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Retrospective Analysis of Feline Ocular Diseases: Insights into Prevalence, Breed Predispositions, and Anatomical Localizations in a Veterinary Hospital in the Northeastern Anatolian Region of Turkey: 310 Cases (2016-2023)

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Abstract: In this retrospective investigation, the medical records of feline patients exhibiting ocular symptoms were comprehensively collected from Atatürk University, Veterinary Faculty, Animal Hospital over the period ranging from 2016 to 2023. A complete investigation was carried out a total of 427 cases with ocular disease observed in 310 cats. A statistical analysis was made to identify patterns associated with breed, age, gender, and anatomical localization. No evidence of gender predisposition to ocular diseases was found, while a higher incidence was noted in kittens aged 0-6 months, resulting in 57.4% of cases. In relation to breed predisposition, it was observed that ocular diseases demonstrated a higher prevalence among Mix breed and British shorthair cat breeds. The predominant conditions observed within patients were adnexa diseases, which represented 50.2% of cases, followed by nasolacrimal system disorders, which represented 27.9% of cases. In summary, it was shown that brachycephalic breeds presented a higher prevalence of nasolacrimal disorders, whereas mix breed breeds indicated a higher incidence of ocular diseases.

Keywords: Adnexa, British shorthair, cat, eye, nasolacrimal

Kedi Oküler Hastalıklarının Retrospektif Analizi: Türkiye'nin Kuzeydoğu Anadolu Bölgesindeki Bir Veteriner Hastanesinde Prevalans, Irk Yatkınlıkları ve Anatomik Lokalizasyonlara İlişkin Görüşler: 310 Vaka (2016-2023)

Öz: Bu retrospektif araştırmada, Atatürk Üniversitesi Veteriner Fakültesi Hayvan Hastanesi'nden 2016-2023 yılları arasında oküler semptomlar gösteren kedi hastalarının tıbbi kayıtları kapsamlı bir şekilde toplandı. Toplam 310 hastada gözlenen 427 oküler hastalık vakası üzerinde tam bir inceleme yapıldı. Irk, yaş, cinsiyet ve anatomik lokalizasyon ile ilişkili kalıpları belirlemek için istatistiksel bir analiz yapıldı. Oküler hastalıklara cinsiyet yatkınlığına dair bir kanıt bulunmazken, 0-6 aylık yavru kedilerde vakaların %57.4'ünü oluşturan daha yüksek bir insidansda olduğu belirlendi. Irk yatkınlığı ile ilgili olarak, oküler hastalıkların Mix breed ve British shorthair kedi ırkları arasında daha yüksek bir prevalans gösterdiği gözlemlendi. Hastalarda gözlemlenen baskın hastalıklar, vakaların %50.2'sini temsil eden adneksa hastalıkları olup, bunu vakaların %27.9'unu temsil eden nazolakrimal sistem bozuklukları izledi. Özetle, brakisefalik ırklarda nazolakrimal bozuklukların daha yüksek prevalans gösterdiği, melez ırklarda ise oküler hastalıkların daha yüksek insidans gösterdiği belirlendi.

Anahtar kelimeler: British shorthair, göz, göz kapakları, kedi, nasolakrimal

Introduction

Ophthalmology plays an important part in the recognition and treatment of disorders affecting animals. The ocular system has a significant the level of complication in both its anatomical make up and physiological mechanisms. The previously identified organ

be sensitised and show clinical signs even as a result of slight changes in the physiological balance of localised or systemic diseases (Scountzou, 2003; Akın and Samsar, 2005).

Ocular diseases are frequently observed in feline species. Hence, the assessment of ocular illness prevalence based on factors such as breed, sex, and age retains significant importance in establishing the diagnosis of ocular diseases (Gould and McLellan,

2014; Akinrinmade and Ogungbenro, 2015; Park et al., 2023). Congenital ocular malformations have been reported in dogs and cats in previous studies (Glaze 2005; Kuehn et al., 2016; Saraiva and Delgado, 2020; Bott and Chahory, 2022). Although there have been many studies on glaucoma, entropion, cherry eye and cataract in cats, there are few studies on the prevalence and epidemiologic analysis of ocular diseases in cats (Chahory et al., 2004; Williams and Kim, 2009; McLellan and Teixeira, 2015; Guyonnet et al., 2019).

Ophthalmologic studies may determine the frequency of ocular diseases and may assist in limiting down potential diagnoses and treatment alternatives (Kanski 2007). While studies investigating the incidence of ocular disorders in dogs and cats have been conducted in France and South Korea (Glaze 2005; Guyonnet et al., 2019; Bott and Chahory, 2022; Sarfaty et al., 2022). The objective of this retrospective study was to investigate the prevalence of ocular disorders in cats, examining the influence of factors such as breed, gender, and age at a Veterinary Hospital in the Northeastern Anatolian Region of Turkey.

Materials and Methods

Medical records review

In this retrospective study, the medical records of feline patients presenting with ocular symptoms at Atatürk University, Veterinary Faculty, Animal Hospital in Erzurum-Türkiye were collected from January 2016 to July 2023. As this study was considered retrospectively and in an observational manner, no institutional or client approval was obtained. Data were gathered for each feline subject, encompassing variables such as sex, age at initial presentation, medical history, length and manifestation of clinical signs, findings from physical examination, diagnosis, treatment administered, and clinical outcomes. An investigation was conducted to determine if both oculars of the patients were impacted. Simultaneously, these structures were categorized based on their localization as adnexa, nasolacrimal canal, cornea, globe/orbit, üvea, lens.

To perform a statistical comparison of the age ranges across patients, the age scale of cats was utilized as a reference point (Quimby et al., 2021). The patients in the study were categorized into four groups based on their age: patients aged 0-6 months were assigned the Group 1, patients aged 7 months-2 years were assigned the Group 2, patients aged 3-6 years were assigned the Group 3, and patients aged 7-10 years were assigned the Group 4.

Ophthalmic examination

Veterinarians in the Department of Surgery at Atatürk University Veterinary Faculty Animal Hospital, Erzu-

rum, Turkey carried a comprehensive ophthalmic examination on cats referred to the facility. Threat response, palpebral, glare, and pupil light reflexes were evaluated. Subsequently, Schirmer tear test I (AkSchirmer), fluorescein staining (Flu-Glo; Akorn Pharmaceuticals), ultrasonographic imaging (Mindray, Vetus 8; China), ophthalmoscopic (Aesculap AC-635 C, Braun, Tuttlingen, Germany) and intraocular pressure measurements using a rebound tonometer (TonoVet; Icare), were performed in both oculars of all patients. If required, pupillary dilation was performed using a topical 0.5% tropicamide solution (Mydriaticum; Théa). STT-1 was applied to each ocular with the designated portion of the strip placed in the lateral third of the ventral conjunctival fornix. A stopwatch was used to time the tests and the wet portion of the strip was measured in millimeters after one minute.

Statistical analysis

Descriptive statistical analysis was performed to examine many factors including breed, sex, age at initial presentation, anatomical location, diagnosis, and the unilateral or bilateral nature of disorders. This study was conducted using commercial software, specifically Excel 2016 by Microsoft. The prevalence of each ocular disease in the reference population and the 95% confidence interval (CI) of the estimates were calculated. The breed, age, and sex of the cats were expressed as proportions relative to the overall population of cats, whereas the prevalence of diseases was presented as proportions relative to the total number of diagnosed cases. All these variables were subjected to parametric and nonparametric tests. The calculation of odds ratios (ORs) was performed to compare the prevalence of a variable in the study population to that in the reference population. The statistical software package SPSS (Version 26.0; IBM) was utilized for conducting the analysis. A p-value less than or equal to 0.05 was considered to be statistically significant.



Figure 1: Laceration in 3 eyelids (a), Entropion (b), Proptosis due to trauma (c).



Figure 2: Anterior uveitis (a), Pannus (b), Glaucoma (c).

Results

A total of 427 out of 6000 feline patients who sought medical attention at Atatürk University Animal Hospital from June 2016 to July 2023 exhibited ocular problems, accounting for 7.12% of the observed cases (Figure 1 and Figure 2). In total, a sample size of 425 ocular disease, from 310 cats, were presented and subjected to examination. A total of 6 different breeds were included in the study (Figure 3). Among

these breeds, there were 132 cats with brachycephalic features, including Scottish fold, British short-hair and Persian. The most common breeds in the study were 164 Mix breeds, 85 British shorthair, 35 Scottish fold and 12 Persian cats.

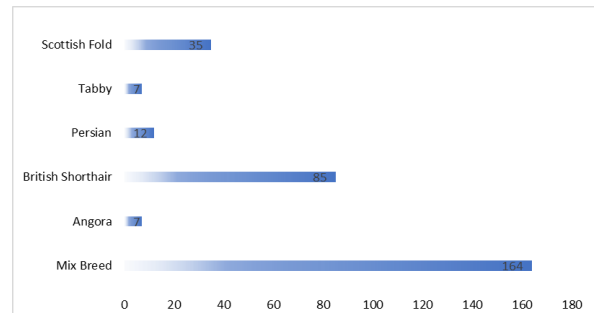


Figure 3: The prevalence rate (%) ocular disease in cats, varies among different breeds.

From the feline subjects examined in the research, a total of 152 (49%) individuals were identified as male, while 149 (48%) individuals were classified as female (Figure 4). The gender of nine feline within the age range of 0-2 months could not be ascertained. Among the participants included in our study, it was seen that 178 (57.4%) individuals fell into the kitten category, 104 (33.5%) individuals were classified as Junior, 26 (8.4%) individuals were categorized as prime, and a mere 2 (0.6%) individuals were identified as adult (Figure 5). The study examined seven ocular findings based on their anatomical positioning, including the adnexa, nasolacrimal system, cornea, globe/orbit, uvea and lens, and glaucoma (Figure 6).

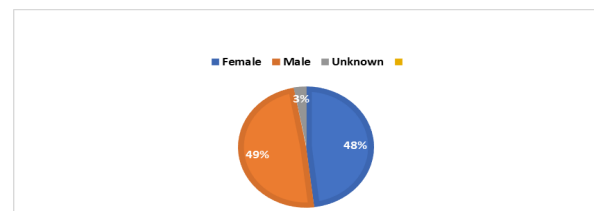


Figure 4: The Prevalence rate (%) of ocular disorders according to gender.

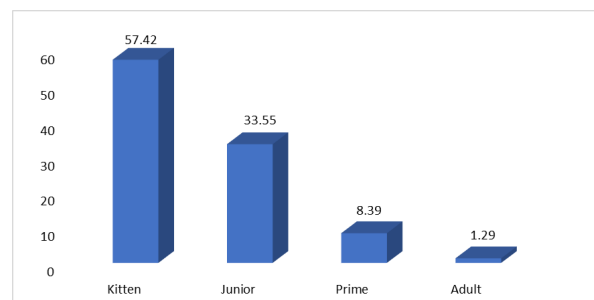


Figure 5: Prevalence rate (%) of ocular disorders according to age scale of cats.

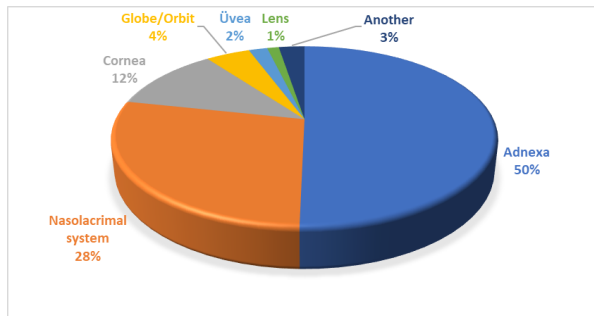


Figure 6: Prevalence rates (%) of ocular disorders according to the anatomical location in cats.

Adnexa

The prevalence rate of adnexa disorders was 50.2% including conjunctivitis (39.3%), entropion (3.51%), cherry ocular (2.11%), chemosis (1.87%), blepharitis and others (Table 1). The incidence of adnexa diseases in mix breed cats was higher than the incidence of adnexa diseases in other breeds (46.6%, ORs: 1.02; 95% CI: 0.67-1.5; $P < 0.05$). This was followed by British shorthair and Scottish fold. When it related to the occurrence of adnexa diseases in cats, there was no statistical difference between male and female cats (ORs: 0.72; 95% CI: 0.47-1.08; $P = 1.11$). When adnexa diseases were analyzed according to

Table 1: Prevalence of ophthalmic disorders according to location in cats in this study

Ocular location	Disorder	Number of disorders	%
Adnexa	Conjunctivitis	168	39.3
	Entropion	15	3.51
	Cherry eye	9	2.11
	Chemosis	8	1.87
	Blepharitis	6	1.40
	Horner syndrome	3	0.70
	Traumatic wound	3	0.70
	Trichiasis	1	0.23
	Symblepharon	1	0.23
	Subtotal	214	50.2
Nasolacrimal system	Epifora	70	16.4
	Micropuncta	40	9.4
	Keratoconjunctivitis sicca	9	2.1
	Subtotal	119	27.9
Cornea	Corneal edema	25	5.85
	Corneal perforation	14	3.28
	Keratitis	7	1.64
	Corneal ulceration	5	1.17
	Subtotal	51	11.9
Globe/orbit	Ocular trauma	10	2.34
	Foreign body	4	0.94
	Buphthalmos	2	0.47
	Microphthalmia	2	0.47
	Orbital fracture	1	0.23
	Subtotal	19	4.45
Uvea	Uveitis	8	1.87
	Subtotal	8	1.87
Lens	Lens luxation	3	0.7
	Cataract	2	0.47
	Subtotal	5	1.17
Another	Secondary glaucoma	11	2.58
	Subtotal	11	2.58
Total		427	100

age groups, it was found that adnexa disease was more likely to be seen in the 1-year age group (ORs: 0.67; 95% CI: 0.46-0.98; $P < 0.05$, Table 2).

Table 2: Localization of eye disease prevalence according to breeds in this study

	Breeds	Odds ratio	95% CI	Prevalance (%)	P VALUE
Adnexa	Mix breed	1.023	0.678 to 1.54	46.6	P<0.001
	Angora	0.336	0.074 to 1.53	3.42	
	British shorthair	1.285	0.75 to 2.21	26.8	
	Persian	0.449	0.14 to 1.48	5.87	
	Tabby	0.598	0.131 to 2.72	3.42	
	Scottish fold	0.979	0.461 to 2.08	13.7	
Nasolacrimal system	Brachiocephalic	2.178	1.440 to 3.296	50.1	P=0.04
	Non-brachiocephalic	0.496	0.327 to 0.751	49.9	
Cornea	Mix breed	0.105	0.066 to 0.165	56.6	P<0.001
	Angora	0.336	0.074 to 1.53	5.19	
	British shorthair	0.0531	0.026 to 0.11	22.3	
	Persian	0.0408	0.005 to 0.32	2.81	
	Tabby	0.0748	0.009 to 0.63	2.63	
	Scotish fold	0.0579	0.019 to 0.169	10.5	
Globe/Orbit	Mix breed	1.429	0.697 to 2.94	57.9	P=0.036
	Angora	0.997	0.055 to 18.1	3.55	
	British shorthair	0.756	0.25 to 2.29	24.4	
	Persian	1.392	0.17 to 11.4	6.78	
	Tabby	0.997	0.06 to 18.09	3.55	
	Scotish fold	0.211	0.012 to 3.56	3.73	
Lens	Mix breed	0.753	0.145 to 3.92	30.1	P=0.64
	Angora	3.703	0.187 to 73.2	9.22	
	British shorthair	0.726	0.084 to 6.3	17.6	
	Persian	5.545	0.596 to 51.5	16.5	
	Tabby	3.703	0.187 to 73.2	9.22	
	Scotish fold	1.794	0.204 to 15.8	17.3	
Uvea	Mix breed	0.944	0.28 to 3.182	37	P=0.93
	Angora	2.373	0.125 to 45	6.32	
	British shorthair	0.910	0.19 to 4.365	22.2	
	Persian	1.424	0.078 to 26	6.47	
	Tabby	2.373	0.125 to 45	6.32	
	Scotish fold	2.288	0.47 to 11.3	21.6	
Another (Gloukom)	Mix breed	1.394	0.549 to 3.54	55.5	P=0.11
	Angora	1.736	0.093 to 32.1	5.64	
	British shorthair	0.324	0.041 to 2.54	11.33	
	Persian	1.042	0.06 to 18.7	5.78	
	Tabby	10.873	1.89 to 62.3	15.8	
	Scotish fold	0.367	0.021 to 6.36	5.92	

Nasolacrimal system

The prevalence rate of nasolacrimal system was 27.9% including epifora (16.4%), micropuncta (9.4%), keratoconjunktivitis sicca (2.21%) (Table 1). Nasolacrimal system diseases were more frequently reported in brachiocephalic breeds than in other breeds (50%; ORs: 2.17; 95% CI: 1.44-3.29; P<0.05). When it related to the occurrence of nasolacrimal system in cats, there was no statistical difference between male and female cats (ORs: 1.02; 95% CI: 0.58-1.82; P=0.93). When nasolacrimal system diseases were analyzed according to age groups, it was found that nasolacrimal system disease was more likely to be

seen in the 1-year age ve 2-year group (ORs: 0.97; 95% CI: 0.604-1.55; P<0.05 and ORs: 0.77; 95% CI: 0.42-1.14; P<0.05, Table 2).

Cornea

In our investigation, the incidence of corneal diseases was found to be 11.9%. Corneal edema accounts for 5.85% of the recorded cases, but corneal perforation represents 3.28% of the total incidences. Four patients with ocular edema and perforation were found to exhibit entropion. The mix breed breed had the highest prevalence of corneal disorders, as reported in the study (56.7%; ORs: 0.105; 95% CI: 0.07-0.16;

$P < 0.05$), followed by British shorthair breed (22.3%; ORs: 0.05; 95% CI: 0.03-0.11; $P < 0.05$) and scottish breed (10.4%; ORs: 0.06; 95% CI: 0.02-0.17; $P < 0.05$). When it related to the occurrence of corneal disease in cats, there was no statistical difference between male and female cats (ORs: 0.88; 95% CI: 0.47-1.64; $P = 0.68$). When corneal disease were analyzed according to age groups, it was found that cornea was more likely to be seen in the 1-year age ve 2-year group (ORs: 1.00; 95% CI: 0.59-1.67; $p < 0.05$ and ORs: 0.94; 95% CI: 0.5 -1.77; $P < 0.05$, Table 2).

Globe/orbit

The incidence of globe and orbital diseases is 4.45% and 2.34%, respectively, causing of ocular trauma. It was found that globe/ orbital diseases were more likely to be seen in mix breed breed cats (48.9%) and British shorthair breed cats (22.6%) compared to other breeds (ORs: 1.47; 95% CI: 0.68-3.07; $P < 0.05$ and ORs: 0.76; 95% CI: 0.25-2.27; $P < 0.05$). There was no statistically significant difference when globe and orbital disease were analyzed in terms of gender compared to other diseases (ORs: 0.67; 95% CI: 0.19 -2.44; $P = 0.55$). When cornea were analyzed according to age groups, it was found that cornea was more likely to be seen in the 1-year age ve 2-year group (ORs: 1.00; 95% CI: 0.59-1.67; $P < 0.05$ and ORs: 0.94; 95% CI: 0.5 -1.77; $P < 0.05$, Table 2).

Other diseases

Secondary gloucoma (2.59%) accounted for all of the gloucoma data in our study. Uveitis was observed in 8 patients in our study, and uveitis constituted 1.88% of our data. Of the lens diseases (1.18%), 0.71% were caused by lens luxation and 0.47% by cataract. No race, age, or gender predisposition was found in these diseases ($P > 0.05$, Table 2).

Discussion and Conclusion

According to the data collected during the study, it was determined that kittens exhibited an increased risk for developing ocular problems associated with conjunctival diseases. Furthermore, our study indicated a statistically significant prevalence of the mix breed breed across all the obtained data. Moreover, the findings of our study indicated the absence of substantial correlation between gender and the incidence of ocular disorders.

The majority of felines included in our research were within the age of one year (57.42%). Previous research has indicated (21.7%) a higher incidence of eye diseases in kittens (Park et al., 2023). Similarly, a previous study carried out in puppies indicated that ocular disease have high prevalence in puppies rather than adult dogs (Akinrinmade and Ogungbenro, 2015). According to the research that was performed, it was observed that the ocular opening of kittens

often occurs within a timeframe of 10 to 14 days subsequent to their birth. The occurrence of premature eye opening in kittens has been found to be associated with many ocular diseases, including corneal dryness, keratitis, corneal ulcers, and conjunctivitis. There exists a claim suggesting that kittens not receive enough amount of maternal milk exhibit reduced levels of antibodies, making them more vulnerable to acquiring infectious diseases (Giger and Casal, 1997; Larson and Schultz, 2021).

There were no notable gender disparities detected in the development of our analysis. Previous research conducted in the field of veterinary medicine suggests that there is no evidence of discernible difference in the occurrence of ocular-related diseases between genders (Saraiva and Delgado, 2020; Bott and Chahory, 2022). The primary source of our data is derived from felines adhering to the brachycephalic and mix breeds. These findings may potentially suggest recent regional breeding patterns or a potentially increased prevalence of congenital ocular defects in the specified breeds. It is also suggested that the prevalence of ocular diseases has increased due to the circumstance that mix breed felines predominantly lack permanent residences and reside within urban areas.

The study's findings indicate that eye problems mostly affect the adnexa of felines. The incidence of conjunctival abnormalities (38.8%) was observed to be the highest among a range of adnexal conditions. The conjunctiva, a crucial part in protecting the cornea from dryness and facilitating the movement of the eyelids and globe, is susceptible to inflammation caused by infections on frequently. Nevertheless, conjunctivitis may result from structural problems, trauma, or hypersensitivity reactions, either alone or in conjunction with these underlying conditions (Hartmann et al., 2010). Previous studies have indicated that conjunctival diseases were found to be the most commonly seen condition in prior investigations conducted on canines and felines (Akinrinmade and Ogungbenro, 2015; Turan, 2022). It is postulated that the conjunctiva is influenced by a multitude of congenital or viral pathologies (Stanley, 1988; Narfstrom, 1999).

During the course of our analysis, it was determined that the nasolacrimal system (28%) had the second highest frequency of occurrence. The current investigation involved an intake of 90 individuals who had been diagnosed with epiphora. Among this group, 60 individuals exhibited micropuncta and were classified as belonging to the barachiocephalic racial group. According to a study, there is a notable prevalence of epiphora in individuals of brachiocephalic racial backgrounds. This phenomenon can be ascribed to the variation of the nasolacrimal duct from its normal anatomical location (Glaze, 2005; Anagrius et al.,

2021).

A further investigation on the prevalence of feline ocular disorders revealed that the cornea exhibited the highest occurrence rate. This observation can be attributed to the chronic and recurring character of corneal disease (Park et al., 2023). In accordance with an alternative investigation, it was found that corneal sequestration emerged as the most commonly observed disease, with a significant proportion of felines exhibiting brachiocephalic facial features. (Sarfaty et al., 2022). The prevalence of corneal disorders was found to be 10.9% in our study. After conducting this retrospective study, we found that ocular diseases were more prevalent among cats aged 0-6 months. Additionally, no gender predisposition was observed among the participants in the study. The majority of the patients belonged to mix breed and brachiocephalic breeds, with the most common affected areas being the conjunctiva, nasolacrimal system, and cornea, respectively.

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