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Seroepidemiological Survey of Helminthic Parasites of Stray Dogs in Sari City, Northern Iran

¹Shirzad Gholami, ¹Ahmad Daryani, ¹Mehdi Sharif, ¹Afsaneh Amouei and ²Traj Mobedi

¹Department of Parasitology and Mycology, Faculty of Medical,
Mazandaran University of Medical Sciences, Sari, Iran

²Department of Parasitology, Faculty of Health, Tehran University of Medical Sciences, Tehran, Iran

Abstract: The objective of this study was to determine the prevalence rate of helminthic parasites in stray dogs' population especially zoonotic infections and to identify potential risk factors in the different areas of Sari city in Caspian area, north of Iran. During the period from April to September 2007, 50 stray dogs were collected from urban areas of Sari city. Recovered parasites were fixed in alcohol and stained by carmine then observed by microscope. The taxonomic study was carried out by measuring different parts of the body of helminthes and statistical tests were performed using the Chi-square test. A total of 27 adult and 23 juvenile stray dogs were collected and the overall prevalence rate of infection was 90%. The three most common helminthes were *Toxocara canis* (60%), *Ancylostoma caninum* (46%) and *Dipylidium caninum* (36%). Other parasites were *Uncinaria stenocephala* (12%), *Taenia hydatigena* (6%), *Spirocerca lupi* (6%), *Dirofilaria immitis* (6%), *Toxascaris leonina* (2%), *Rictularia* sp. (2%), *Taenia ovis* (2%) and *Taenia taeniformis* (2%). Five species of zoonotic helminthes recovered were *T. canis*, *A. caninum*, *U. stenocephala*, *D. caninum* and *D. immitis*. Hookworm infections (58%) were more common significantly in the young stray dogs ($p < 0.01$). In regard to prevalence of *A. caninum*, *T. canis* and *U. stenocephala*, there was significant difference between juvenile and adult dogs ($p < 0.05$). The results highlight the potential role of stray dogs for transmission of helminthic parasites particularly zoonotic parasites that are a significant risk to human health.

Key words: Worms, zoonose, juvenile, Ancylostoma, transmission

INTRODUCTION

Intestinal parasites, both helminthes and protozoa, are important pathogens in dogs particularly in rural areas. Unfortunately, some of these animals are infected with parasites including parasitic worms thus by contamination of water, soil and food could be a leading source of infections in humans where they can produce mild to life threatening diseases. In North of Iran, stray dogs, working sheepdogs, pet dogs and wild canids, such as foxes and jackals threaten the public health. Dogs and wild canids are definitive host of some intestinal parasites that cause important diseases in man and animals. Some of intestinal parasites are zoonotic agents and important in public health e.g. *Echinococcus granulosus*, *T. canis*, *Giardia* sp. and *Cryptosporidium* sp. (Macpherson *et al.*, 2000; Dubey *et al.*, 2007; Conraths and Gottstein, 2007; Claerebout *et al.*, 2009).

Although in Iran, the stray dogs are usually rejected due to religious believes, hygienic issues and their biting nature, they still comprise the largest population in the

country. Intestinal parasites of stray dogs and wild canids are also frequently implicated in public health problems. Numerous studies have been conducted on the prevalence of the helminthic parasites in stray dogs and wild carnivores from all over the world including Iran (Eslami and Hosseini, 1998; Bugg *et al.*, 1999; Mehrabani *et al.*, 1999; Mehrabani *et al.*, 2002; Dalimi *et al.*, 2006; Martinez-Moreno *et al.*, 2007; Claerebout *et al.*, 2009; Razmi, 2009). Moreover, some studies have been done in North of Iran to identify the significance of stray dogs as potential reservoirs of intestinal helminth especially Hookworm, *Toxocara* sp. and *E. granulosus* with a higher prevalence rate than the other intestinal helminthic parasites (Gholami *et al.*, 1999). However, prevalence of intestinal parasites of dogs were reported from different areas of Iran, especially from Azarbaijan, Kordestan and Kermanshah in the western part of Iran, Kashand and Khorasan Razavi provinces (Arbabi and Hooshyar, 2006; Dalimi *et al.*, 2006; Razmi, 2009), these studies have shown the different percentages of intestinal parasites in dogs. In the North of Iran, the

most recent report on helminthic and protozoan parasites in dogs is related to nearly 15 years ago. Thus, there is a need to obtain new data about intestinal parasites of dogs and other canines from North of Iran.

Therefore, the objective of this study was to determine the situation of intestinal helminthic parasites in stray dogs' population especially to estimate the zoonotic infections and to identify potential risk factors in the different areas of Sari city in the Mazandaran province, North of Iran.

MATERIALS AND METHODS

Study area: In this study, samples were taken in Sari city, Northern Iran, with a human population around 196,000 and lies between the parallels 35°58' and 36°50' of the Northern latitude and between 52°56' and 53°59' of the Eastern longitude. The mean yearly relative humidity is 85.83% with rainfall occurrence in all seasons of the year and an average temperature of 17°C.

Collection and examination of dogs: During the period from April to September 2007, with permission from appropriate authorities from the Ethics Committee of Mazandaran University of Medical Sciences, 50 Juvenile (<6 months) and adult (≥6 months) stray dogs (male, 21; female, 29) under stray dog control programme were collected by shooting from different parts of urban areas of Sari, Mazandaran province, Iran. Immediately they were carried to the Sari Medical School, where they were necropsied and the gastrointestinal tract was opened along its entire length. The mucosa was scraped with a scalpel. To collect worm from the intestine, the epithelial scrapings and the intestinal contents were passed through 60 and 80 mesh wire sieves. The contents of the sieves were washed with tap water and the helminthes were collected. Recovered parasites were fixed in alcohol and stained by carmine. Fecal specimens also were examined by the formalin ether concentration method. The taxonomic study was carried out by measuring different parts of the body of helminthic parasites according to the keys and guideline given by Yamaguti (1961), Anderson (1992) and Khalil *et al.* (1994) by light microscopic with stage micrometer.

Statistical analysis: Statistical tests were performed using the SPSS 15. Chi-square test was used to determine the significant association for the prevalence of helminth parasites relative to host age and gender. In all cases, 95% confidence intervals and $p < 0.05$, were set for significant.

RESULTS

In this study, a total of 27 adult and 23 juvenile stray dogs collected from the whole city were examined with an overall prevalence rate of 90%. Prevalence rate of infection in adult and juvenile dogs was 54 and 46%, respectively. On the other hand, its prevalence in males and females was 42 and 58%, respectively (Table 1). Seven species of nematodes and four species of cestodes were found in this survey (Table 2). The overall prevalence of intestinal parasites in 50 dogs was as follow: nematodes, 90% and cestodes, 44%. Among these parasites, the most important species of zoonotic helminthes recovered were *T. canis*, *A. caninum*, *U. stenocephala*, *D. caninum* and *D. immitis* (Table 2). In this study, *Echinococcus granulosus* and *Taenia multiceps* were not found.

Fifteen dogs (30%) harbored two species of parasites, whereas, nineteen (38%) of them had three and four parasites species. Among these dogs harboring mixed infections, hookworm infections were more common especially in the young stray dogs ($p < 0.01$) with an overall prevalence of 58%. In regard to age, there was also significant difference between juvenile dogs and prevalence of *A. caninum*, *T. canis* and *U. stenocephala* ($p < 0.05$), but there was no significant difference in the overall prevalence between male and female ($p > 0.05$).

The results indicated that polyparasitism is more common than single infection in these animals. The rate of polyparasitism in stray dogs was 78%.

Table 1: Prevalence of helminthic infections in 50 stray dogs related to host age and sex, in Sari city, Mazandaran province, North of Iran

Variable	Nematoda	Cestoda	Total
	No. of positive (%)	No. of positive (%)	No. of dogs (%)
Age^a			
Juvenile	21(91.3)	7(30.4)	23(46)
Adult	24(88.8)	14(51.8)	27(54)
Sex^b			
Male	18(85.7)	11(52.3)	21(42)
Female	27(93.1)	10(34.5)	29(58)

^a: $\chi^2 = 0.368$; $df = 1$; $p = 0.77$, ^b: $\chi^2 = 0.564$; $df = 1$; $p = 0.11$

Table 2: Prevalence of helminthic parasites in 50 dogs in Sari city, Mazandaran province, North of Iran

Parasites	Number of infected dogs	Prevalence of helminthes (%)
<i>Toxocara canis</i>	30	60
<i>Ancylostoma caninum</i>	23	46
<i>Uncinaria stenocephala</i>	12	24
<i>Dirofilaria immitis</i>	3	6
<i>Spirocerca lupi</i>	3	6
<i>Toxascaris leonina</i>	1	2
<i>Rictularia</i> sp.	1	2
<i>Dipylidium caninum</i>	18	36
<i>Taenia hydatigena</i>	3	6
<i>Taenia ovis</i>	1	2
<i>Taenia taeniformis</i>	1	2

DISCUSSION

Helminthic parasites in dogs are both common and important with some serious diseases in the world. The overall prevalence of helminthic parasites in stray dogs found in this study is 90%, revealing a very high level of infection. Previous report in Mazandaran province shows almost the same prevalence rate of infection in dogs (80%) (Gholami *et al.*, 1999). This survey also reveals different prevalence rates in comparison with the results of Fontanarrosa *et al.* (2006) in Argentina (52%), Martinez-Moreno *et al.* (2007) in Spain (71.33%) and Claerebout *et al.* (2009) in Belgium (26.9%). There is similar result with the report of Ramirez-Barrios *et al.* (2004) in Venezuela (93.5%). These results have shown that as these animals have no health control measures, they are exposed to natural infection more than household dogs (Martinez-Moreno *et al.*, 2007; Claerebout *et al.*, 2009). Although the role of these populations in the transmission of parasites to man is not clearly determined (Eguia-Aguilar *et al.*, 2005) they may be an important source of infection for humans (by contamination of water, soil and food) and constitute a relevant public problem.

In the present study, seven species of nematodes and four species of cestodes were observed. The most common parasites were *T. canis* (60%), *A. caninum* (46%) *D. caninum* (36%). These parasites have been usually considered the most frequent helminthic parasites in dogs, in Iran and other countries (Ramirez-Barrios *et al.*, 2004; Dalimi *et al.*, 2006; Martinez-Moreno *et al.*, 2007; Razmi, 2009).

Although in this research, no *E. granulosus* egg or adult worm was found in dogs; other previous reports revealed different prevalences in Iran (3-50%) (Gholami *et al.*, 1999; Sadjjadi *et al.*, 2000; Dalimi *et al.*, 2002; Arbabi and Hooshyar, 2006; Sattari *et al.*, 2008). According to previous studies, *E. granulosus* is a parasite with global incidence and more important could have a direct effect on sanitation in the different regions in the world. Mediterranean area, South of the Sahara in the semi-arid areas of East Africa, South Africa, South America, Eastern Europe parts of China, with a prevalence rate of 1 to 63.5% are regions with a relatively high prevalence (Rausch, 1995; Macpherson and Wachira, 1997; Wen and yang, 1997; Eckert *et al.*, 2001; Battelli *et al.*, 2002; Thompson and McManus, 2002; Romig, 2003; Sadjjadi, 2006).

The present study revealed, *D. immitis* (6%), *T. hydatigena* (6%), *T. ovis* (2%), *T. taeniformis* (2%) and *T. leonina* (2%). In Iran, particularly in Caspian region,

these parasites have been reported to be present in dogs, cats, Jackals and foxes (Gholami *et al.*, 1999; Dalimi *et al.*, 2006; Sharif *et al.*, 2010).

According to other reports, *A. caninum*, *T. canis*, *D. caninum*, *T. leonine*, *D. immitis*, *T. hydatigena*, *T. ovis* and *T. taeniformis* are most commonly found helminthes in dogs, whereas a decreasing was observed for *E. granulosus* and *T. muticpes* (Oliveira-Sequeira *et al.*, 2002; Ramirez-Barrios *et al.*, 2004; Eguia-Aguilar *et al.*, 2005; Dalimi *et al.*, 2006; Fontanarrosa *et al.*, 2006; Martinez-Moreno *et al.*, 2007; Claerebout *et al.*, 2009; Razmi, 2009). However, different prevalence of intestinal helminthes in dogs have shown that infection rates vary in these studies according to the geographic area, environmental situations and the year in which survey was done. In this study, eggs of *S. lupi* was found in the feces of 3 stray dogs (6%), which were also reported in stray dogs in Shiraz, Southern Iran (19.04%) (Oryan *et al.*, 2008). *S. lupi* is a nematode with a worldwide distribution in regions with a warm climate, the prevalence of spirocercosis of dogs reported from endemic regions varies from 10 to 85% (Oliveira-Sequeira *et al.*, 2002; Minnaar *et al.*, 2002; Oryan *et al.*, 2008).

Five parasite genera found in stray dogs containing *A. caninum* (46%), *D. caninum* (36%), *T. canis* (60%), *D. immitis* (6%), *U. stenocephala* (12%), are proven zoonotic agents. The prevalence of zoonotic helminthes could indicate that humans in this region are seriously at risk; therefore the preventive program is necessary. In addition, health education and regulation of livestock slaughtering in abattoirs or forms can reduce highly the risk of parasites transmission. Thus, more attention need to these issues.

In regard to age and sex there were no significant differences in the overall prevalence between juvenile and adult dogs ($p > 0.05$), as well between male and female ($p > 0.05$). The influence of the age was different for each parasite group and even for each species. These finding are similar to those obtained in previous studies (Oliveira-Sequeira *et al.*, 2002; Ramirez-Barrios *et al.*, 2004; Fontanarrosa *et al.*, 2006; Martinez-Moreno *et al.*, 2007). The results of study, indicating a potentially increased susceptibility of adult males to patent infection (Oliveira-Sequeira *et al.*, 2002; Rubel *et al.*, 2003). *A. caninum* was only parasite showing significant difference between genders, with higher values for males, in agreement with the other study (Rubel *et al.*, 2003). The prevalence of *T. canis* in stray dogs was significantly different between adult and juvenile dogs ($p = 0.003$), but insignificant differences between male and female dogs ($p > 0.05$).

This study presents new data about parasitic infections of dogs in this area. Data indicate that dogs

harbor helminthic species are significant risk to human health. The most prevalent species (*A. caninum*, *U. Stenocephala*, *T. canis* and *D. caninum*) are causative agents of helminthic diseases especially cutaneous and visceral larva migrants. Public health programmes should take into consideration this finding and remove stray dogs from public zones in urban areas. In addition, more attention needs to improve personal and food hygiene as well controlling stray dogs as reservoirs in urban areas and educational programmes about zoonotic diseases that can be transmitted to humans should be developed. The results highlight the potential role of stray dogs for transmission of helminthic parasites particularly zoonotic parasites that by contamination of water, soil and food can threaten human health.

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