

## Research Article



# Epidemiological Study on Feline Otoacariasis with Special Reference for Therapeutic Trials

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**Abstract** | Mange mite is a common ectoparasite that affects pets. The current study aimed to investigate the most common clinical signs associated with ear mange in household cats, as well as to assess its epidemiological pattern and the most effective treatment. Individual clinical and parasitic examinations were performed, and infested cats were assigned to one of four treatment groups. Each group was treated with one of the following drugs: Frontline®-Merial, BARS® ampules, BARS® ear drops, and the last group received a combination of Frontline® and BARS® ear drops. The most prevalent clinical signs were pruritus, dermatitis, frequent scratching of the ears, and head shaking with coffee-like waxy excretions. The epidemiological findings revealed that age and season significantly affected the prevalence of ear mange in cats ( $P < 0.05$ ). Young cats (less than a year old) were more infested (87.57%) than older cats (50%). Infestation rates were highest during cold months (84.44%). Sex and breeds had a non-significant effect on the infestation rate ( $P > 0.05$ ). According to the results of the clinical trials, the combination between Frontline® and BARS® ear drops was the most effective treatment protocol with a synergistic effect (100% recovery rate), followed by Frontline® (95%), BARS® ampules (75%), and finally, BARS® ear drops (66.67%).

**Keywords** | Cat, Otoacariasis, BARS®, Frontline®, Age, Season

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## INTRODUCTION

Mange mite is one of the most common ectoparasites affecting pets worldwide. *Otodectes cynotis* (*O. cynotis*) is one of the most common species that cause Otoacariasis in wild and domesticated cats. It is an obligatory non-burrowing mange mite infects both adult and young cats; nonetheless, some studies have revealed that young cats are more susceptible than adults (Six et al., 2000; Sotiraki et al., 2001). The infection usually spreads through direct contact between infected and susceptible cats as well as through indirect contact with contaminated fomites like combs, brushes, bedding, and clothes. Due to their feeding habits and movement, ear mites live and breed in the external and internal ear canal, leading to severe irritation. In addition, its secretions induce severe inflammation and hypersensitivity (Kraft et al., 1988; Weisbroth et al., 1974).

Since an infested cat can tolerate a significant population of otodectic mites, these lesions are usually undetectable in cats (Roth, 1988). *O. cynotis* has public health importance because it can affect humans who are in contact with infested animals (Lopez, 1993). Effective treatment aims to kill and remove mites from the ear canal. This study was designed to determine the most common clinical signs associated with ear mange in domestic cats and assess its epidemiological pattern and the most effective treatment.

## MATERIALS AND METHODS

### ANIMALS AND STUDY AREA

During the period between 2019 and 2020, a total of 100 private owned cats were admitted to a veterinary clinic in EL-Minia governorate, Egypt, which is in Upper Egypt, about 245 km south of Cairo, on the western bank of the

Nile River and it has an area of about 32.279 km<sup>2</sup> (Fig. 1). The map was created using QGIS Development Team, (2019). Cats examined had different breeds (55 Siamese and 45 Persian animals), ages (70 animals less than one year and 30 animals more than one year), and had different sex. A clinical examination was conducted in different seasons (hot months from May to October and cold months from November to April).

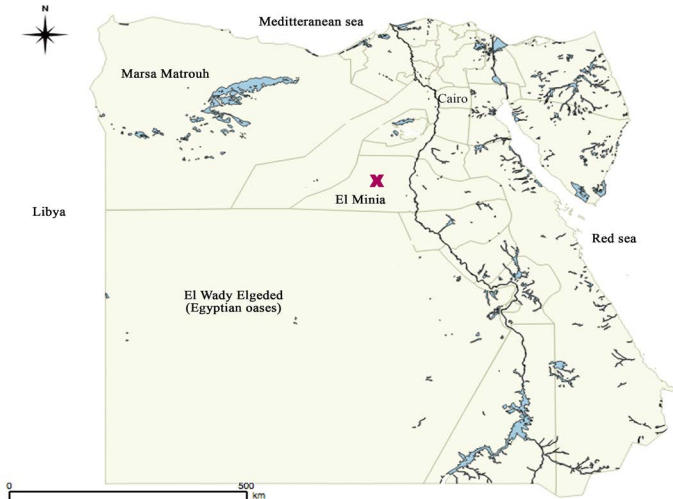


Figure 1: Map of the study area

CLINICAL EXAMINATION

The clinical examination included a visual examination of the inner surface of the ears to detect any signs related to ear mite infestation and otitis externa (Fig. 2). Bilateral otoscopic examination was performed to detect any motile ear mites (Combarros et al., 2019; Côte, 2014).



Figure 2: Clinical examination using otoscope

MICROSCOPICAL EXAMINATION

Cotton-tipped swabs were used to collect samples from both ears. The swabs were inserted deeply into the external ear canal, and samples were taken by the rotatory movement to collect adequate samples (Fig. 3). The samples were immediately examined under light microscope 40 x lens (Olympus, Japan) for the presence of *O. cynotis* (adults, larvae, nymphs, and eggs). The cats were considered positive when any parasite stage was present (Côte, 2014).



Figure 3: Coffee-colored waxy excretion collected from the infected ear



Figure 4: Microscopical detection of *Otodectes cynotis*

TREATMENT PROTOCOLS

The infested cats were allocated into four groups, with each group receiving a therapeutic program for seven days (Table 1). The first group was treated with Frontline® (fipronil) 2.5g/ml (Merial-Australia). One spray per affected ear every 48 hours. The second group was treated with BARS® ampules (Fipronil, 10 mg/ml, Diflubenzuron, 1 mg/ml, Dicarboximide, 1 mg/ml, and excipients as a vehicle for that active substance), (AVZ, Animal Health Co, Russia). Every 48 hours, one to two drops of the drug were applied to the affected ear. The third group received BARS® ear drops (Diazinon) (AVZ, Animal Health Co, Russia), and the drug was applied as one to two drops/affected ear four times per day. The last group was treated with a combination of Frontline®, and BARS® ear drops to evaluate the synergistic effect of this combination in the treatment of feline Otoacariasis, and both drugs were applied as previously described. Each cat from the treated groups was weighed with a portable scale to determine the appropriate treatment dosage. Some supportive drugs were used during the treatment, such as Otal® ear drops (AMOUN, phar

**Table 1:** Epidemiological parameters associated with *Cat mange infestation* (Chi-square test)

Epidemiological Parameters		Positive	%	X2	P-value	Odds Ratio	95% Confidence Interval
Sex	Males (50)	39	78	3.048	0.081	2.173	(0.902-5.237)
	Females (50)	31	62				
Age	≤ 1 year (70)	55	78.57	8.163	0.004	3.667	(1.468-9.159)
	> 1 Years (30)	15	50				
Breed	Seamy (55)	36	65.45	1.203	0.273	0.613	(0.255-1.475)
	Persian (45)	34	75.55				
Season	Hot Months* (55)	32	58.18	8.129	0.004	0.256	(0.97-0.675)
	Cold Months** (45)	38	84.44				

\*Hot months in Egypt start from April to September, it usually ranged from 30:50 degree Celsius.

\*\* cold months in Egypt start from October to March, it usually ranged from 9.5:23 degree Celsius.

**Table 2:** Different protocols used for treatment of *Cat mange infestation*.

Treatment	Severity of Infestation			Recovered	%	Non-Recovered	%
	Mild	Moderate	Severe				
Frontline® (20)	3	10	7	19	95	1*	5
Bar's ampules® (16)	3	7	6	12	75	4*	25
Bars® Ear drops (15)	3	7	5	10	66.67	5*	33.33
(Frontline® + Bars® Ear drops) (19)	3	5	11	19	100	0	0
Total (70)	12	29	29	60	85.71	10	14.29

\*Severs case didn't recovered or response to any treatment protocol.

maceutical, Co, Egypt), containing framycetin sulfate, framycetin base gramicidin, dexamethasone, cinchocaine, and HCl, acting as an anti-inflammatory and an antibacterial agent with topical anesthetic effect, in addition to helping in wax removal. Lexicon (Meloxicam, oral suspension 1.5 mg/ml, Norbrook, UK) was also used as a systemic anti-inflammatory.

Furthermore, multivitamins were administrated like multivitamins paste (skin and coat complex by GimCat, Germany), or antifort multivitamin tablets by Görge's nature products, GmbH, Germany. All the symptomatic or/and supportive drugs mentioned above were used once daily during the week of the treatment in each group according to the case severity. The ears were cleaned periodically daily with cotton-coated ear sticks.

### STATISTICAL ANALYSIS

The obtained data were analyzed by SPSS Statistical Program (SPSS, Chicago, USA). The Pearson Chi-square test was used to measure the association between season (hot months and cold months), breeds (Siamese and Persian), sex (male and female), age (less than one year and more than one year), and the disease prevalence. The level of statistical significance was determined at  $p < 0.05$ .

### RESULTS

The current study was carried out on 100 privately owned cats. Seventy of them had symptoms of ear mange. The examined cats were being positive for the *O. cynotis* infestation microscopically (Adult female *Otodectes* are 500 x 300 μm in size, and males 395 x 295 μm, it has four pairs of long legs with short pretarsi, Males have suckers on short pedicels on all legs, females have them only on the first and second pairs of legs.) (Fig. 4) and clinically. The degree of infestation ranged from mild to severe. The main clinical signs were restless, marked pruritus, mild or severe dermatitis, frequent scratching of the ears, and head shaking associated with coffee grounds like waxy excretions. The intense pruritus sometimes adversely affects nutrition and, in some cases, leads to self-mutilation, bleeding, and hematomas.

As depicted in Table 1, age and season were the main risk factors affecting cat mange prevalence. Statistically, there was a significant association between age and cat mange infestation rate ( $p < 0.05$ ). Age was also considered a risk factor as the odds ratio was 3.667 (1.468-9.159). The young cats less than one-year-old had a higher infestation rate (78.57%) than the old ones (50%). With regard to season, there was a significant association between season and the infection level ( $p < 0.05$ ), but it was not considered a risk factor as the odds ratio was 0.256 (0.97-0.675). A higher

infestation level was reported in cold months (84.4%) than in hot months (58.18%). On the contrary, there was no significant effect for sex and breed on the cat mange prevalence ( $p > 0.05$ ), and they were not considered statistically as a risk factor since the odds ratio was 2.173 (0.902–5.237) for sex and were 0.613 (0.255–1.475) for the breed.

The therapeutic trials revealed that the combination of Frontline® and BARS® ear drops had a synergistic effect, and it was the most effective against ear mange, particularly in moderate and severe infestations (100%), followed by Frontline® (95%), BARS® ampules (75%) and finally, BARS® ear drops which has the lowest cure rate (66.67 % ) against the ear mange (Table 2).

## DISCUSSION

Parasitic mange mite (Acari: Psoroptidae) is a parasite affecting companion animals' ear canals, including cats and dogs. In addition, it may inadvertently affect humans. This parasite causes otitis and is characterized by ceruminous gland hyperplasia (Van de Heyning and Thienpon, 1977; Van der Gaag, 1986). In the present study, the clinical signs were pruritus, dermatitis, scratching of the ears and head shaking associated with coffee ground waxy excretions. These findings agree with some previous studies (Lohse et al., 2002; Perego et al., 2013). The intense pruritus sometimes adversely affects nutrition and, in some cases, results in mutilation, bleeding, and hematomas (Farkas et al., 2007; Yang and Huang, 2016).

Ear mange in cats was considered a problem in Egypt. In our study, the overall prevalence of mange mite is 70%, which agrees with another study that reported more than 59% in Egypt between 2007 and 2011 (Waly and Khalaf 2013). Epidemiological findings revealed that cats less than one-year-old were more susceptible to the disease than old ones. This finding is consistent with (Fanelli et al., 2020) but contradicts with (Beugnet et al., 2014), who confirmed that outdoor cats less than one-year-old and living separately were significantly less affected. The sex and breed had no significant effect on the infestation rate, which aligns with (Beugnet et al., 2014; Fanelli et al., 2020; Perego et al., 2013; Sotiraki et al., 2001). According to the seasonal variations, the percentage of infestation was high during cold months. This finding is consistent with some previous studies (Fanelli et al., 2020; Otranto et al., 2004), as they reported that the infection was usually high during the winter as the parasite survival is common in low temperatures, and it also facilitates its transmission.

There are a lot of approved medications for the treatment of this disease by direct application into the external ear canal once or twice daily for up to four weeks (Curtis,

2004). Another type of medication is the spot-on application to the skin once monthly, which is considered a more practical control measure against *O. cynotis* (Shanks et al., 2000; Six et al., 2000). Fipronil topical treatment has been proven to be an effective treatment (Carlotti 1991, Coleman and Atwell 1999). In our study, fipronil (Frontline®) achieved a 95% recovery rate when sprayed into the ear. This high percentage agrees with another study that reported 94% efficacy of fipronil (Yang and Huang 2016) and nearly agrees with another study that reported an 89.4% recovery percentage in cats using fipronil (Scarpella et al., 2005). Diazinon is an insecticide that belongs to an organophosphates group, and it has been widely used against ectoparasites (flies, lice, fleas) and some acarine (mite and tick) in many animals for more than 40 years in New Zealand (Pfeffer and Health 2010). It demonstrated high efficacy and can be used even after birth (Donkó 1999). It causes parasite paralysis by inhibiting the cholinesterase enzyme. In our study, diazinon (Bar's ear drops) has a 66.67% recovery rate, and this rate does not agree with another study that reported 100% efficacy of diazinon against ear mange infestation (Pimentel De Souza et al., 2006). The therapeutic trials in this study were based on a combination of the drugs mentioned above. The obtained results revealed that the combination between Frontline® (fipronil) and BARS® ear drops (diazinon) had a synergistic effect, and it was the most effective against ear mange, especially in moderate and severe infestation (100%), followed by Frontline® (95%), BARS® ampules (75%) and finally, BARS® ear drops alone was the less effective drug and recorded efficiency of 66.67% against the ear mites.

## CONCLUSION

In conclusion, age and seasonal variations are the main risk factors affecting ear mange mite infestation in cats. Frontline® and BARS® ear drops are the most effective therapeutic combination, they have a synergistic effect against ear mange in cats. We strongly recommend that the pet owner visit the pet's clinics for periodical examination of their companion animals and regularly administer prophylactic doses of the antiparasitic drugs to protect the cats.

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## CONFLICT OF INTEREST

The authors declares that there is no conflict of interest.

As stated in the journal submission guidelines, the author confirmed that the journal's ethical policies were noted and followed. The research was performed according to the ethical standards approved by the Faculty of Veterinary Medicine, Assiut University, and the Veterinary authorities.

## AUTHOR CONTRIBUTION

All authors contributed to the study.

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