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Araştırma Makalesi ***Research Article***

Prevalence of Zoonotic and Other Intestinal Protozoan Parasites in Stray Cats (*Felis domesticus*) of Kerman, South-East of Iran

Sakineh BEIGI[1], Saeid Reza NOUROLLAHI FARD[2], Baharak AKHTARDANESH[3]*

[1]Department of Pathobiology, School of Veterinary Medicine, Shahid Bahonar University of Kerman, Kerman, Iran
[2]Department of Pathobiology, School of Veterinary Medicine, Shahid Bahonar University of Kerman, Kerman, Iran
[3]Department of Clinical Science, School of Veterinary Medicine, Shahid Bahonar University of Kerman, Kerman, Iran

****Sorumlu Yazar / Corresponding Author:***
Saeid Reza Nourollahi FARD
e-mail: nourollahifard@uk.ac.ir

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Abstract

Intestinal protozoan parasites constitute a major source of diseases for stray cats and have been recognized as important public health problems in several parts of the world. Considering the potential risk of stray cats for public health, present cross-sectional study was carried out to determine the type and frequency of protozoan parasites by faecal examination. A total of 100 stray cats were examined in Kerman city, Iran, Overall 67 cats (67%) were infected with at least one protozoan parasite. The following parasites, with their respective prevalence, were found; *Isospora felis* 38%, *Isospora rivolta* 25%, *Toxoplasma gondii* 16%, Sarcocystis spp. 8%, Cryptosporidium spp. 7%, and Giardia sp. 5%. Based on our data, the sex of stray cats was not significantly associated with the prevalence of gastrointestinal protozoan parasites. The high infection rate of zoonotic intestinal protozoan parasites in stray cats is considered to be critical from the viewpoint of public health importance.

Introduction

Felines play an essential role in the epidemiology of zoonotic parasites, including Toxoplasmosis, Cryptosporidiosis and Giardiasis (Apelbee et al., 2005; Ballweber et al. 2010;). All these intestinal protozoan parasites have faecal-oral transmission cycle and a major component for the spread of these parasites is the shedding of oocysts or cysts into the environment (Claerebout et al., 2009). Regarding to Iranian society for the Prevention of Cruelty to Animal (IRAN, SPCA) announcement, more than 90% of cats (*Felis catus*) in Iran are strayed cats and they often fed at homes like a pet. Intestinal protozoan parasites of cats are responsible for several important zoonotic diseases.

Infection with *Giardia lamblia* in cats is associated with diarrhea, decreased weight gain and feed efficiency. *Isospora felis* appears moderately pathogenic for 6 week old to 13 week old kittens and causes coccidiosis. Cats also are important as definitive hosts for at least 11 named species of Sarcocystis and are the intermediate host for one species, *Sarcocystis felis*, the stage of Sarcocystis passed in the feces of cats is a sporulated sporocyst containing 4 sporozoites (Bowman, 2003).

Another coccidian of cat is *Hammondia hammondi,* the only known feline definitive hosts are cats. Natural intermediate hosts of *H. hammondi* include goats, rats, and roe deer. In cats *H. hammondi* does not cause disease (Bowman, 2003).

Transmission of certain parasites of carnivores to domestic animals and man led to disease and causes economic losses and public health hazards (Ballweber et al. 2010, Gates et al. 2009). Considering aspects related to public and animal health, determining the prevalence of intestinal parasites of cats should, therefore, be continuous task, with the most relevant aim being the establishment of control measures (Paul et al. 2010).

The aim of this study was to provide information on the prevalence of intestinal protozoan parasites in stray cats and its veterinary and zoonotic significance in Kerman, a semi-dried zone in south-east Iran.

Materials and Methods

All of the methods used in this study were confirmed by the Ethics Committee of Shahid Bahonar University of Kerman, respecting currently accepted animal welfare rules in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008. This study had an ethics approval certificate from research council of Shahid Bahonar University with grant number#G1392.

Collection of Fecal Samples

The study was conducted from April 2011 to September 2012. Urban stray cats were collected from cat dense areas within the Kerman city by a volunteer cat rescue group. Kerman city is located at 30°17′13″N and 57°04′09″E southeast of Iran and has hot summers and arid weather.

The animals were identified and all available information related to each cat was recorded in a data form. Estimation of age was carried out by examination of the teeth and cat dental formula.

In this study, prevalence of intestinal protozoan parasites in 100 stray cats investigated by faecal examination. A minimum of 2 g of feces was obtained directly from the rectum and immediately placed into a plastic container, and stored at 4°C. Faecal specimens were concentrated by the formalin-ether sedimentation method. Faecal smears of the sediment (20 µL) were made and stained by the modified Ziehl-Neelson technique and examined for Cryptosporidium oocysts (Causape et al., 1996, Geurden et al., 2008). Smear of the faeces were prepared and stained with trichrome and iodine stains to detect cysts or trophozoites of Giardia and Entamoeba spp. (Tanyuksel and Petri Jr., 2003). Although *T. gondii* oocysts in feline feces are morphometrically indistinguishable from oocysts of *H. hammondi* and Besnoitia spp, which also occur in cats, we regarded oocyst smaller than 14µm as *Toxoplasma*, just because of public health importance (Bowman, 1995). Oocysts of Isospora, Toxoplasma and sporocyst of sarcocyst were detected based on their size.

Data Analysis

The data analysis was performed separately by grouping the animals by age (0≤1 year, 1-3 years and >3 years) and gender (male and female). In each case, the general prevalence for all intestinal parasites, and the prevalence of each particular parasite were analyzed by using x^2 test. Statistical analysis was performed by SPSS (version 14) and statistically significance was defined as $P<0.05$.

Results

On stool examination, of the 100 stray cats, 67% were found to be parasitized with at least one protozoan parasite. The parasites detected in fecal examination were, *Isospora felis* (38%), *Isospora rivolta* (25%), *Toxoplasma gondii* (16%), Sarcocystis spp. (8%), Cryptosporidium spp. (7%), and Giardia spp. (5%). The Infection rates of gastrointestinal parasites were given in Table 1. Besides, the relationship of age and gender with the prevalence of intestinal protozoan parasites in 100 stray cats of the Kerman, Iran was shown in Table 1.

Concurrent infection with two or more parasites was also seen in most of the stray cats examined (Table 2).

Discussion

The high prevalence of intestinal protozoan parasites in stray cats in Kerman (67%) indicates that stray cats were considerably infected with several protozoan parasites especially zoonotic parasites. Some factors such as geographical location, status of animal ownership, sampling protocols, demographic factors, anthelmintic usage, and diagnostic techniques are responsible for the wide range of endoparasite prevalence. Among the parasites found in our survey, *Giardia* sp., *T. gondii* and *Cryptosporidium* spp. are considered responsible for important zoonotic infections.

In our study, *Cryptosporidium* spp. was detected in 7% of fecal samples, it was is similar with observation recorded by Bahrami et al. (2011) in Ilam province, located in Iran and Iraq borderline and Mtambo et al. (1991) In Glasgow area, *Cryptosporidium felis* (Huber et al., 2005) and several other *Cryptosporidium* species have been described in cats, including *Cryptosporidium parvum* and *Cryptosporidium muris* (Pavlasek and Ryan, 2007).

In the United Kingdom, Tzannes et al. (2008) analyzed fecal samples from 1355 cats and observed approximately 1% positivity prevalence for Cryptosporidium species oocysts. Several causes might have affected observed variability in intestinal parasite infections including: geographical region (temperature and humidity), season, behaviors and habits of the local animal populations and the type of population of cat (stray, feral, shelter, household).

Table 1. The frequency and intensity of intestinal protozoan parasites in relation to age and sex of the stray cats.

		Gender		Age(year)		
Parasite	**Infection rate (%)**	Female (n=54) 36(66.66%)	Male (n=46) 31(67.39%)	1< (n=24) 19(79.16%)	1-3 (n=43) 31(72.09%)	3> (n=33) 17(51.51%)
Isospora felis	38	19(35.18%)	19(41.30%)	14(58.33%)	15(34.88%)	9(27.27%)
Isospora rivolta	25	13(24.07%)	12(26.08%)	6(25.00%)	13(30.23%)	6(18.18%)
Toxoplasma gondii	16	8(14.81%)	8(17.39%)	4(16.66%)	8(18.60%)	4(12.12%)
Sarcocystis spp.	8	5(9.25%)	3(6.52%)	0(00.00%)	5(11.62%)	3(9.09%)
Cryptosporidium spp.	7	4(7.40%)	3(6.52%)	2(8.33%)	2(6.97%)	2(6.06%)
Giardia sp.	5	3(5.55%)	2(4.34%)	2(8.33%)	2(4.65%)	1(3.03%)

Table 2. Concurrent infection with more than one intestinal protozoan parasite detected in stray cats.

	Gender		Age(year)				
Mixed Infection	Female (n=54)	Male (n=46)	1< (n=24)	1-3 (n=43)	3> (n=33)	Prevalence% (n = 100)	Prevalence%
Single Species Infection	20(37.03%)	15(32.60%)	10(41.66%)	16(37.20%)	9(27.27%)	35	(If) 15 (Ir) 8 (T) 9 (S) 3
Double Species Infection	16(29.62%)	16(34.78%)	9(37.50%)	15(34.88%)	8(24.24%)	32	(If+Ir) 9 If+C) 6 (Ir+T) 4 If+G) 3 (If+S) 3 (If+T) 2 (Ir+G) 2 (Ir+S) 1 (Ir+C) 1 (S+T) 1

(IF) *Isospora felis*, (Ir) *Isospora rivolta*, (T) *Toxoplasma gondii*, (S) Sarcocystis spp., (C) Cryptosporidium spp., (G) Giardia sp.

In our study, *Giardia* spp. was detected in 5% fecal samples from domestic cats. Several publications from the Iran documented prevalence of 2% and 18.91% in faecal sample of cats (Mosallanejad et al. 2010; Bahrami et al. 2011). The comparison of the present study with published survey indicated difference in prevalence of particular parasite, perhaps due to regional, environmental and climatic variations. In Brazil, Gennari et al. (1999) noted that 16.04% of 187 fecal samples from cats were positive for *Giardia* spp. In Australia, MacGlade et al. (2003) analyzed fecal samples from 40 cats and observed approximately 60% positivity prevalence for *Giardia sp*. Tzannes et al. (2008) in United Kingdom, observed approximately 6% positivity prevalence for *Giardia sp*.

A different occurrence was detected in Germany between 1999 and 2002, when fecal samples from 3164 cats were analyzed indicating that 51.6% had cysts of *Giardia* spp. (Barutzki and Schaper, 2003). The

difference between the prevalence rates might be due to the method of examination.

With respect to *T. gondii* the infection rate of 16% was observed in our study. *T. gondii* is a protozoan capable of infecting a large number of animals and has felines as its definitive host. This parasite represents a great risk to the human population, causing diverse infection and mortality levels, especially among immunosuppressed people and pregnant women (Barbosa et al., 2007).

Another very common parasite found in the evaluated cats was *Isospora* spp., which shows that these coccidia are the main intestinal protozoa found in cats, as indicated Visco et al., (1997). *Isospora* spp. was the most common enteric protozoan of stray cats in our study.

Based on our data, the sex of stray cats was not significantly associated with the prevalence of intestinal protozoan parasites. A similar finding was reported by Bahadori et al. (2004), Jamshidi et al. (2002) and Tzannes et al. (2008) who reported no difference in the intensity of infection in male and female cats. Generally, sex does not seem to be a determining factor of infection (Mosallanejad et al. 2010).

The results obtained in this study contradict with that of Tzannes et al. (2008), who reported the higher prevalence of Giardia and Isospora in adult cats than in cats less than 6 months old. The different between prevalence rates of other studies with reports from Iran can be explained by behaviors and type of population of cats and method of examination (Mosallanejad et al. 2010).

In conclusion, the high infection rate of intestinal protozoan parasites in stray cats is considered to be critical from the viewpoint of public health importance, some of which are responsible for several zoonotic diseases. Hence, it is imperative that appropriate control strategies and measures be implemented to prevent and control the infection of stray cats with protozoan parasites in Kerman and elsewhere in Iran.

Data generated from this study will help veterinarians and physicians practicing in this region to better educate their clients and patients about the local prevalence of these parasites and help to guide parasite diagnostic and preventative programs.

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