



## Research Paper

# Prevalence of Intestinal Parasites and Risk Perception of Zoonotic Infection for Humans

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## ABSTRACT

The present study consisted of two parts on various related aspects from Karachi during 2013. The results for the first part of study indicated that, the overall prevalence of gastrointestinal parasites was 86.00%, the GI parasitic species identified were hook worm, tape worm, round worm and *Giardia protozoa*. The results of the second part of the study included the survey, in which 15 veterinary practitioners were asked about the significant parasite in their practice area. Out of 15 veterinarian surveyed, the *Toxocara canis* was considered as a significant problem by 01 veterinarian; Hook worm (*A. caninum*) by 5 veterinarians, *Echinococcus granulosus*, *Dipylidium caninum* and *Trichuris vulpis* by 5 veterinarians each, *Taenia or Spirometra* by 3 and *Giardia* spp. by 09 veterinarians, who mentioned these as significant problems. In case of zoonotic awareness of dog owners, the zoonoses can be contracted from contact with soil, lawn or plants. The antiparasitic history indicated that 81.20% of the dog owners have received antiparasitic drugs in the previous 12 months; while 34% solely rely on pyrantel for activity against nematodes similarly, 54% administered at three-monthly intervals. It was concluded that a high rate of prevalence of gastrointestinal parasites in dogs from different areas found that there were transmission of these gastrointestinal parasites to humans through the feces of the infected dogs in puppies was alarmingly high than adult dogs.

**Keywords:** *Toxocara canis*, *Echinococcus granulosus*, *Trichuris vulpis*, *Giardia protozoa*, Dogs.

## INTRODUCTION

The domestic dogs and *Canis* are familiar and generally considered as the first domesticated mammals that have coexisted with man as a working partner and house pet in all areas and culture since the days of the cave dwellers and are the most successful canids adapted to human habilitation worldwide (Birchard and Sherding, 2006). They

have contributed to physical, social and emotional well being of their owners, particularly to children. In spite of the beneficial effects, close bonds of dogs and humans remained a major threat to public health, with dog harboring a bewildering number of infective stages of parasites transmissible to man and other domestic animals. However, dogs like many canines have been reported to harbor a variety of intestinal parasites, some of which can also infect livestock, wildlife and humans. Dogs are affected at some stage in their life (Foryet, 2001) a heavy infection in malnourished dogs caused anemia and

protein loss (Coati *et al.*, 2003). Ascarids, *Toxocara canis* and Hook worms, *Ancylostoma* species are common intestinal parasites of dogs. These two were mostly diagnosed in puppies because of the occurrences of both transplacental and transmammary transmission of *T. canis*. Puppies are usually born with or acquire ascarid infection early in their life (Taylor, 2007). The clinical signs of parasitic infection in dogs are varied and occasionally some infected animals.

Zoonotic disease such as; visceral and ocular larval migrans caused by *T. canis* and cutaneous larval migrans caused by *Ancylostoma braziliense* are some intestinal helminth infections in dogs (Urquhart *et al.*, 1996; Thamasorn, 2006; Jittapalapong, 2007). The temperature and humidity also determine the distribution and survival of eggs, helminthic larvae and cysts (Zelon, 2003). The development of the parasite larvae in the soil and their transmission to people need conditions such as; moderate temperature, a high percentage of humidity, certain chemical and biological conditions (Komatangi, 2005; Abbasi *et al.*, 2013). More than, 60 zoonotic diseases are also associated with dogs, among which helminthosis in particular is concerned with serious public health problems around the globe. Many canine gastrointestinal parasites eliminate their dispersion elements such as; eggs, larvae and oocysts through faeces. Especially in pups the hookworms, if present with *Ascardia* may cause death resulting from serious blood loss due to its blood sucking activity and acute gastrointestinal hemorrhages. These parasites cause diseases in their respective hosts, but also causes migrans syndrome in humans especially in children. The aim of this study is to record the prevalence of dog's intestinal parasites, with particular parasitic species including both helminthes and protozoans in pet dogs of different areas of Defence Karachi- Pakistan. Further, the knowledge gathered would be helpful for the new scientists of the world.

## MATERIALS AND METHODS

The present study was conducted on dog population by surveying the different area of Defence, Karachi during, 2013, total of 50 housed dogs of mixed gender were selected randomly. Each study area was sampled once for fecal sample collection. The animals divided into two groups containing adults and puppies, each having 25 animals. Each sample was collected from rectum of the dogs consisting of approximately 5 gms of fresh stool. The fecal sample examination was carried out within 48 hours of sampling. These samples were classified as positive even if one egg was observed and marked as negative if neither egg nor larvae was found. The clinical observations in all the animals were recorded having general symptoms like pale conjunctiva, pot bellied appearance, anemia, skin lesions and diarrhea.

**Fecal Floatation test:** One gram of fecal sample was added with 10 ml of sodium nitrate floatation fluid and

mixed well by shaking. Then the sample was transferred to 10 ml test tube, the cover slip was placed on the top of the test tube. Sample was left for 30 minutes to leave the eggs to float and attach to cover slip and allow the debris to settle down. After 30 minutes, the wet side of cover slip was placed down on glass slide and examined under microscope for presence of eggs or larvae if any.

**Questionnaire design and implementation:** A questionnaire, targeting pet owners was composed for this study and aimed at collecting information on pet management practices and owner awareness of zoonoses. The dog questionnaire used in this study was to focus on collecting information on gastrointestinal parasites. The questionnaire for pet owners were used to obtain information on demographic data such as; frequency of contact with other dogs, frequency and methods of anthelmintic use, frequency of exposure to faecal material, consumption of raw and uncooked meat and predation of other animals by his/her pet. The questionnaire for veterinarians was designed to collect the information about the perceived risk of parasitic infection in the animals visiting the clinic and the anthelmintic treatment. It also included regimes recommended to the client for the control of gastrointestinal parasites and the information provided by veterinarians to their clients about these parasites. A data sheet was also provided to each refuge so that, the following information could be collected for every animal sampled as; age, breed, gender, neutring status, anthelmintics administration. In case of antiparasitics usage, the duration between treatments and the period of time during which the dog had been at the refuge.

**Preservation and transportation of fecal samples:** Due to the prolonged time lapse between collection of the faeces and processing, it was necessary to preserve the samples. Samples were preserved in two different solutions that is, 10% formalin for microscopic analysis and 20% Dimethyl Sulphoxide (DMSO) in saturated salt solution. The decision to use 20% DMSO for preservation over ethanol or potassium dichromate solution was made in consideration of the transporting constraints with regard as ethanol being a fire hazard and the health risk associated with handling potassium dichromate. Finally, the collected data were analysed, tabulated and presented in results.

## RESULTS

The data indicated that the prevalence of hook worm was recorded at high rate that is, 4 (26.7%) in main Defence and Phase II, followed by Cantt and Phase I, where it was identified from 3 (20.0%) fecal samples. However, in samples from KDA, only 1 (6.7%) was found infected with hook worm (Table 1). The overall five samples were recorded to be infect with tapeworm, out of which 2 (40.0%) were recorded from both main Defence and KDA and 1 (20%) was identified from samples collected from

**Table 1.** Gastrointestinal parasites (%) identified in the fecal samples of dog at different areas of Karachi during, 2013.

Parasite	Cantt	Main Defence	Phase-1	Phase-2	KDA	No. of positive samples	Overall %
Hook worm	3(20.00)	4(26.70)	3(20.00)	4(26.70)	1(6.70)	15(34.89)	30.00
Tape worm	1(20.00)	2(40.00)	0(0.00)	0(0.00)	2(40.00)	05(11.63)	10.00
Round worm	1(33.30)	1(33.30)	0(0.00)	0(0.00)	1(33.30)	03(6.98)	6.00
Giardia spp.	1(33.30)	0(0.00)	1(33.30)	0(0.00)	1(33.30)	03(6.98)	6.00
Multiple species	7(41.18)	3(17.65)	2(11.76)	2(11.76)	3(17.65)	17(39.52)	34.00
Overall 50	13	10	6	6	8	43 (100.00)	86.00

Cantt whereas, the samples from Phase I and Phase II did not show any presence of tapeworm. The roundworm was recorded 3 (6.98%) out of 50 samples collected. It was identified in 1 (33.3%) sample from Cantt, main defence and KDA. Whereas, the samples collected from Phase I and II were observed free from it. The same was recorded with *Giardia spp.*, which was recorded in 3 (6.98%), and it was identified from the samples collected from Cantt. Phase I and KDA with the prevalence of 1(33.3%) from each area whereas, from main Defence and Phase II, the samples were found negative for the presence of above mentioned protozoan.

The presence of multiple species having no zoonotic importance was recorded higher i.e., 17 (39.52%) out of 50 samples examined for presence of GIT parasites. These species were recorded higher in samples collected from Cant: i.e., 7 (41.18%), followed by main Defence and KDA. These were recorded from 3 (17.65%) samples from both areas and Phase-I and II, with the incidence of 2 (11.76%) from each area. By using some appropriate tests of the fecal samples for isolation and identification of gastrointestinal parasites, the parasitic species were identified and the data (Table 4) showed that the species identified from the 50 fecal samples of dogs in the different areas of Defence Karachi included hook worm, tape worm, round worm and *Giardia*.

Out of total 50 fecal samples, 15 (30%) samples were found to be infected with hook worm; while, tape worm was detected in 5 (10%) samples, the round worm were isolated in 3 (6%) samples and the *Giardia* was identified in 3 (6%) fecal samples. However, out of 50 fecal samples examined, 17 (34%) were found to be infected with multiple species of the gastrointestinal parasites which were not involved in the zoonosis.

#### Veterinarian's considerations on GIT parasites prevalence in dogs

This survey was carried out using the Veterinary Practitioners as the respondents to know their perceptions regarding severity of the problem caused by the gastrointestinal parasites in dogs. Out of 15 veterinary practitioners, majority (08) veterinarians perceived that *T.*

*canis* was not a problem in the dogs of their respective areas, 05 indicated a slight problem, whereas; 01 indicated significant problem. Similarly, *A. caninum* was recorded as having a significant problem indicated by 06 Veterinary practitioners out of 15, 01 stated as a slight problem and 07 indicated not a problem. The Veterinarians were also asked to perceive regarding the severity of the problems caused by *Echinococcus granulosus* in dogs and 06 out of 15 disclosed it as not a problem, 05 stated as a slight problem, whereas; 05 considered it as a significant problem; while *Dipylidium caninum* was considered as the significant problem by 05 veterinarians out of 15, 04 considered not a problem and 05 considered as a slight problem. Similarly, *Taenia spirimetra* was recorded as causing significant problem by 08 veterinarians, 07 stated it as a slight problem and 03 disclosed it as not a problem in the dogs of their respective area. *Trichuris vulpis* was recorded to cause a significant problem in dogs, 01 veterinarian stated it as a slight problem; while 07 mentioned that *T. vulpis* was not a problem in dogs of the respective area. Likewise, *Giardia spp.* was a significant problem considered by 02 veterinarians, 02 showed as slight problem; while 09 stated it as no problem as GIT parasite in dogs (Table 2). However, *Cryptosporidium spp.* was considered as a slight problem by 02 respondent veterinarians out of 15; while 05 considered as no problem and 08 disclosed that they are unaware of such problem. *Dipylidium caninum* was considered as the significant parasitic problem in dogs by most of the veterinarians, followed by *T. canis*, *Giardia spp.*, hookworm, *Echinococcus granulosus* and *T. vulpis*.

#### Potential zoonotic hazards with veterinary clients for various parasite species

Frequency with which the veterinarians surveyed on the potential zoonotic hazards with veterinary clients was discussed and the data (Table 3) indicated that 4, 8, 2 and 1 veterinarians treated dogs only when they were asked for round worm, hook worm, tape worm and protozoa; while 3, 2, 9 and 1 veterinarians treated round worm, hook worm, tape worm and protozoa. Whenever, worms were diagnosed in client's pets, respectively. Similarly, 8, 4, 2

**Table 2.** GIT parasites in pet dogs observed by veterinarians in their practice area.

Parasite	Not a problem	A slight problem	A significant problem	Don't know
<i>Toxocara canis</i>	08	05	01	01
Hookworm ( <i>A. caninum</i> )	06	01	07	01
<i>Echinococcus granulosus</i>	06	05	05	0
<i>Dipylidium caninum</i>	05	04	05	01
<i>Taenia or Spirometra</i>	08	03	03	01
<i>Trichuris vulpis</i>	01	07	05	02
<i>Giardia</i> spp.	02	02	09	02
<i>Cryptosporidium</i> spp.	02	05	0	08

**Table 3.** Frequency with which the veterinarians surveyed discussed the potential zoonotic hazards with their clients of the following parasites.

Particulars	Round worm	Hookworm	Tapeworm	Protozoa
Only when asked	4	8	2	1
Whenever worms are diagnosed in clients pets	3	9	2	1
Routinely with new clients	8	4	2	1
Routinely with clients with puppies	9	3	2	1
Routinely with clients known to have children	9	3	2	1
Routinely with all clients	6	2	4	3

and 01 veterinarians out of 46 treated routinely with new clients for round worm, hook worm, tape worm and protozoa; while 1, 3, 2 and 1 veterinarians out of 46 routinely treated the puppies of their clients for round worm, hook worm, tape worm and protozoa, respectively. Likewise, 9, 3, 2 and 1 veterinarians out of 15 treated routinely. While 6, 2, 4 and 3 veterinarians out of 15 routinely treated for round worm, hook worm, tape worm and protozoa, respectively.

### Antiparasitic history

The dog owners were also enquired for antiparasitic history in the study area and the data (Table 4) indicated that 81.20% of the dog owners perceived that their dogs have received antiparasitic drugs in the previous 12 months; while 34% of the dog owners stated that their dogs were administered antiparasitic which solely rely on pyrantel for activity against nematodes. Similarly, 54% of dog owners were of the view that the antiparasitic has been administered at three-monthly intervals. The data further showed that 9.30% of the dog owners have reported drug administration to their dogs monthly which is effective against both intestinal and heart worms.

### DISCUSSION

This study was conducted in different areas of Defence of

Karachi, including Cantt, Main defence, Phase-I, II and KDA. Total 50 samples were collected, 10 from each area. The data showed higher prevalence of GIT parasites in Phase-I, II and KDA 9 (90%) out of 10, whereas from Cantt and Main defence, 8 (80%) samples were recorded positive out of 10 samples. The prevalence is high due to the high humidity in these areas, as the larvae shed by the dogs in feces can get access to the humid soil. Soil-transmitted helminths (STHs) form one of the most important groups of infectious agents and are the cause of serious global health problems. Claerebout *et al.*, (2009) stated that the *Giardia* and other intestinal parasites in different dog populations in Northern Belgium. These findings support present study in which the overall prevalence is recorded higher. The sex wise prevalence of intestinal parasite revealed high rate in male 23 (92%) as compared to female 20 (80%) dogs. Daniel, (2006) conducted the study on prevalence of intestinal parasites in dogs and cats, and recorded the high percentage of male dogs (53%) as compared to female (45%) dogs, infected with intestinal parasites. The results regarding male and female ratio infected with intestinal parasites are in accordance with Daniel, (2006). The overall prevalence of gastrointestinal parasite in Defence-Karachi among dog specie wise found was high. Hookworm (*Ancylostoma*) was higher (15) then tapeworm (5) and roundworm and *giardia* were found to have same frequency (3), with the overall percentage of 30, 10 and 6, respectively. However, the multiple species were recorded higher than all of above

helminthes that is, 17, with 34%. Similar findings were observed by Andresiuk *et al.*, (2007) who found seasonal fluctuations in prevalence of dog intestinal parasites in public squares of Mar del Plata city, Argentina and its risk for humans. The difference in the prevalence between our study and above mentioned study could be attributed to geographical areas health care and animal management practice followed. Further, our study is well supported and in agreement with other scientists of the world such as; Enedina *et al.*, (2010) observed the frequency of intestinal parasites in puppies from Mexican Kennels. Ferreira *et al.*, (2011) worked over intestinal parasites in dogs and cats from the districts of Évora, Portugal. Fok *et al.*, (2011) evaluated the epidemiology; prevalence of intestinal epidemic parasites in dogs in some urban and rural areas of Hungary and Khante *et al.*, (2009) surveyed in Nagpur City who described about gastro intestinal parasites of non-descript dogs. Kimi *et al.*, (2011) reported from Japan. Mercedes *et al.*, (2009) also reported intestinal parasites from dogs and cats in Spain. Octavius *et al.*, (2011) reported from Southern Ethiopia. Riggio *et al.*, (2013) found same parasites from dogs and cats in Italy, Sabi *et al.*, (2013) from dogs in Denmark Sowermimo and Asaolu, (2008) from dogs in Nigeria. Uehlinger *et al.*, (2013) observed the potential of *Giardia duodenalis* and *Cryptosporidium* spp. from Canada.

In present study, the survey was conducted to know the possible risk factors associated with the presence of gastrointestinal parasites in dogs of area surveyed. The data showed that the hook worm was more common in animals having age of less than 6 months and those who were kept at refugee. In contrast, *T. canis* can cause infection in dogs at any age and also more common in male. *Trichuris* was common in the dogs older than 6 months. Whereas, the *Dipylidium caninum* was found common in the dogs infested with flea or lice. *Spirometra* was found higher in adult animals as well as in the dogs used for hunting, its infection was common in the areas near water sources. *Echinococcus* was also observed in adult male dogs, in those dogs which were not treated with Praziquantel (Anthelmintic), dogs fed with offal, and those used in hunting. *Giardia* was found common in dogs aged less than 6 months, in dogs purchased from pet shop, those dogs which were kept at breeding stations and multi housed animals. Katagiri and Oliveira-Sequeira (2008) conducted study on prevalence of dog intestinal parasites and risk perception of zoonotic infection by dog owners in Sao Paulo State of Brazil and reported the same risk factors as surveyed in present study. Higher parasite prevalence was recorded in younger animals due to their immature immune system. Whereas, factors associated with overcrowded conditions such as; breeding stations, refugees and multi animal households have been due to poor levels of care, unhygienic surroundings and contact with infected animals. Beirromvand *et al.*, (2013) observed the prevalence of zoonotic intestinal parasites in domestic and stray dogs in a rural area of Iran. Cardoso *et al.*, (2013) observed the occurrence of zoonotic parasites in

rural dog populations from northern Portugal. This survey showed the high risk in male dogs, this could be due to sex associated hormones, which influence the immune system.

As awareness about the specific parasites 71.30 % of the dog owners were aware of the *Toxocara*, while 55.60, 24.60 and 74.90 % were aware of hookworm, *Dipylidium caninum* and *Echinococcus granulosus*, respectively. Moreover, 16.70, 50.20 and 25.80% dog owners were aware of *Trichuris vulpis*, *Giardia* spp. and *Cryptosporidium* spp., respectively. Beirromvand *et al.*, (2013) found GI parasites in 51 out of the 77 (66%) dogs, most common being *Toxascaris leonina* (29%, 22/77), *Toxocara* spp. (25%, 19/77), *Eimeria* spp. (19%, 15/77), *Taenia / Echinococcus* spp. (18%, 14/77), *Sarcocystis* spp. (17%, 13/77), and *Dicrocoelium dendriticum* (14%, 11/77). Lower infection rates of parasites were observed for *Trichuris vulpis* (6%, 5/77), *Cryptosporidium* spp. (5%, 4/77) and *Physaloptera* spp. (3%, 2/77). Prevalence of infection by *Dipylidium caninum*, *Capillaria* spp., *Cystoisospora* spp., and hookworms was similar (1%, 1/77). Cardoso *et al.*, (2013) reported that the overall parasite prevalence in faecal samples of dogs was 58.8%, with specific prevalence for *Ancylostomidae* being 40.9% followed by species of *Trichuris* (29.9%), *Toxocara* (8%), *Isospora* (4%), *Capillaria* (0.7%) and *Spirometra* (0.3%). Kimura *et al.*, (2013) suggested that dogs have close contact to other dogs remain important infection reservoirs of zoonotic parasites in Osaka prefecture. Therefore, control of contact with stray dogs is crucial for reducing the risk of public health problems due to parasitic infections Pam *et al.*, (2013). In case of antiparasitic administration history, 81.20% of the dog owners perceived that their dogs have received drug in the previous 12 months; 34% stated administered against nematodes; 54% dog owners were of the view that the Antiparasitic drug were administered to their dogs at three-monthly intervals; 9.30% reported administration to their dogs monthly which is effective against both intestinal worms and heart worm. This indicated that the situation regarding the gastrointestinal parasites in dogs at the different areas of Defence Karachi was very critical and from the feces lying around the areas, the human health was found to be at risk due to parasitic transmission through feces.

## CONCLUSIONS

A high rate of prevalence of gastrointestinal parasites in housed dogs in the different areas of Defence, Karachi was recorded which can be due to improper or inadequate deworming. The rate of prevalence of gastrointestinal parasites in puppies was alarmingly high; while in adult dogs the rate of prevalence of gastrointestinal parasites was low, which is due to the weak or immature immune system of puppies. The species identified from the fecal samples of dogs in the different areas of defence Karachi were hook worm, tape worm, round worm and *Giardia*

*protozoa*. These are the main parasitic species recorded throughout the world, as well in Pakistan. The situation regarding the gastrointestinal parasites in dogs at the different areas is alarming and from the feces lying around these areas, the human health is at risk due to parasitic transmission through feces.

From the present findings of the study, these suggestions could be drawn such as;  
Routinely deworming of puppies and adult house dogs should be performed.

Contact of stray dogs with housed dogs should be minimized to eliminate the transmission of GIT and other protozoan's parasites.

Extension programs, seminars, trainings, workshops will be held to give awareness to the pet owners regarding transmission and deworming of GIT and other protozoan parasites.

Health and Hygeinic precaution should be followed.

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