Study on Gastrointestinal Zoonotic Parasites in Pet Dogs in Western Iran

Batı İran'da Evcil Köpeklerde Gastrointestinal Zoonoz Parazitler Üzerinde Çalışma

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ABSTRACT

Objective: Dogs are the definitive or reservoirs hosts of more than 60 zoonotic parasites. This study was conducted to investigate the prevalence of gastrointestinal (GI) parasites in pet dogs in Hamedan, Western Iran.

Methods: In cross-sectional study, 210 stool samples were collected randomly in pet dogs without clinical signs in Hamedan in April to December 2010. All samples were concentrated by formalin-ether technique. Smears of the feces were prepared and stained with Ziehl-Neelsen, trichrome, and iodine stains.

Results: During coproscopy, the overall proportion of GI parasitic infection was found in 6.7% (14/210) of samples. The detected parasites with their frequencies were *Cryptosporidium* spp. (3.8%), *Toxocara canis* (1.9%), and *Giardia* spp. (0.95%). A significant difference was not observed between infection rates in different age groups) p=0.617) or between genders (p=0.627).

Conclusion: This is the first report of GI parasites in dogs from Western Iran. Although the rate of infection is low, the results showed that the pet dogs are reservoirs for zoonotic GI parasites and should be considered important to public health in this region. A combination of routine screening fecal samples for parasites, strategic anthelmintics regimens, and improved pet owner education is highly recommended for the control of GI parasites in pet dogs. *(Turkiye Parazitol Derg 2014; 38: 172-6)*

Key Words: Gastrointestinal parasite, dog, Hamedan, Iran

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ÖZET

Amaç: Köpekler, altmıştan fazla zoonotik parazitin son veya rezervuar konaklarıdır. Bu çalışma, İran'ın batısında yer alan Hamedan'da evcil köpeklerdeki gastrointestinal (GI) parazitlerin prevalansını incelemek amacıyla gerçekleştirilmiştir.

Yöntemler: Bu kesitsel çalışmada, Nisan-Aralık 2010 tarihleri arasında Hamedan'da klinik bulguları olmayan ve rastgele seçilen 210 evcil köpekten dışkı örnekleri toplanmıştır. Bütün örnekler formalin-eter tekniği ile konsantre edilmiştir. Dışkı yaymaları hazırlanarak Ziehl-Nielsen ve iyot ile boyanmıştır.

Bulgular: Koproskopik incelemede, GI parazitik enfeksiyonun toplam oranı %6,7 (14/210) olarak bulunmuştur. Sıklıklarına göre bulunan parazitler; *Cryptosporidium* spp. (%3,8), *Toxocara canis* (%1,9) ve *Giardia* spp. (%0,95)'dir. Yaş grupları (p=0,617) veya cinsiyetler (p=0,627) arasında istatistiksel olarak herhangi bir önemli farklılık gözlenmemiştir.

Sonuç: Bu, batı İran'daki köpeklerin GI parazitlerinin sıklıkları hakkında yapılan ilk çalışmadır. Her nekadar enfeksiyon oranı düşük olsa da bulgular evcil köpeklerin zoonotik GI parazitler için rezervuar olduğunu ve bu bölgede önemli bir toplum sağlığı sorunu olarak düşünülmesi gerektiğini göstermiştir. Bu çalışma, evcil köpeklerde GI parazitlerin kontrolu için parazitler açısından dışkı örneklerinin rutin olarak

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incelenmesi, stratejik antihelmentik rejimlerin hazırlanması ve köpek sahiplerinin eğitilmesi konularının önemli olduğunu ve şiddetle tavsiye edilmesi gerektiğini ortaya koymuştur. *(Turkiye Parazitol Derg 2014; 38: 172-6)*

Anahtar Sözcükler: Gastrointestinal parazitler, köpek, Hamedan, Iran

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INTRODUCTION

The domestic dog (Canis familiars) is generally considered the first domesticated mammal. Pet dogs are often considered to be faithful friends and intimate companions of humans and enjoy life together with humans (1).

Dogs are the definitive or reservoirs hosts of more than 60 zoonotic parasites, such as Taenia sp., Echinococcus sp. (hydatidosis), Diphylidium caninum, Toxocara canis (visceral larval migrants), Ancylostoma sp. (cutaneous larval migrants), Giardia sp., and Cryptosporidium sp. (2, 3). Their roles in transmitting human infections have been recognized worldwide (4).

Gastrointestinal (GI) parasites are one of the main enteropathogens and causes of mortality in dogs, especially in newly whelped or neonates (3, 5). The clinical signs of parasitic infection in dogs are varied, such as vomiting, diarrhea, anemia, anorexia, dermatitis, and loss of condition, and occasionally, some infected animals may present no symptoms (1, 6)

Environmental contamination by dog feces in urban and rural public spaces is considered a risk factor to public health, as dogs can be carriers of pathogenic agents transmissible to humans (7). Furthermore, a low level of hygienic conditions and lack of sufficient veterinary attention and zoonotic disease awareness compound the risk of transmission of these diseases to humans (2).

With the increasing number of pet dogs, mainly in Hamedan, there is more contact between dogs and people, exposing humans to zoonotic GI parasites. The transmission of these parasites could be by direct contact with the dog and indirectly with dog excretions and secretions and contaminated food and water.

Many studies have been conducted to assess the situation of GI parasites in dogs worldwide, such as in Iran. The first report presenting studies was published on GI parasites in dogs (stray dogs and jackals) in Iran in 1969 (8). There is little information regarding the occurrence of GI parasitic infection in pet dogs in different regions of Iran (9-12). Current information on regional prevalence rates is essential for the development and modification of control measures in animal and public health.

The main objective of current investigation was to determine the prevalence of zoonotic GI parasites in pet dogs in Hamedan, Western Iran.

METHODS

Study Area

Hamedan province, a mountainous and mild climate, is located in the west part of Iran (34.77°N and 48.58°E) (Figure 1). The mean annual rainfall and temperature is 317.7 mm and 11.3°C, respectively. This region is economically impressed by agricultural and animal husbandry. The pet dog population in this region is approximately 1000.

Sample Collection

From April to December 2010, in a cross-sectional study, 210 stool samples (male=122, female=88) were collected randomly in pet dogs without clinical signs in Hamedan. The samples were collected per rectally with the gloves on hands and kept in a disposable plastic sampling dish. The animals were categorized into two age groups (≤6 months old=57 and >6 months old=153). The samples were fixed as quickly as possible in 10% formalin neutral buffered solution until the examination.

Sample Examination

Samples were examined grossly for adult parasites, which were removed and placed in a labeled Petri dish. All samples concentrated by formalin-ether technique. Fecal smears were stained by modified Ziehl-Neelsen method and examined for *Cryptosporidium* oocysts (13). Smears of the feces were prepared and stained with trichrome and iodine stains to detect cysts or trophozoites of *Giardia* and *Entamoaba*. Also, fecal samples were examined using flotation techniques in saturated sodium chloride solution, 33% zinc sulphate and sucrose (12, 13).

Identification of characteristic parasites was made according to the morphological characteristics and key, as outlined by Soulsby (14).

Statistical analysis

An analysis of chi-square (X^2) and Fisher's exact test with 95% confidence interval (CI) was carried out by SPSS version 16.0 for windows (SPSS Inc., Chicago, IL, USA). A *p*-value of less than 0.05 was considered statistically significant.

RESULTS

During coproscopy, the overall proportion of GI parasitic infection was found in 6.7% (14/210) of samples (5<CI 95%<8.4) (Table 1). The detected parasites with their frequencies were *Cryptosporidium* spp. (3.8%), *Toxocara canis* (1.9%), and *Giardia* spp. (0.95%). The overall infection rate in male animals (7.4%) was higher than females (5.7%); also, this rate was reported as 5.3% in ≤6 and 7.2% in >6 months old. No significant difference was observed between infection rates in different age groups) X^2=0.247, p=0.617, DF=1) or between gender (X^2=0.236, p=0.627, DF=1).

In a separate assessment of different parasite infection rates, there was no statistical differences (p>0.05) in age groups and genders, except age groups in *Toxocara canis* (X^2=4.722, p=0.029, DF=1, odds ratio=1.4). The detailed information of different parasitic infections is summarized in Table 1.

DISSCUSION

The prevalence of GI parasites can vary widely, based in part on methodology, location, and the population studied (13). The GI parasitic infection rate of dogs has been found to range from 16.5% (Canada) to 90% (Sri Lanka) worldwide (3, 15). In previous investigations in Iran, this rate was reported as 14.1% and 87% in Northeast, 16% in Southeast, 21.3% and 80% in Central, 34.4%

Table 1. Gastrointestinal (GI) parasitic infection in different age and gender groups of pet dogs in Hamedan, Iran

NP - p%	*Giardia* spp	*Cryptosporidium* spp	*Toxocara canis*	Overall
Gender				
Male	2-1.6	5-4.1	2-1.6	9-7.4
Female	0	3-3.4	2-2.3	5-5.7
p-value	0.227	0.796	0.74	0.627
Age groups (months)				
≤6	0	0	3-5.3	3-5.3
>6	2-1.3	8-5.2	1-0.65	11-7.2
p-value	0.385	0.078	0.029	0.618
Total	2-0.95	8-3.8	4-1.9	14-6.7
CI	0.3-1.6	2.5-5.1	1-2.8	5-8.4

NP: number of positive; CI: confidence interval

and 41% in Northwest, and 90% in the North of Iran (9-11, 16-19). In our work, the detected parasites were *Cryptosporidium* spp. (3.8%), *Toxocara canis* (1.9%), and *Giardia* spp. (0.95%). Our overall infection rate (6.7%) is lower than other researchers, due to the status of animal ownership and anthelmintic usage. Also, most previous studies were done in stray dogs that have no health control measure.

There was no significant difference in the overall prevalence between males (7.4%) and females (5.7%) (Table 1). A similar finding was reported by Gholami et al. (18), Razmi (16), Mirzaei and Fooladi (12), Awoke et al. (1), and Perera et al. (3).

In this study, the general prevalence of GI parasites was higher in pups ≤6 months old than in >6 months old (Table 1, no significant difference: p=0.618), agreeing with studies in the Northeast of Iran (16) and Northwest of Iran (10). This finding was unlike studies by Rodriguez-Vivas et al. (20) in Mexico and Lorenzini et al. (21) in Brazil. This could be attributed to exposure of the dogs to sources of infection, like water and lack of proper sanitation, and possibly because immunity against GI infection decreases as age increases due to acquired immunity. Mirzaei and Fooladi (22) suggest that in the case of the GI parasites found, specific immunity in dogs would develop with age, probably as a consequence of one or more exposures.

The high prevalence could also be due to high stocking density, as observed with some of the dogs sampled. This prevents proper cleaning and disinfection of kennels, leading to horizontal spread of infections with protozoan parasites.

Several studies have shown that Toxocara canis is prevalent among stray dogs, household dogs, and sheep dogs and wild carnivores of Iran (17). The prevalence of Toxocara canis was 1.9%. Our finding is less as compared to reports from the North of Iran (60%), Northeast of Iran (39%), Northwest of Iran (9.7%), Central Iran (6.5%), Spain (17.7%), China (36.5% and 45.2%), Ethiopia (32.8%), Canada (4.2%), Mexico (6.2%), and Sri Lanka (27.8%) (3-6, 9, 10, 15, 18, 20, 23). Consequently, few case reports exist on human visceral larva migrans (VLM) induced by T. canis in Iran (24).

This variation may be due to differences in management systems, health care, and degree of environmental contamination, with infective stages and exposition to natural infection more than owned dogs. Studies reveal that dogs that are well cared for by their owners and given veterinary attention have a lower incidence of intestinal helminthes than dogs lacking such privileges (1). Thus, intestinal nematodes were less prevalent due to the fact that the animals examined were kept in house with hygienic compounds.

The present study revealed that the prevalence of *T. canis* was higher in those ≤6 months old (5.3%) than >6 months old (0.65%) (Table 1, p=0.029), similar to investigations in Canada, Ethiopia, and North and Northeast of Iran (6, 15, 18, 23). Pups are at higher risk of infection due to transplacental and transmammary transmission, and parasite-specific immunity is usually acquired with age, probably as a consequence of single or repeated exposures (23).

There was no statistical difference between *T. canis* infection and gender (Table 1, p=0.74), similar to the Getahun and Addis (6) study in Ethiopia. Some studies reported that T. canis infections are more common and higher in male dogs; hormonal factors and sex-associated behaviors, such as roaming, are the factors potentially involved (10, 12).

In our study, the prevalence rate of Giardia infection (0.95%) was less than other previously reported rates in the Northeast of Iran (1.1%), in Tehran, Central Iran (1.63%), in Sri Lanka (2.2%), in the Northwest of Iran (2.9%), in Kerman, Central Iran (7.1%), in Canada (8%), and China (11%) (3, 4, 9, 10, 15, 16).

The high prevalence may be due to climate conditions, the fact that Giardia can colonize a niche previously occupied by parasites, such T. canis, and that most of the anthelmintics do not interfere in the development of Giardia (13).

Our results are approximately similar to the Martinez-Moreno et al. (5) study in Spain (1%). Intermittent shedding of Giardia cysts may also confound effective identification and may have been a factor in the current study. The clinical significance of Giardia appears minimal, as most dog infections are asymptomatic (13).

Figure 1. Map of Iran and location of Hamedan province

No statistical bias for Giardia infection due to gender and age groups was seen in the present work. This confirms the findings of Tavassoli et al. (10) and Mirzaei (25).

In our study, *Cryptosporidium* spp. infection was 3.8% (Table 1); this is similar to research in Central Iran (4%) and Nigeria (4.3) (25, 26). Epidemiological studies on the prevalence of *Cryptosporidium* in dogs showed that the infection rates are variable according to geographic area and range from 1.4% in the Czech Republic (27), 1.6% in Tehran, Central Iran (9), 2% in California (28), 2.41% in Brazil (29), and 2.9% in Northwest Iran (10). The likelihood of finding a source of the oocyst could explain the differences in prevalence between different areas. Other researchers suggested that the prevalence may be highest in dogs from rural environments, since Cryptosporidiosis is primarily associated with farm livestock (13).

In this work, there were no statistical differences ($p>0.05$) in Cryptosporidium infection, gender, and age groups (Table 1), similar to studies in Central and Northwest Iran (10, 25).

The detection of parasites, such as Giardia and Cryptosporidium, can be difficult using conventional microscopy, requiring sensitive methods, such as PCR (16).

CONCLUSION

This is the first report of GI parasites in dogs from Western Iran. Although the rate of infection is low, the results showed that pet dogs are reservoirs for zoonotic GI parasites and should be considered important to public health in this region. A combination of routinely screening fecal samples for parasites, strategic anthelmintic regimens, and improved pet owner education is highly recommended for the control of GI parasites in pet dogs.

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