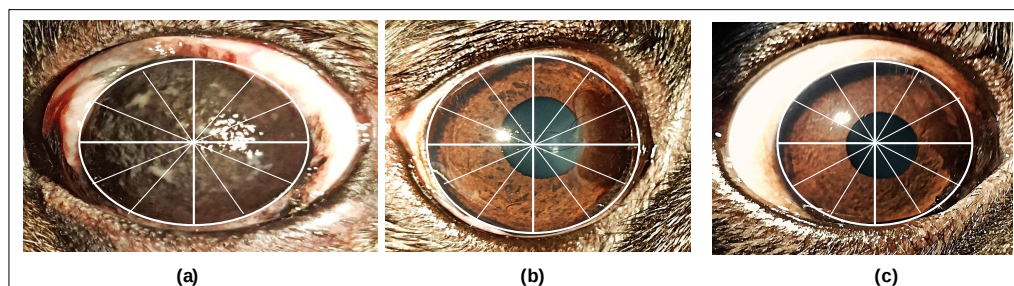


Plate 1: Pigmentation grading score (a) Severe (10-14), (b) Moderate (5-9.5), (c) Mild (0.5-4.5).

Distribution according to degree of corneal pigmentation

The corneal photographs were assessed for pigmentation levels based on the grading system proposed by Maini *et al.* (2019). Among the 76 corneas evaluated, 40 (52.63%) of them exhibited severe pigmentary keratitis, 30 (39.47%) showed a moderate degree and 6 (7.89%) had a mild degree of pigmentary keratitis. These results indicate that most eyes were affected by a severe degree of pigmentary keratitis (Table 8).

Table 7: Distribution of ocular affections based on anatomical location.

Ocular affections	Number of dogs	Distribution (%)
Cornea	85	28.33
Lens	69	23.00
Eyelids and nictitating membrane	41	13.66
Orbit and globe	36	12.00
Conjunctiva	29	09.66
Lacrimal system	26	08.66
Fundus	08	02.66
Uvea	06	02.00
Total	300	100

Table 8: Distribution according to degree of corneal pigmentation.

Degree of pigmentation	Number of eyes	Per cent (%)
Mild	06	07.89
Moderate	30	39.47
Severe	40	52.63
Total	76	100

Table 9: Etiology wise distribution of pigmentary keratitis.

Etiology	Number of eyes	Per cent (%)
Nasal fold trichiasis	25	32.89
Medial entropion lower eyelid	20	26.31
Macropalpebral fissure	15	19.73
Keratoconjunctivitis sicca	06	07.89
Eyelid mass	04	05.26
Trichiasis	03	03.12
Chronic superficial keratitis	02	02.63
Distichiasis	01	01.31
Total	76	100

Table 10: Distribution based on pattern of corneal pigmentation.

Pattern of pigmentation	Number of eyes	Per cent (%)
Diffuse	40	52.63
Medial pyramid	17	22.36
Patchy	09	11.84
Paintbrush	06	07.89
Streak	04	05.26
Total	76	100

In contrast, Quintana *et al.* (2024) reported varying degrees of corneal pigmentation, with the distribution as very mild (20.3%), mild (16.4%), moderate (38.2%) and severe (25.1%).

Etiology wise distribution of pigmentary keratitis

The major causative factor found to be responsible for the pigmentary keratitis was nasal fold trichiasis (32.89%) followed by medial entropion lower eyelid (26.31%), macropalpebral fissure (19.73%), keratoconjunctivitis sicca (07.89%), eyelid mass (05.26), trichiasis (03.12%), chronic superficial keratitis (02.63%) and distichiasis (01.31%) (Table 9).

These findings were in accordance to those of Charbiwala (2019), who stated that brachycephalic ocular syndrome (medial lower eyelid entropion, medial caruncle, trichiasis, macropalpebral fissure and nasal fold trichiasis) was the most common cause (34.85%). Ratnu (2017) identified that both nasal fold trichiasis and distichiasis (50%) were the most common cause of pigmentary keratitis. Pigmentation was thought to result from pigmented corneal epithelial injury exceeding the regenerative capacity of epithelial cells. However, the exact cause remains unclear.

Distribution based on pattern of corneal pigmentation

The corneal pigmentation pattern was classified based on the criterias suggested by Charbiwala (2019) and Rajasekaran (2021). In this study the majority of the affected eyes exhibited a diffuse pattern of corneal pigmentation (52.63%), followed by medial pyramid (22.36%), patchy (11.84%), paintbrush (7.89%) and streak (5.26%) patterns (Table 10, Plate 3).

These findings were consistent with Rajasekaran (2021) and Charbiwala (2019), who found that the diffuse pattern was the most common, observed in 34.38% and 43.94% of cases, respectively, followed by other patterns occurring less frequently.

Relationship between presence of pigmentary keratitis with animal variables

The study evaluated 300 animals, including 42 with pigmentary keratitis and 258 without pigmentary keratitis, to identify associated factors. No significant associations were found with sex ($X^2=0.585$, $P=0.44$) or age ($X^2=1.0151$, $P=0.60$). However, a strong association was observed with breed ($X^2=151.28$, $P<0.00001$), with Pug being the most affected (29/35 cases) and with bilateral eye involvement ($X^2=45.33$, $P<0.00001$). These findings indicate that breed and bilateral presentation are significant risk factors for pigmentary keratitis (Table 11).

The results were closely similar to Labelle *et al.* (2013) who observed that no significant correlation between the age of the dogs and corneal pigmentation detection. In contrast to this, Quintana *et al.* (2024) reported that the presence of pigmentary keratitis showed a statistically significant relationship with the age of the studied animals.



Plate 2: Eye affections.

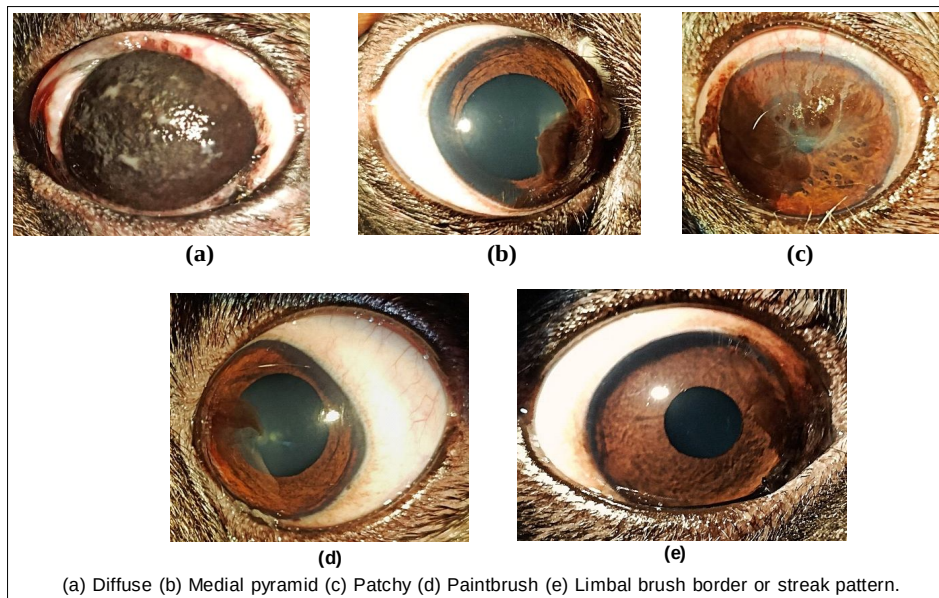


Plate 3: Different patterns of pigmentation.

Table 11: Relationship between presence of pigmentary keratitis with animal variables.

Animal variable	Total cases (N=300)	Cases with pigmentary keratitis(N=42)	Cases without pigmentary keratitis(N= 258)	Total (N= 300)	X ² , P value
Sex	Male	28	156	184	0.585, 0.44
	Female	14	102	114	
Age	0-3	12	90	102	1.0151, 0.60
	3-7	18	91	109	
	>7	12	77	89	
Breed	Pug	29	06	35	151.28, <0.00001***
	Labrador retriever	05	71	76	
	Other breeds	08	181	189	
Side of eye	Bilateral	34	71	105	45.33, <0.00001***
	Unilateral	08	187	195	

CONCLUSION

A study involving 5148 dogs found that 5.82% of dogs had ocular disorders, with cataracts being the most common (20%), followed by pigmentary keratitis (14%). Pigmentary keratitis showed a marked breed predisposition, occurring predominantly in Pugs (69.04% of cases), with bilateral involvement in 80.95% of affected dogs. Anatomical factors, particularly nasal fold trichiasis (32.89%), were identified as major causes. Adult dogs were the most frequently affected age group (36.33%) and males exhibited a higher prevalence (61.33%), although females had a slightly greater incidence rate. Statistical evaluation revealed that breed ($P < 0.00001$) and bilateral occurrence ($P < 0.00001$) were significant risk factors for pigmentary keratitis. The high proportion of severe cases (52.63%) highlights the importance of breed-targeted screening, early detection and timely management to protect vision in affected dogs.

Conflict of interest

All authors declare that they have no conflict of interest.

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