ПАРАЗИТАРНІ ХВОРОБИ

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Distribution of *Otodectes cynoites* in domestic cats in Karbala province, Iraq

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Otodectes cynotis mite is a frequently parasite of cats and other animals, remain in the ear canal and causes itching, otitis externa and severe complications. The study extended from November 2023 to October 2024, the current study the total prevalence was 86/187 (45.99 %) along with twelve months. The cat was suspected infection brought to the Teaching Animal Hospital, Faculty of Veterinary Medicine, University of Kerbala, Karbala, Iraq. All the infested cats which related with (13) breed. The microscopic examination of ear swabs of 187 cats revealed that only *O. cynotis* with different stages (eggs and adults). It characterized by different clinical signs (itching, itching and hearing impairment, itching and erythema, itching, and abscesses, itching, and wounds, itching wounds and abscesses, minor itching, purulent inflammation, the infection is mild and asymptomatic).

The most common sign associated with mite's infection was itching 75/86 (87.21 %). The most infected cats in bilateral (both ears) was 85/86 (98.2 %) while in unilateral 1/86 was (1.2 %). Sex male 52/111 (55.30 %), female 42/76 (44.70 %). Cats under one-year-old revealed the highest prevalence 53/115 (61.60 %). The weight less than (1Kg) was 22/45 (25.60 %). Seasons were showed the highest prevalence similar in both springs and summer 31/62 (36.00 %). Also the study analyzed risk factors, for age, weight, sex, and season, revealing no significance variations in infestation rates $P \geq 0.05$. This survey study provides crucial information concerning ectoparasite infestations in domestic cats in order to improve cat welfare and preserve public health.

Key words: clinical signs, domestic cat, ear mite, risk factors.

Introduction. Otodectes cynotis (Hering, 1838), commonly referred to as ear mite or ear canker mite, is a parasite that is commonly seen in the external auditory ear canal of dogs, foxes, cats, raccoon dogs, mink, nutria, ferrets, wild carnivores, and humans. It is not exclusive to cats and is thought to be highly infectious (Lefkaditis et al., 2009; Roy et al., 2011; Lefkaditis et al., 2015; Fanelli et al., 2020). Among these, the otodectosis-causing agent One of the most prevalent is Otodectes cynotis. This may cause animals to die (Melezhyk et al., 2024). The infestation in cats are called feline otoacariasis (El-Dakhly et al., 2024A). Many of them being vectors of pathogens to humans and zoonotic relevance (Genchi et al., 2021). Globally, at least 50 % of canker cases in cats are caused by *O. cynotis* (Sotiraki et al., 2001), and sometimes range between (50–80 %) of cases of otitis externa in cats (Kumar et al., 2021). They are extremely active parasites that live as surface parasites and do not burrow into the skin

(Salib and Baraka., 2011; Zakaria et al., 2022). This mite consumes tissue fluids and epidermal detritus from the surface epidermis (Roy et al., 2011). It is remains in the ear canal and causes otitis externa, characterized by itching and serious consequences, and typically found deep within external ear canal animals (Salib and Baraka., 2011; Zakaria et al., 2022). During ear examination other clinical signs are erythema, pruritus, and coffee-ground-like, a dark brown ceruminous tic exudate is a characteristic sign in the infested animals (Sotiraki et al., 2001).

The ear mite parasite represents a cause to the fungal and secondary bacterial infection related with otoacariasis (Radha et al., 2024). Infestations in cats are typically only detect by owners when they are accompanied by severe itching (Sotiraki et al., 2001). The most common cat ectoparasite in Europe is *O. cynotis* (Beugnet et al., 2014). While in owned cats of various breeds in Cairo, Giza and Beni-Suef provinces, Egypt. They were considered risk factors including sex, age, seasons and breed with total prevalence 25.47 % (174/683) (El-Dakhly et al., 2024B). In Iraq the first report on the presence of *O. cynotis* in cats in Baghdad, Iraq. Using skin samples were detected in 3/50 (6 %) of local housed cats (Kallo, 2004). Then in Fallujah city/Iraq (Hussein et al., 2024). Who reported in (140) domestic cats with various ages, which were randomly offered in veterinary clinics with the total prevalence was 51/140 (36.4 %) (Hussein et al., 2024).

The aim of the current study to evaluate and compare between ages, sexes, strains, health conditions, weight and clinical signs of the domestic cats. Due to the little of data about the prevalence of this parasite in Iraq, and no information and first report about the prevalence of *Otodectes cynotis* in domestic cats from the different region of Karbala, Iraq.

Materials and methods.

2.1. Study design and Data collection.

This study was conducted at the Kerbala University, College of Veterinary Medicine, Department of Parasitology, for laboratory examination. The study was beginning from November 2023 to October 2024. The information of the cats was taken from owners that were recorded to the hospital of college for regular examinations, treatment, deworming, and vaccinations. Clinical signs were recorded only in infected animals by mites.

2.2. Sample collection and microscopic examination.

A total of 187 of swab samples of cats were collected from different sources by owners. Data on the samples and associated conditions were recorded using a questionnaire. The questionnaire was used to collect epidemiological data for one year at four season from the owners of the cats by taking encounter along with general examining the cats. During the course of the study, data on a variety of qualitative and quantitative factors, such as general information about the cats (sex, age, breed, previous infection, number of cats at the same region, neutering, contact with other animals), and cats healthy status were recorded. The techniques have been used in diagnosis was direct otoscopic evaluation of the external auditory canal (right and left) (Coelho et al., 2024; Combarros et al., 2019; Tyler et al., 2020), and ear wax direct swab through cotton and then kept in a clear slide direct smear (Coelho et al., 2024). The absence or presence of mite eggs and live mites (Tyler et al., 2020).

Laboratory examination, clinical indicators of the disease, and epizootic data were taken into consideration while making the diagnosis. In every instance, the otodectosis symptom complex was accompanied with otitis, which manifested as a variety of clinical symptoms (Kaliuzhnyi and Zhivilo, 2024). According to the guide the differentiation between genders was made. Animals were different of ages at the time of sampling, based on information obtained from their owners (El-Dakhly et al., 2024B).

2.3. Statistical analysis.

The association of ear mite infestation with a risk factor was confirmed by using chi-square test and a value of $P < 0.05$. No significant by many sex (Male and female), age (<12-to-48-60), weight (Less than 1-to-5Kg) and seasons (winter, spring, summer, and autumn).

Results. In the current study the total prevalence was (46 %) in the duration of twelve months. The result showed that out of the 187 cats examined, 86 were positively infected with mite's parasites. The infection includes different stages (eggs and adults) along period of the study (fig 1,2 and 3). All the infested cats which related with (13) breed in different numbers and percentages. This mean all the number (187 cats) distributed in (13) breed (Table 1.).

The infection has single or mix signs and characterized by different clinical signs (itching (87.21 %), (itching and hearing impairment, itching and erythema, itching, and abscesses were 1.16 %), (itching, and wounds, itching wounds and abscesses, minor itching were 2.33 %), purulent inflammation, the infection is mild and asymptomatic were 1.16%). The most common sign associated with mite's infection was itching 75/86 (87.21 %) (Tab. 2). The most infected cats in bilateral (both ears) was 85/86 (98.2 %) while in unilateral 1/86 was (1.2 %).

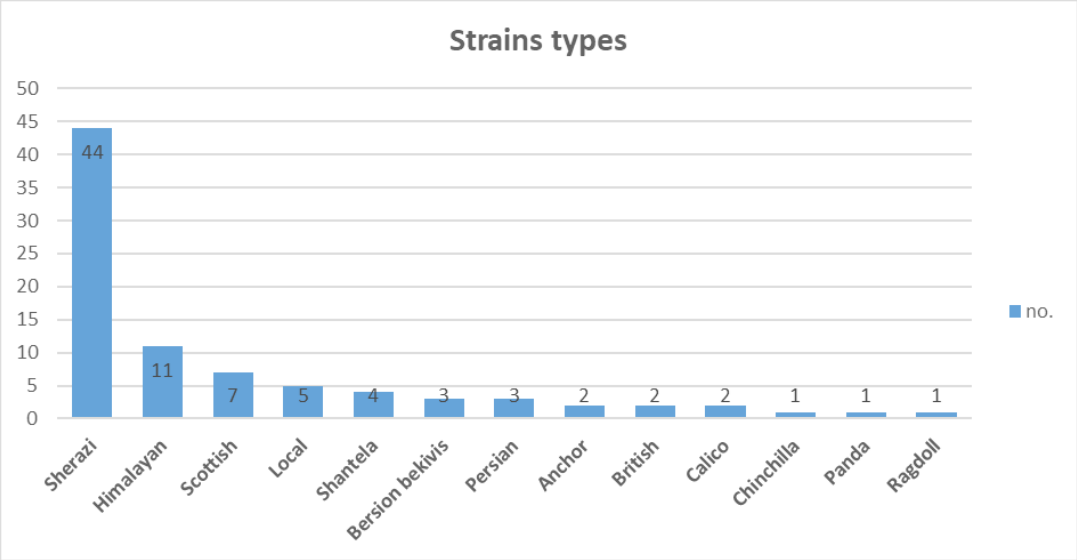

Fig. 1. **Many of strain types infected in cats.**

Table 1 – **Prevalence distribution of different clinical signs**

Signs	No. of infected cats	%
Itching	75	87.21
Itching and hearing impairment	1	1.16
Itching and erythema	1	1.16
Itching, and abscesses	1	1.16
Itching, and wounds	2	2.33
Itching wounds and abscesses	2	2.33
Minor itching	2	2.33
Purulent inflammation	1	1.16
The infection is mild and asymptomatic	1	1.16
Total	86	45.99

Many factors were recorded during the study of *Otodectes cynotis* infestation, male: 52, female: 42, with prevalence 55.3 % and 44.7 %, respectively. The factor age (<12, 12-24, 24-36, 36-48 and 48-60 months-old) were infected with prevalence (61.60 %, 22.10 %, 7.00 % for both and 2.30 %) respectively. The infection prevalence tended to increase with age less than one year. While weight of animals extends from (less than 1Kg,1-2,3,4, and 1-5) regarding the prevalence (25.60 %, 20.90 %, 22.10 %,15.10 % and 16.30 %) respectively. Also seasons (Winter, Springs, Summer and Autumn) were prevalence (8.10 %, 36.00 % for both and 19.80 %) respectively. Although no significant difference was confirmed in cats with sex, age, weight and season (P>0.05), are shown in Table 2.

A - Metapodosomal region (plate) showed sclerotized areas. B - Two cuticular pits or pair of retractile adanal suckers of the male's ventral surface were surrounded by sclerotized areas (Scale bar =50μm).

A - a ventral view of female showing epigynal apodeme, B - horse-shoe-shaped epigynium and vulva. C - Ovipore of the adult female. D - The adult female has Leg III with 2 long terminal bristles and rudimentary leg IV (Scale bar = 100 μm).

Discussion. Globally otitis externa, one of the clinically significant conditions affecting cats and dogs, is frequently caused by ear mites (*Otodectes cynotis*) (He et al., 2022). The total prevalence in the current study was (46 %) in the period of twelve months. Otoscopic examination after general checking for both ears then using microscopic examination. The prevalence agrees with study by (Siagian and Siregar., 2021), who reported a prevalence of *O. cynotis* 14/29 (48,27 %) in both domesticated and feral cats using otoscope examination and direct smears that characterized by feline otitis externa in Indonesia. Other study agree was confirmed in India, by Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.), in the College of Veterinary Science and Animal Husbandry. The prevalence was 26/55 (47.27 %) of 167 suspected cats after made physical examination for ear examination using otoscope and direct smears (Radha et al., 2024).

Table 2 – **Risk factors for *O. cynotis* infestation in cats**

Epidemiological Parameters		No.	Positive	%	Negative	%	X^2	*P* value
Sex	Male	111	52	55.30 %	59	63.40 %	0.3	0.990
	Female	76	42	44.70 %	34	36.60 %		
Age	Categories of age							
	<12	115	53	61.60 %	62	61.40 %	0.036	1.000
	12-24	42	19	22.10 %	23	22.80 %		
	24-36	13	6	7.00 %	7	6.90 %		
	36-48	13	6	7.00 %	7	6.90 %		
	48-60	4	2	2.30 %	2	2.00 %		
Weight	Categories of weight Kg							
	Less than 1	45	22	25.60 %	23	22.80 %	0.081	0.776
	1-2	39	18	20.90 %	21	20.80 %		
	1-3	43	19	22.10 %	24	23.80 %		
	1-4	30	13	15.10 %	17	16.80 %		
	1-5	30	14	16.30 %	16	15.80 %		
Seasons	Winter	26	7	8.10 %	19	18.80 %	4.608	0.203
	Springs	62	31	36.00 %	31	30.70 %		
	Summer	62	31	36.00 %	31	30.70 %		
	Autumn	37	17	19.80 %	20	19.80 %		

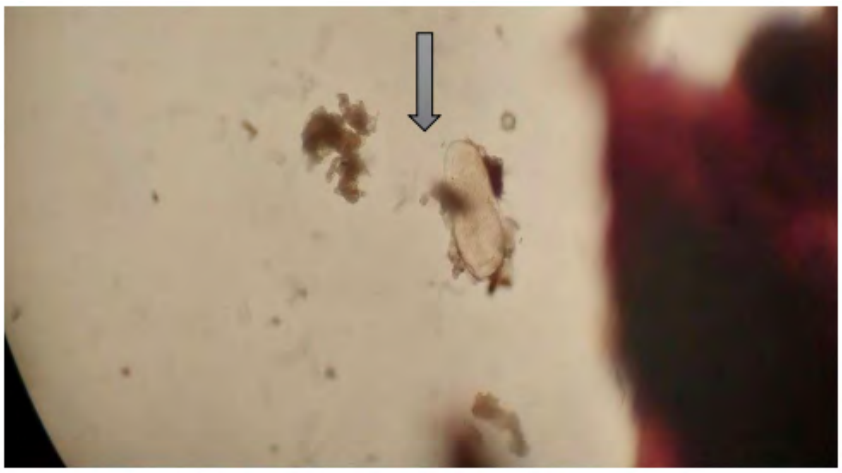

Fig. 2. **An egg of *Otodectes cynotis*.**

Fig. 3. **The copulatory position of male and female.**

Fig. 4. **Morphological characters of adult female *Otodectes cynotis*.**

In general, after physical examination the result of the current study showed that out of the 187 cats examined, 86 were positively infected with mite's parasites. Cat ears may have infection in different stages (eggs and adults) along period of the current study. A cytological examination of cerumen swabs of Indonesian two years old male cat domestic Tabby Pet Care clinic with scratches his left and right ears. Itis showed scratching marks on the pinna, wet, smelly ear cerumen and blackish yellow, on the ear canal. Ear swab was observed presence of adult and eggs (Aritonang et al, 2020). While another study was detected different developmental stages, including eggs, protonymphs, deutonymphs and tritonymphs, in owned cats in Cairo, Giza and Beni-Suef provinces, Egypt (El-Dakhly., 2024A; El-Dakhly et al., 2024B).

In the current study, all the infested cats which related with (13) breed in different numbers and percentages, (Table 1.). The various breeds were infected and no related with the infection and this explain the ability of all breeds to infection in different degrees. Many of scientist were reported the relation between different breeds with infection as (Siagian and Syafitri., 2023), who confirmed of 3.2 % (5/156) in domesticated cats of various breeds that came to the Winadivet Animal clinic in Indonesia. While (Zakaria et al., 2022), who reported infection in (42) stray cats and only six breeds were confirmed in Johor Bahru one of the cities in Malaysia.

In EL-Minia governorate, Egypt, the breeds and sexes were no significant effect on the prevalence of infection (P>0.05), 100 private owned cats were examined to a veterinary clinic (Al-Hosary and Mostafa, 2022). The Persian breed of cats were recorded high significant was (65.62 %) other than breeds which admitted to the Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.), India (Radha et al.,2024). While another study was detected different breeds, in owned cats in Cairo, Giza and Beni-Suef provinces, Egypt (El-Dakhly., 2024A; El-Dakhly et al., 2024B). No significant difference was confirmed in cats with breed and sex (P>0.05).

In the current study analyzed risk factor, for age revealing no significance variations in infestation rates P≥0.05. The factor age (<12, 12-24, 24-36, 36-48 and 48-60 months-old) were infected with prevalence (61.60 %, 22.10 %, 7.00 % for both and 2.30 %) respectively. The infection prevalence tended to increase with age less than one year. Also seasons (Winter, Springs, Summer and Autumn) were prevalence (8.10 %, 36.00 % for both and 19.80 %) respectively. This study agreement with age of 152 cats in the municipality of Sousa, Paraíba State, Brazil.

However, compared to young cats, adults were found to have higher infection levels, which was unexpected because research generally indicates that infection levels are higher in young cats (Silva et al., 2020). Other agreement with factor of ages and no with season in Murcia municipality (SE Spain), 30 % of the (296) cats were found positives to *O. cynotis*. Cats were classified by age and season provenience were significantly higher in adult cats, during the winter and in individuals from peri-urban areas (Fanelli et al., 2020). While disagreement study

by (Al-Hosary and Mostafa, 2022), who revealed that age and season significantly affected the prevalence of ear mange in cats (P<0.05). Older cats (50 %) less than young cats (less than a year old) were (87.57 %). The prevalence was highest during cold months (84.44 %).

Another study was age and season detected, in owned cats in Cairo, Giza and Beni-Suef provinces, Egypt, significantly influenced the prevalence of otoacariasis (El-Dakhly., 2024 A; El-Dakhly et al., 2024 B). Also, from (400) domestic cats (*Felis catus*) in Giza Governorate, Egypt. The study revealed cats under one-year-old manifest the highest prevalence (48.35 %). Seasonal variation showed the highest infection rate in autumn, followed by summer and winter, and less in spring (Yousef et al., 2024). Although, the prevalence and contagious nature of Mites. Cats that are young are susceptible to serious mite infestations. This is due to the fact that cats' immunity to mites grows with age (Ashwini and GK, 2023). But in the current study which explain the continuous exposure to different agents/or mites, contaminated environment of cats and from mother to kittens. These factors may be having a main role in distribution of infection in different ages and all seasons.

No significant difference was confirmed in cats with weight (*P*>0.05). Weight of animals extends from (less than 1Kg,1-2,3,4, and 1-5) regarding the prevalence (25.60 %, 20.90 %, 22.10 %, 15.10 % and 16.30 %) respectively. Zakaria et al., (2022), who reported infection in (52.52 %) stray cats and weight were confirmed in Johor Bahru one of the cities in Malaysia. One of the primary causes of external otitis in small animals is *O. cynotis* infestation, which is problematic for small animal medicine since it can lead to secondary bacterial or fungal infections and cause a lot of discomfort (Silva et al., 2020).

The infection has single or mix signs and characterized by different clinical signs (itching, itching and hearing impairment, itching and erythema, itching, and abscesses, itching, and wounds, itching wounds and abscesses, minor itching, purulent inflammation, the infection is mild and asymptomatic). The most common sign associated with mite's infection was itching 75/86 (87.21 %) (Tab. 2). Other cases have been reported in cats with various clinical signs included itching, localized dermatitis, and allergic reactions are accompanied by otitis and considered the symptom complex of parasitic infestation, and general symptoms of anxiety, altered behavior: local hyperemia, possible swelling of the auricle scratching, the animal shakes its head (Kaliuzhnyi and Zhivilo, 2024). The common phenomenon in associated animals is the infection of their skin by parasitic mites or insects, causing onerous symptoms, such as itching, allergic reactions, or discomfort (Kocoń and Nowak-Chmura., 2017). Other signs were recorded from otitis externa in cats, itching (41.5 %) and abnormal secretion (85.4 %) are observed other signs (aggressiveness and restlessness) give rise to fatal outcomes (YİPEL, 2015).

In the current study the most infected cats in bilateral (both ears) was 85/86 (98.2 %) while in unilateral 1/86 was (1.2 %). This study agrees with study by (Hiblu et al., 2020), who *reported O. cynotis* infestation was more common bilateral and severe signs in Tripoli, Libya. While in the Department of Veterinary Medicine, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.), India. A total of 167 cats were examined with an otoscope to examine their ears. Bilateral ear infections were more common in cats (80.76 %) than unilateral ones, and the majority of afflicted cats had severe infestations (Radha et al., 2024). The bilateral ear infestation may be due to many factors direct contact with infected animals, humidity, temperature, maintenance, and environment.

Conclusion. The prevalence and distribution of *O. cynotis* in domestic cats in Karbala province, Iraq, would be around 86/187 (46 %) along with twelve months, which is extremely high. The cats under the age of one year, and less than one Kg are more prevalence of cats. While the sex was the male more prevalence to infection and season springs and summer more than other seasons were recorded. Therefore, that licensed veterinarians should regularly examine the health of pet cats. Routine antiparasitic control should be include in cat. Prevention through public health education will reduce the risk of human transmission. Many studies should be make in focusing on molecular and sequencing studies to deep understand the nature of parasite.

Ethics approval. The study protocol was approved by the Animal Care Committee at the Date: 1/11/2023; UOK.VET. MI.2023.081

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Competing interests. The authors declare that they have no competing interests.

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Поширення *Otodectes cynoites* у домашніх котів у провінції Кербела, Ірак

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Кліщ *Otodectes cynotis* часто паразитує у котів та інших тварин, залишається у вушному каналі і спричинює свербіж, зовнішній отит та важкі ускладнення. Дослідження тривало з листопада 2023 року до жовтня 2024 року, в поточному дослідженні загальна поширеність становила 86/187 (45,99 %) за дванадцять місяців. Котів з підозрою на інфекцію привезли до навчальної лікарні для тварин факультету ветеринарної медицини Університету Кербала, Карбала, Ірак. Усі заражені коти належали до породи (13). Мікроскопічне дослідження мазків з вух 187 котів виявило лише *O. cynotis* з різними стадіями (яйця та дорослі особини). Для них характерні різні клінічні ознаки (свербіж, свербіж і порушення слуху, свербіж і еритема, свербіж і абсцеси, свербіж і рани, сверблячі рани і абсцеси, незначний свербіж, гнійне запалення, інфекція перебігає в легкій формі і безсимптомно).

Найпоширенішою ознакою, пов'язаною із зараженням кліщем, був свербіж – 75/86 (87,21 %). Більшість котів були заражені двосторонньо (обидва вуха) – 85/86 (98,2 %), тимчасом односторонньо – 1/86 (1,2 %). Стать: самці 52/111 (55,30 %), самки 42/76 (44,70 %). Найвища поширеність була у котів віком до одного року – 53/115 (61,60 %). Вага менше (1 кг) становила 22/45 (25,60 %). За порами року найвищу поширеність, спостерігали навесні і влітку, за однакового показника 31/62 (36,00 %). Також у дослідженні були проаналізовані чинники ризику за віком, вагою, статтю та порою року, і не було виявлено значущих відмінностей у рівнях інвазії (P≥0,05). Це дослідження надає важливу інформацію щодо ектопаразитарних інвазій у домашніх котів з метою покращення добробуту котів та збереження громадського здоров'я.

Ключові слова: клінічні ознаки, домашній кіт, вушний кліщ, чинники ризику.

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