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Prevalence of flea infestation in stray cats in North West of Iran, Iran

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ABSTRACT: Stray cats are important as the potential reservoir hosts of a variety of endoparasites and ectoparasites in medical and veterinary point of view. Ectoparasites, particularly fleas are a common and important cause of skin disorders in cats and these are also capable of disease transmission and can cause life-threatening anemia in young or debilitated animals. The objective of this study was to determine the prevalence of flea infestation in stray cats in Azarshahr, East Azarbayjan, Iran. From a total 50 stray cats examined, 35 (70%) were males and 15 (30%) were females. The overall prevalence of fleas infestation was 92%. Two species were present, of which *Ctenocephalides felis felis* was the most abundant (61.05%) followed by *Ctenocephalides felis canis* (38.94%). No lice, tick and mite were found on cats during this study.
There was no significant difference in infestion rate between male and female cats. However, the overall prevalence of fleas was higher amongst male compare with female cats. The prevalence of *C.canis* in 2< group was significantly higher than that of 1> and 1-2 ages.

Keywords: Flea, stray cats, *Ctenocephalides*, Azarshahr

INTRODUCTION

Stray cats are animals that wander outdoors and can be found on the streets, food courts, markets and can also be free roaming but return to human habitation after foraging for food (Dryden and Rust, 1994; Rust and Dryden, 1997). These cats are exposed to many types of diseases and may harbour various parasites that are transmittable to human such as; toxoplasmosis, toxocariasi, opisthorchiasis, leishmaniasis (Bowman *et al.,* 2010; Bush *et al.,* 2011; Pennisi *et al.,* 2013; Prokopowicz and Sosnowska, 1990; Richter *et al.,* 2014; Youssef and Uga, 2014). Ectoparasites are a common and important cause of pruritic skin diseases and hypersensitivity disorders in stray cats, as well as Some ectoparasites are vectors of a wide range of important zoonotic diseases worldwide, such as borreliosis, bartonellosis, ehrlichiosis, rickettsiosis, anaplasmosis, yersiniosis, tularemia(André *et al.,* 2014; Beaudu-Lange and Lange, 2014; Comer *et al.,* 2001; Mencke, 2013; Ortuno *et al.,* 2005; Robertson *et al.,* 2000; Sasaki *et al.,* 2012; Schloderer *et al.,* 2006; Shaw *et al.,* 2004) .Throughout the world, fleas, particularly species of *Ctenocephalides*, are common ectoparasites of domesticated dog , cats and hedgehogs (Gracia *et al.,* 2013; Hajipour *et al.,* 2015; Mircean *et al.,* 2010; Salant *et al.,* 2013). Flea infestations can cause considerable irritation to animals and humans, and can lead to severe disorders, such as anaemia and dermatological problems, because repeated infestation of dogs and cats may result in hypersensitivity to components of flea saliva, which, in turn, can cause flea allergic dermatitis (Dryden and Rust, 1994; Kunkle *et al.,* 2003; Newbury and Moriello, 2006). The cat flea, *Ctenocephalides felis*, is a known vector for *Bartonella henselae, Bartonella clarridgeiae and Rickettsia felis*, which, in humans, can cause cat scratch disease, endocarditis and cat flea typhus, respectively(Dryden and Rust, 1994; Kenny *et al.,* 2003; Krämer and Mencke, 2001; Rolain *et al.,* 2003; Shaw *et al.,* 2004). Dog and cat fleas are known to be intermediate hosts of *Dipylidium caninum*, which can be transmitted to pets and humans (Guzman, 1984; Soulsby, 1982). Several studies have been published on the distributions and prevalences of fleas on cats in different parts of the world. (Akucewich *et al.,* 2002; Bond *et al.,* 2007; Capári *et al.,* 2013; Cruz-Vazquez *et al.,* 2001; Farkas *et al.,* 2009; Gracia *et al.,* 2013; Jittapalapong *et al.,* 2008; Koutinas *et al.,* 1995; Kumsa and Mekonnen, 2011; Slapeta *et al.,* 2011; Xhaxhiu *et al.,* 2009).

Despite the large numbers of cats in Iran, very few studies have been conducted on the ectoparasites of these animals (Borji *et al.,* 2011), therefore, local and updated information is essential to understand the epidemiology of intestinal parasitic diseases in cats to design rational control strategies. This information is also important to prevent the indiscriminant use of anthelmintics that could lead to anthelmintic resistance (Irwin, 2002; Thompson, 1999).This study was carried out to identify and estimate the frequencies of ectoparasites occurring on stray cats in Azarshahr.

MATERIALS AND METHODS

A. Study area

The study was conducted in Azarshahr. This city lies in North Western of Iran, is located 1468 mts above mean sea level between 37°46' North Latitude and 45°85' East Longitude. The studied region has a moderate climate in winters and mild in summers, with an annual rainfall of about 388mm.

B. Sample collection

This study was performed based on cross sectional design. Fifty stray (35 males and 15 females) cats were trapped and collected from different areas Azarshahr of between March 2012 and February 2013 with permission from Iranian Department of Environment. Trapping using baited cage-traps with tinned fish was carry out in our study areas. The samples were sent to the Department of Animal Biology, Faculty of Natural Science, Tabriz University. Information about age, sex, body weight were recorded. Animals were divided into three groups based on the age (>1 year, 1-2 years and 2< years). Age was determined as described by Eldredge *et al.* (2008).

C. Ectoparasite samples

To recover fleas, animals were combed craniocaudally with a plastic fine-toothed flea-comb for at least 15 minutes on the dorsal and ventral trunk. These animals were examined for detecting tick, mit and lice infestation by a complete examination of the skin,skin scraping, acetate tape preparation and otic swabs.(Zakson *et al.,* 1995).

This was performed after anaesthetized by intra muscular injection of high doses of anesthetic drug (Ketamine 10%). Collected fleas were preserved in glass containers with a 70% ethanol solution until identification.

D. Parasitological procedure

Fleas were clean by water and immersed in 5% potassium hydroxide (KOH) with a slightly warm for 10-15 minutes, Samples were transferred to 30% acid alcohol for 5 min. to adjust the pH on samples, dehydrated the samples by using series of alcohol from 50, 60,70, 80, 90, 95 and 100% (absolute) with 5 min and then transparency by xylene for 5 min. After mounting and drying , species identification of fleas was based on light microscopic examination as described by Soulsby (1982).

E. Statistics analysis

Associations between parasitism and host characterizes were made using the Chi-square and Fisher exact test and their 95% confidence intervals. Statistical comparisons were carried Out using SPSS 16.0 statistical software.

RESULTS

Of the 50 stray cats included in this survey, 35 (70%) were males and 15 (30%) were females. The overall prevalence of fleas infestation in the stray cats was 92%.A total of 434 fleas collected, two species were identified: *C. f. felis* (265 fleas, males = 10 and females = 255) and *C. f. canis* (169 fleas, males = 5 and females = 164). *C. f. felis* was the most common species found on cats (61.05%) , followed by *C. f. canis* (38.94%). No lice, tick and mite were found on cats during this study. The results indicated that the overall prevalence of fleas on stray cats was not significantly different ($p > 0.05$) between male and female cats, However, the overall prevalence of fleas was higher amongst male compare with female cats. Wherever the prevalence of *C. canis* in 2< group was significantly higher than that of 1> and 1-2 ages (Table 1,2). Amongst fleas, the number of female individuals was higher than that of male individuals.

DISCUSSION

Ectoparasites have the potential to transmit zoonotic disease. Some zoonotic diseases only cause severe pain to human but some may cause serious disease and even death (Dryden and Rust, 1994; Krämer and Mencke, 2001; Pennisi *et al.,* 2013; Rolain *et al.,* 2003; Rust and Dryden, 1997; Sasaki *et al.,* 2012; Schloderer *et al.,* 2006; Youssef and Uga, 2014). In our study, the overall prevalence of fleas infestation in stray cats was 92%. These results were compatible with previous studies (Akucewich *et al.,* 2002; Gracia *et al.,* 2013; Jittapalapong *et al.,* 2008; Xhaxhiu *et al.,* 2009). Two species of fleas including *C. **f.** felis* 42(84%) and *C. f. canis* 32 (64%) of the 50 stray cats, were found. Of the 50 stray cats included in the investigation, 32 (64%) had mix infestation. *C. f. felis* was the most prevalent species among stray cats examined(61.05%) which was lower than the estimated prevalence previously found in Fplorida of 92.5% (Akucewich *et al.,* 2002), in United Kingdom of 98.93% (Bond *et al.,* 2007), in Spain of 98.4% (Gracia *et al.,* 2013), in Mexico of 90%

Table 1: Prevalence of infestation fleas in relation to age of the cats (n = 50).

Parasite	Infected (N), prevalenc (%)			Significance (X^2:P)
	Age			
	1≥ n=14	1-2 n=17	>2 n=19	
Ctenocephalides felis	9(64.28)	3(17.64)	-	p>0.05
Ctenocephalides canis	4(28.57)	-	-	p<0.05
Mix	1(7.14)	12(70.58)	19(100)	p>0.05

Table 2: Prevalence of infestation fleas in relation to sex of the cats (n = 50).

Parasite	Infected (N), prevalenc (%)		Significance (X^2:P)
	Sex		
	Male n=35	Female n=15	
Ctenocephalides felis	9(25.71)	2(13.33)	p>0.05
Ctenocephalides canis	2(5.7)	1(6.66)	p>0.05
Mix	20(57.14)	12(80)	p>0.05

(Cruz-Vazquez *et al.,* 2001), in several areas of Germany of 81.5% (Beck *et al.,* 2006), in Ethiopia of 67% (Kumsa and Mekonnen, 2011), in Bangkok of 88.3% (Jittapalapong *et al.,* 2008) and in Australia of 98.8% (Slapeta *et al.,* 2011), in Albania of 100% (Xhaxhiu *et al.,* 2009), in Greece of 97.4% (Koutinas *et al.,* 1995), in Hungary of 94.3% (Farkas *et al.,* 2009) wherever ,the prevalence rate of *C. f. felis* in this resent survey was high compared with conducted studies in Iran (20.68%) (Borji *et al.,* 2011), in India (26%) (Krecek *et al., 2*010). ***C. f. canis*** was the second most abundant species (169 fleas, 38.94%). These results were consistent with carried out previous studies (Beck *et al.,* 2006; Bond *et al.,* 2007; Canto *et al.,* 2013; Farkas *et al.,* 2009). The higher prevalence of *C. f. felis* than *C. f. canis* may be due to the fact that the resent survey was conducted in urban areas, where the cat flea usually predominates (Rinaldi *et al.,* 2007). Moreover, environmental conditions can affect the proliferation and survival of ectoparasites. For example, flea larvae development occurs in protected microhabitats that combine moderate temperature and high relative humidity. In Azarshahr, the temperature and humidity area enhancing the life cycle of all ectoparasites and assisting them more survival in the environment (Jittapalapong *et al.,* 2008).Our studies indicated that female ectoparasite was predominant than male.

This finding was in line with earlier reports from Ethiopia (Kumsa and Mekonnen, 2011), Iran and Iraq Boarder Line Area (Bahrami *et al.,* 2012). The reason for this discrepancy is unclear but may be in part related to the fact that females have longer life than males and that males are spending more time off the host or they are more prone to predation or grooming by the host, or due to starvation (Bahrami *et al.,* 2012; Kumsa and Mekonnen, 2011). A significant difference ($p < 0.05$) was observed in the prevalence of *C. f. felis* infestation between age groups, which was compatible with previous survey carried out in Thailand (Jittapalapong *et al.,* 2008; Xhaxhiu *et al.,* 2009). The high prevalence *C. f. felis* found in this study must serve as a warning sign to public health agencies, veterinarians and nearby people because this study reinforcers the role of stray cats as one of the potential sources of zoonotic parasites transmission to humans.

CONCLUSION

C. f. felis was known to be the most common ectoparasite of stray cats. Our results provide important information about the prevalence and the kind of ectoparasites present in stray cats in Azarshahr city, East Azerbaijan Province, North West, Iran, and provide the basis for additional work focus in developing control programs to prevent risks to public health.

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