

Prevalence of Infestation, and Risk Factors for *Otodectes cynotis* in Dogs in Kars Region, Türkiye

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Abstract

In this study, the prevalence of *Otodectes cynotis*, the causative agent of ear manges, was investigated in dogs from the Kars region, Türkiye. As part of the study, the medical histories of 100 dogs of different breeds, sexes, and age groups were recorded, clinical examinations were performed, and samples were collected from the ear canal using a swab for microscopic examination of aural exudates (earwax). Ear mite infestation was detected in 38% (38/100) of the examined dogs. Dogs were categorized based on breed, sex, age, lifestyle, and clinical symptoms, and the relationship between these factors and infestation was statistically evaluated using the chi-square test. As a result of the analysis, the relationship between age, lifestyle, ownership status, and *O. cynotis* infestation was found to be statistically significant ($P<0.05$). The findings reveal the prevalence of ear mite infestation in dogs in the Kars region. The results indicate that otocariasis is more commonly observed in young and stray dogs, with shelter dogs being more prone to this causative agent. Therefore, it has been concluded that hygiene and preventive measures should be emphasized.

Key Words: Dog, otocariasis, *Otodectes cynotis*, prevalence, risk factors

Kars Bölgesindeki Köpeklerde *Otodectes cynotis* Enfestasyonun Yaygınlığı ve Risk Faktörleri

Öz

Bu çalışmada, Kars yöresindeki köpeklerde kulak uyuzuna neden olan *Otodectes cynotis*'in prevalansı ve risk faktörleri araştırılmıştır. Bu çalışma kapsamında, farklı ırk, cinsiyet ve yaş gruplarına ait 100 köpeğin anamnezleri alınmış, klinik muayeneleri yapılmış ve kulak kirlerinden alınan örnekler mikroskopik olarak incelenmiştir. Araştırmada köpeklerin %38'inde (38/100) kulak uyuzu tespit edilmiştir. Köpekler ırk, cinsiyet, yaş, yaşam tarzı ve klinik semptomlar açısından kategorize edilmiş ve ki-kare testi kullanılarak bu faktörlerin enfestasyon ile ilişkisi istatistiksel olarak değerlendirilmiştir. Analiz sonucunda, yaş, yaşam tarzı ve sahiplik durumu ile *O. cynotis* enfestasyonu arasındaki ilişki istatistiksel olarak anlamlı bulunmuştur ($P<0.05$). Elde edilen bulgular, Kars bölgesindeki köpeklerde *O. cynotis* enfestasyonunun yaygın olduğunu göstermektedir. Sonuçlar, otocariasis'in özellikle genç ve sahihsiz köpeklerde daha sık görüldüğünü, barınakta yaşayan köpeklerin bu uyuz etkenine daha yatkın olduğunu göstermektedir. Bu nedenle, hijyen ve koruyucu tedbirlerin önemsenmesi gerektiği sonucuna varılmıştır.

Anahtar Kelimeler: Köpek, otocariasis, *Otodectes cynotis*, prevalans, risk faktörü

INTRODUCTION

Otodectes cynotis is a mite belonging to the *Otodectes* genus within the Psoroptidae family, and it is widely distributed worldwide. It is primarily known as the causative agent of otodectic mange (ear mite infestation, otocariasis) in cats and dogs (1-4). This mite colonizes the ear canal of dogs, functioning as an obligate ectoparasite that resides without burrowing (5,6). In carnivorous animals, it causes lesions, particularly in the ear region, and is manifested by clinical signs such as otitis externa, ear discharge, and dermatitis around the head, neck, and ears (4,7). Infested animals exhibit severe itching, head shaking, and podal reflexes as common symptoms. Additionally, secondary bacterial infections may lead to the development of purulent inflammations, ear hemorrhages, and torticollis, resulting in serious complications (8). In the later stages of the disease, the lesions may disseminate to the facial region, neck, and limbs. *Otodectes cynotis* is widely distributed both globally and in Türkiye, and has been identified as the causative agent in more than 50% of otitis externa cases. *Otodectes cynotis* mites are primarily transmitted through direct contact between hosts. Host-switching is particularly common during the neonatal period, where close physical contact between the mother and her offspring facilitates the transmission of the parasite (4,9). *Otodectes cynotis* is primarily diagnosed in cats; however, it can also infest dogs, foxes, weasels, and, though rarely, humans. It is also known to possess zoonotic potential (3). *Otodectes cynotis* has been occasionally identified in unusual hosts, including anteaters (10), Patagonian caviés (11), and Southern pudus (12). It is a highly contagious ectoparasite that primarily affects young individuals and is often diagnosed during routine veterinary examinations (13). While *O. cynotis* does not cause significant clinical signs in the early stages of infestation in cats and foxes, it has been reported to lead to severe symptoms at all stages in dogs (14). Given the higher prevalence of *O. cynotis* in cats, it is hypothesized that cats may serve as the primary source of infestations observed in dogs (15).

To date, while retrospective clinical studies have been conducted on ectoparasites found in various animals in the Kars province (16-19) and on dermatological diseases observed in dogs (20), no specific research has been conducted on the presence of *O. cynotis*. That is one of the significant mite pathogens threatening canine health and, due to its zoonotic potential, poses a risk to human health as well (6). It can be transmitted to humans in close contact with cats and dogs, causing dermatological reactions such as temporary itching. Due to the frequent presence of dogs in household environments and their close contact with humans, it is believed that this parasite should also be considered a public health concern. This study was conducted with the aim of determining the presence of *O. cynotis* in dogs in the Kars region and identifying the risk factors associated with otocariasis.

MATERIAL AND METHODS

The study was conducted on dogs brought to the Internal Medicine Clinic of the Kafkas University Animal Hospital. During this period, a total of 100 dogs from different breeds, genders, and age groups were included in the study.

The dogs examined in the clinic were first subjected to anamnesis, followed by clinical evaluations for symptoms such as restlessness, head shaking, itching in the ears, ear discharge, ear pain, ulceration, and erythema. Subsequently, otoscopic examinations were performed on the animals, and ear wax samples collected from the ear canal were subjected to microscopic examination at the Parasitology Department Laboratory of Kafkas University (4).

Statistical Analysis

The statistical analysis of all data was performed using the Chi-square test for independence to determine whether the differences between the groups were statistically significant. The analyses were conducted using R software (21). A significance level of $P < 0.05$ was considered statistically significant.

RESULTS

In this study, the prevalence of *O. cynotis* infestation in dogs from the Kars region was 38% (38/100) determined. As seen in Table 1 and Table 2, the microscopic examination results revealed a positivity rate of 47.27% in female dogs and 26.67% in male dogs. Additionally, an infestation rate of 36.92% was observed in large breed dogs, while 40% was found in small breed dogs. The higher infestation rate in female dogs compared to male dogs may be attributed to hormonal differences and the effects of immune responses. However, it was determined that the breed factor had no statistically significant effect on the infestation rates ($P > 0.05$).

When the distribution of infestation rates by age groups was examined, a higher infestation rate of 46.67% was found in young dogs compared to older dogs. It was found that a large proportion of the infected dogs were strays and shelter dogs (54.29%). This situation suggests that the high animal population in shelter conditions and insufficient hygiene measures may increase the risk of infestation. Statistical analyses revealed that factors such as age and lifestyle have a significant impact on infestation rates ($P < 0.05$).

The obtained findings were statistically evaluated using the Chi-Square (X^2) test, and risk factors influencing the disease development were analyzed. As a result of the analysis, a statistically significant relationship was found between age, lifestyle, and ownership status with *O. cynotis* infestation ($P < 0.05$).

Table 1. Distribution of *Otodectes cynotis* positive cases based on breed, gender, age, lifestyle, ownership status, season, and clinical condition.

No	Breed	Gender	Age	Lifestyle	Ownership status	Season	Clinical condition
1	KafkasX	♀	5 m	Shelter	Stray	Autumn	Ear discharge, Pruritus
2	KafkasX	♂	10 m	Shelter	Stray	Autumn	Lesions around the right ear, Pruritus, Overall condition is good
3	KafkasX	♀	1.5	Shelter	Stray	Autumn	Ear discharge, Pruritus
4	Kangal	♂	4 m	Shelter	Stray	Autumn	Alopecia in the head region, Ear discharge
5	Kangal	♀	2	Shelter	Stray	Autumn	Ear discharge, Pruritus, Erythema
6	Zagar	♀	7	Shelter	Stray	Spring	Diffuse alopecia
7	Zagar	♀	2 m	Shelter	Stray	Spring	Alopecia in the head region, Pruritus
8	Zagar	♂	3 m	Shelter	Stray	Spring	Focal alopecia on the dorsal region
9	Kangal	♀	6 m	Shelter	Stray	Autumn	Diffuse dandruff
10	Zagar	♀	2 m	Shelter	Stray	Spring	Partial dandruff and alopecia
11	KangalX	♂	3	Shelter	Stray	Autumn	Particularly in the ear and head regions, Dandruff and pruritus
12	Zagar	♀	3	Shelter	Stray	Spring	Ear discharge, Pruritus
13	Zagar	♀	2	Shelter	Stray	Spring	Alopecia and pruritus in the ear region
14	Zagar	♀	18 m	Shelter	Stray	Spring	Partial alopecia and pruritus in the ear region
15	Zagar	♀	2 m	Shelter	Stray	Spring	Alopecia in the dorsal and abdominal regions
16	KangalX	♀	18 m	Shelter	Stray	Autumn	Dandruff and pruritus in the head region
17	Zagar	♂	6 m	Shelter	Stray	Spring	Alopecia in the back and ear regions
18	Zagar	♀	4	Shelter	Stray	Spring	Ear discharge, Pruritus
19	Zagar	♂	6 m	Shelter	Stray	Spring	Diffuse alopecia
20	Zagar	♀	7 m	Shelter	Stray	Spring	Lesions around the eyes and ears, Ear discharge, Pruritus
21	Zagar	♂	2	Shelter	Stray	Spring	Alopecia in the back and ear regions
22	Zagar	♂	2	Shelter	Stray	Spring	Ear discharge, Pruritus
23	KafkasX	♀	1	Shelter	Stray	Autumn	Ear discharge, Pruritus
24	KafkasX	♀	1	Shelter	Stray	Autumn	Poor general condition
25	KangalX	♂	6	Shelter	Stray	Autumn	Generalized alopecia, Poor overall condition
26	Kangal	♀	1.5	Shelter	Stray	Autumn	Ear discharge, Pruritus
27	Kangal	♀	4	Shelter	Stray	Autumn	Alopecia in the head region, Pruritus
28	KafkasX	♀	1.5	Shelter	Stray	Autumn	Ear discharge, Pruritus
29	KafkasX	♀	6	Shelter	Stray	Autumn	Alopecia in the head region
30	KafkasX	♀	2	Shelter	Stray	Autumn	Ear discharge, Pruritus
31	KafkasX	♀	2	Shelter	Stray	Autumn	Alopecia in the head region
32	KafkasX	♀	2	Shelter	Stray	Autumn	Ear discharge, Pruritus
33	KafkasX	♀	4	Shelter	Stray	Autumn	Diffuse alopecia
34	KafkasX	♀	3	Shelter	Stray	Autumn	Ear discharge, Pruritus
35	KafkasX	♂	1	Shelter	Stray	Autumn	Itching
36	KafkasX	♂	2	Shelter	Stray	Autumn	Ear discharge, Pruritus
37	KafkasX	♀	4	Shelter	Stray	Autumn	Diffuse alopecia
38	KafkasX	♂	2	Shelter	Stray	Autumn	Alopecia in the head region

♀:female, ♂: male, m:month

Table 2. Risk factors associated with otocariasis in dogs

Risk Factors		n	Positive	Prevalence	χ^2	P
Breed	Large	65	24	36.92%	0.007	P>0.05
	Small	35	14	40%		
Gender	♀	55	26	47.27%	3.623	P>0.05
	♂	45	12	26.67%		
Age	Young	60	28	46.67%	3.907	P<0.05
	Adult	40	10	25%		
Lifestyle	Home	30	-	0%	24.014	P<0.05
	Shelter	70	38	54.29%		
Ownership status	Owned	30	-	0%	24.014	P<0.05
	Stray	70	38	54.29%		
Clinical condition	Healthy	24	13	54.16%	2.658	P>0.05
	Sick	76	25	32.89%		
Season	Autumn	55	24	43.64%	1.159	P>0.05
	Spring	45	14	31.11%		

n: number of dog

DISCUSSION AND CONCLUSION

The ear is a critical sensory organ in mammals responsible for hearing and balance functions, and its health maintenance is of paramount importance for animal welfare. Ear diseases can progress over time, leading to severe complications such as chronic otitis externa. Therefore, early diagnosis and appropriate treatment play a critical role in controlling infestations (22). In this study, the otodectic mange infestation caused by *O. cynotis* in dogs in the Kars region was investigated, and the prevalence rate was determined to be 38%. *Otodectes cynotis* is reported to be widely distributed worldwide and in Türkiye, and has been identified as the causative agent in more than 50% of otitis externa cases (4). The findings obtained not only reveal the prevalence of *O. cynotis* in dogs in the region but also support the necessity for early diagnosis of ear diseases and the application of appropriate antiparasitic treatments. Additionally, regional epidemiological studies to determine the spread dynamics of such infestations will contribute to the development of preventive veterinary practices.

Studies on *O. cynotis* infestation in dogs worldwide have reported varying prevalence rates across different regions. In this study, 38% of dogs in Kars province had *O. cynotis*, which is comparable to the 26% reported in Romania (23) and the 37.1% in Poland (24). In Türkiye, a study conducted on street dogs in Diyarbakır found that *Otodectes* spp. was identified as the causative agent in 28% of ear diseases (25). In a study conducted on street dogs in the Bursa region, the *O. cynotis* infestation was reported to be 3.44% (6), while a retrospective study conducted in Konya found an infestation rate of 1.23% (26). The variability in infestation rates reported in studies conducted in different regions of Türkiye may be related to regional ecological factors, climatic differences, the living conditions of the dogs, shelter hygiene, and differences in the diagnostic methods used in the studies (otoscopic examination only, skin scraping only). It is also thought that one of the most important reasons for the differences in prevalence rates depends on whether the animals included in the studies have received parasitic treatment before. While lower infestation rates are expected in animals that have received parasitic treatment, it is likely that higher infestation rates are detected in untreated animals. This situation, along with the methodological differences between studies, suggests that the treatment history of the populations evaluated could be a determining factor in the results. In this context, comprehensive epidemiological studies are needed to better understand the dynamics of *O. cynotis* infestation spread.

Otodectes cynotis infestation has been reported to be more prevalent in younger age groups of dogs (3,8,27). The findings obtained in this study also support the information presented in the literature. In our study, when dogs were classified according to age groups, the highest infestation rate was observed in young dogs (46.67%). The effect of age on infestation rates may be associated with immune system development, transmission risk, and behavioral differences. Since the immune systems of puppies and young dogs are not fully developed, they are known to be more susceptible to parasitic infestations. Moreover, young dogs are more likely to acquire the parasite through contact with their mothers or exposure to infected animals. Behaviorally, puppies

and young dogs are more curious and social compared to adults, leading to increased physical contact and, consequently, a higher risk of transmission. On the other hand, the decreased incidence of otoacariosis in older age groups may be associated with age-related acquired immune responses and the widespread use of macrocyclic lactones (e.g., avermectin and milbemycin group antiparasitic agents) (3). However, infestation cases have also been reported in immunosuppressed elderly dogs, with a prevalence of 25% determined in our study. Overall, the findings indicate that otodectic mange is most commonly observed in young dogs and that age may be a determining factor in infestation dynamics.

It has been stated that gender does not have an effect on otodectic mange infestation (3,28,29). However, in this study, infestation was found to be 47.27% in female dogs and 26.67% in male dogs ($P>0.05$). These findings suggest that gender could potentially be an influencing factor in the prevalence of otodectic mange. The higher infestation rates observed in female dogs may be associated with factors such as hormonal differences, immune responses, and lifestyle. It is suggested that hormonal changes occurring during the reproductive cycle may affect the immune system and increase susceptibility to parasites. However, more extensive and controlled studies are needed to definitively determine the effect of gender on infestation.

The living environments and lifestyles of dogs are considered significant risk factors in the spread of infestation (29). It has been reported that stray or shelter dogs play a critical role in the transmission and spread of the disease. The spread of ectoparasitic infestations is more commonly observed in young dogs or those with weakened immune status, particularly in communal living environments (4). In dogs kept in home environments, the risk of infestation is lower due to regular care, better nutritional conditions, and consistent ectoparasitic treatments. In contrast, such measures are often neglected in shelters or stray animal populations, leading to a higher prevalence of otodectic mange infestations. Indeed, in our study, the infestation rate in shelter dogs was found to be 54.29%, and as expected, otodectic mange was more prevalent in street or shelter dogs (3). These findings underscore the importance of managing stray animal populations, improving shelter conditions, and ensuring regular antiparasitic treatments to prevent and control *O. cynotis* infestations.

In this study, the susceptibility of dog breeds to *O. cynotis* infestation was investigated, with infestations found in 36.92% of large-breed dogs and 40% of small-breed dogs. However, the literature reports that dog breeds do not show a significant predisposition to ear mite infestations (8,30). The findings of our study suggest that infestation rates may vary according to breed, but breed alone is not a determining factor in the development of the disease. It is believed that environmental factors such as general care, hygiene conditions, and living environment play a more decisive role in the prevention of otodectic mange, rather than breed predisposition. Hygiene is a critical factor that prevents the proliferation of mites in dogs' ears. Regular ear cleaning reduces the parasite load, lowers the risk of infection, and prevents mite proliferation, thereby contributing to the control of infestation. In addition, maintaining hygienic conditions in the living environments of dogs, especially in shelters or multi-

animal settings, is an important strategy for preventing the spread of parasites. However, regular veterinary check-ups are of great importance for the early detection and effective treatment of otodectic mange. Specifically, identifying infested animals that do not exhibit clinical symptoms is a critical step in controlling the spread of the parasite. In this regard, the prevention and management of otodectic mange should be ensured through systematic care and health measures that should be applied to all dogs, regardless of breed.

In our study, the infestation rate of *O. cynotis* was found to be higher in autumn compared to spring. This finding can be explained by seasonal variations in temperature and humidity, which influence the reproduction rate and life cycle of mites (31). With the decrease in air temperatures during autumn, changes in the immune system of dogs may increase susceptibility to the parasite ($P<0.05$). Additionally, during the summer months, dogs spending more time in open areas have an increased likelihood of contact with infested animals, leading to a more pronounced manifestation of infestations in autumn. These findings are important for better understanding the seasonal distribution of otodectic mange and for implementing appropriate measures to control the infection.

As a result, in this study, the prevalence of ear mange in dogs in Kars province was investigated, and the presence of *O. cynotis*, one of the significant zoonotic agents in the region, has contributed to the literature. In Kars, alongside the intensive breeding of livestock such as cattle, sheep, and horses, the dog population is also found in high numbers. A large portion of these dogs are stray street dogs, while some are used as shepherd dogs or guard dogs. This study highlights the importance of *O. cynotis* in the region due to its zoonotic characteristics. As a result of the analysis, the relationship between age, lifestyle, and ownership status with *O. cynotis* infestation was found to be statistically significant ($P<0.05$), and these factors were identified as risk factors for the disease. Since *O. cynotis* is a pathogen that can easily be transmitted through direct contact, it is emphasized that necessary control and prevention programs should be implemented to prevent transmission both between animals and to humans. In addition to hygiene, it has been concluded that regular health check-ups are of great importance in the prevention and treatment of otodectic mange. Future studies, by supporting these findings with larger sample sizes, could contribute to the development of strategies for more effective management of ear diseases.

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CONFLICT OF INTEREST

The author(s) have declared that there is no potential conflict of interest.

AUTHOR CONTRIBUTIONS

The writing and final revisions of the study were carried out with contributions from all authors.

ETHICAL STATEMENT

The necessary permission for this study was obtained from the Kafkas University Local Ethics Committee for Animal Experiments with the decision number 2024-139, dated 04.07.2024.

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