American-Eurasian Journal of Scientific Research 10 (5): 299-306, 2015
ISSN 1818-6785

DOI: 10.5829/idosi.aejsr.2015.10.5.95311

Cat and Dog Gastrointestinal Helminth and Assessment of Community Perception on Helminthic Zoonosis in Haramaya Town, Eastern Ethiopia

[1]Nateneal Tamerat, [2]Dereje Abera, [2]Raju Teha, [1]Yitagele Terefe and [1]Fethu Lemma

[1]Haramaya University, College of Veterinary Medicine, Ethiopia
[2]Wollega University, College of Veterinary Medicine, Ethiopia

Abstract: Across sectional study was conducted from November 2014 to April 2015 in Haramaya town with the objective of estimating the prevalence of Gastero-intestinal (GI) helminthes parasite of pet dog and cat including assessment of owner's awareness level regarding pet parasite zoonotic risk. A total of 384 fresh fecal samples were collected for copromicroscopic examination after employing floatation technique. The overall prevalence of Gastero-intestinal(GI) helminthes was 83.1% in which 91% of dogs and 65.9% of cats were infected with at least one helminthic parasite. In both hosts *Ancylostoma* was the most prevalent parasite, specifically 70.5% indogs and 37.5% in cats followed by *Toxocara*with 30.3% in dogs and 32.5% in cats while *Physaloptera* (1.1%) and *Diplidiumcaninum* (1.7%) were the least prevalent parasites in dogs and cats, respectively. The overall prevalence of GIT helminthes was significantly (p<0.05) higher in dog species (OR=6.1) and young animals (OR=2.4) than the counter cat and adult age group. *Ancylostoma* parasite had significantly (p<0.05) higher prevalence in canine than felines (OR=4.1) and it also had a significantly (p<0.05) greater prevalent in young animals than adult (OR=1.6). *Toxocara* parasites had considerably (p<0.05) higher prevalence in female pets (OR=3.9) and young animal (OR=4) than the counter male and adult pet. The result of the questioner revealed that only small portion of the owners 15(10%) was aware of helminthic zoonosis from their pets. In conclusion, the prevalence of GIT helminthes in pet dog and cat was high in the study area while awareness level of pet owners proved to be low. Therefore, the necessary measures should be put in place to reduce and control the heavy parasitic infestation including management measures and strategic deworming along launching awareness creation schemes in the community.

Key words: Cat and Dog · GI Helminths · Awareness

INTRODUCTION

Pet animals like cats and dogs are frequently helpless victims of various pesky critters that worm their way into their gastrointestinal tract. Gastrointestinal helminthes of pets pose serious impact both on the hosts and human beings. It impede the successful rearing of pets and result in losses that are manifested by lowered resistance to infectious diseases, retarded growth, reduced work and feed efficiency and general ill [1, 2].

Close bonds of pets and humans in combination with inappropriate human practices and behavior remain a major threat to public health, with dog and cat harboring infective stages of parasites transmissible to man and other domestic animals [3, 4]. Dogs and cats are associated with more zoonotic disease among which parasite can pose serious public health concerns worldwide [4, 5] especially in rural areas where dogs and livestock are raised together [6] and in developing countries where many inhabitants live under poor sanitation conditions [7] and control of stray dogs is practically non existent [8].

The transmission of zoonotic agents could be through direct contact with the animal, through indirect contact with animal secretions and excretion and infected water and food [9]. Many pet gastrointestinal parasites eliminate their dispersion elements i.e egg or Larvae by the fecal routs [5]. Accordingly, different studies have demonstrated that the soil contamination of gardens and public grounds by infectious parasitic forms constitutes a significant zoonotic risk [10].

Despite tremendous efforts, parasitic infections continue to be a significant health and welfare issue in companion animals and public health. Additionally,

Corresponding Author: Nateneal Tamerat Beyene, Haramaya University, College of Veterinary Medicine, Ethiopia.
Tel: +251-9-11-34-00-94.

the number of eradicated parasites is insignificant and the perspectives for future eradications would most likely be overbalanced by the emergence or re-emergence of other parasites [11]. In Ethiopia, very little attention was given for parasites of pets and the works done so far on the prevalence of the different gastrointestinal parasites of pets in general and cats in particular are insignificant. Therefore, the objective of the present study was to estimate the prevalence of gastrointestinal helminthic parasites of pets along the associated host related risk factor and to assess awareness level of owners' regarding zoonotic risk of GI helminthes parasite.

MATERIALS AND METHODS

Study Area: The study was conducted in Haramaya town Eastern Hararghe zone of Oromia region, Southeastern Ethiopia, from November 2014 to April 2015. The area is located 508 km east of the capital Addis Ababa. Topographically, it is situated at an altitude of 1600 to 2100 m above sea level with the mean annual temperature and relative humidity of 18°C and 65%, respectively. The area receives an average annual rain fall of approximately 900 mm, with a bimodal distribution pattern, picking in mid-April and mid-August [12].

Study Animals: The study animals were pet dogs and cats of both sexes that are reared in the study area. Dogs and cats up to one year of age were classified as young and those above one year of age were referred to as adults.

Sampling Method and Sample Size Determination: The pet animals were selected randomly to collect the fecal sample in the study area. Since there was no record of previous prevalence in the study area, the sample size was determined by taking 50% expected prevalence using the formula described by Thrusfield [13]. Accordingly, a sample size of 384 pet animals was considered for the study.

Study Design: A cross sectional study design was used to estimate the prevalence GI helminthes parasite of pet dogs and cats along with assessing the level of owners' awareness about zoonotic risk of GI helminthes affecting their pet during the study period.

Sample Collection: Fecal samples were collected with the permission and assistance of the owners. A total of 384 fecal samples (264 dogsand 120 cats) were collected during the entire period of the study, either directly from the rectum of selected animals or immediately after voided from target animal using a gloved hand provided with formalin containing sample collection vial. The samples were initially examined macroscopically for adult worms and proglottids and placed in air and water tight sample collection vials. Extra care was taken to avoid contamination with soil which might harm existing or introducing free-living organism from the environment. During sampling, data with regard to species, age, sex and date of sample collection was recorded for each animal that were sampled. Then the samples were taken to the Veterinary parasitology laboratory of Haramaya University for examination of the fecal sample

Parasitological Procedure: All fecal samples were examined on the same day of sample collection. The presence of zoonotic helminthes infection were confirmed by centrifugal flotation techniques. Sheather sucrose solution was used as a flotation fluid and Identification of the eggs was made on the basis of their egg morphology using keys given by Soulsby [1]. After laboratory examination, the result was considered as positive when at least one parasite egg was observed.

Questionnaire Survey: Randomly selected 100 dog owners and 50 cat owners were considered for the questionnaire survey. The question naire was designed to extract information which was relevant to determine the respondent level of awareness regarding canine and feline parasite zoonosis and the related management issues.

Data Analysis: Data on individual animals were entered into MS-excel spread sheet program to create a database. Then the data was transferred to SPSS version 20 for further analysis. Descriptive statistical tools such as frequency tables and percentages were used to describe the data while prevalence of each parasite with in categories of the considered variables was compared using a Chi-Square test (χ^2) and results were considered as significant when $p<0.05$. Furthermore, Multivariate logistic regression was employed to determine the degree of association between prevalence and different categories of host related factors after checking co-linearity and univariate logistic regression.

RESULTS

In the present study the overall GIT parasites prevalence was 83.1%. Species wise, Dogs had an overall prevalence of 91% while cats had 65.9 % prevalence. Dog and cats were found to be infested by

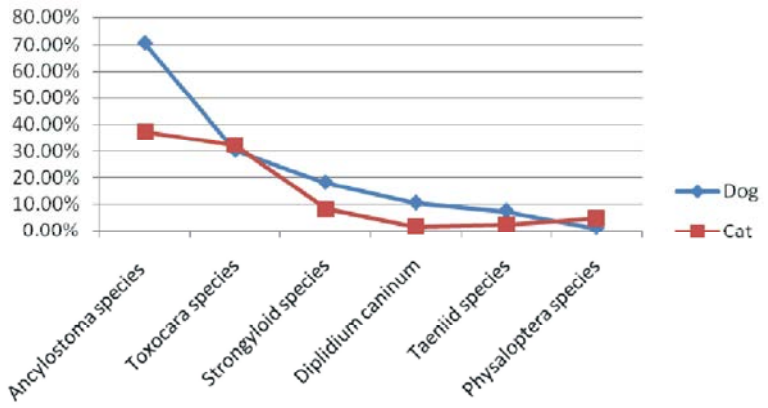

Fig. 1: Prevalence of each species of helminthes in cat and dog

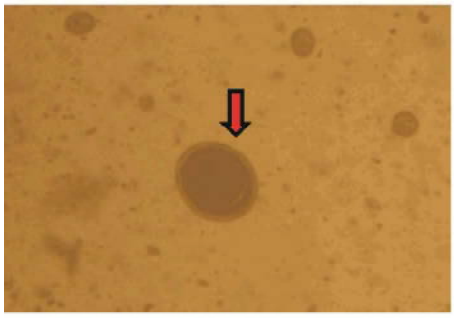

Fig 2a. Single *Toxocara* Ova

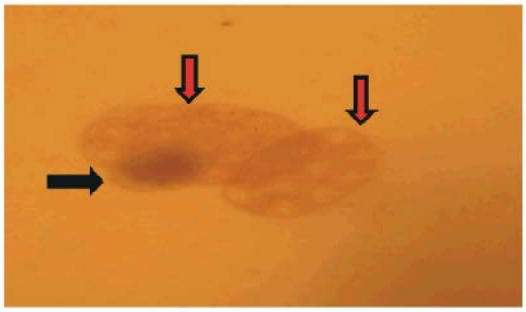

Fig 2b. Two Egg packets of *D.caninum* and one *Toxocara egg*

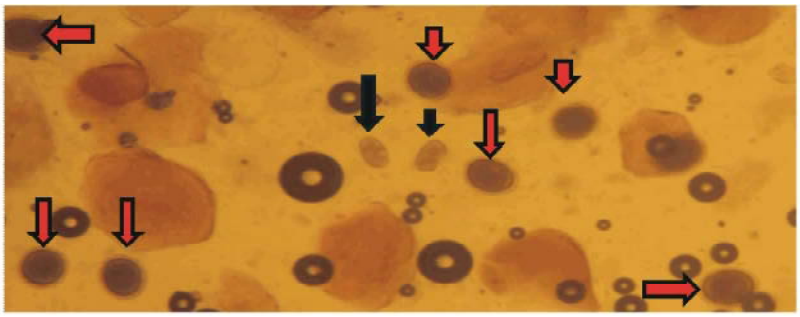

Fig 2c. Mixed Infestation of *Toxocara* (red arrow) and *Ancylostoma* Ova(black arrow)

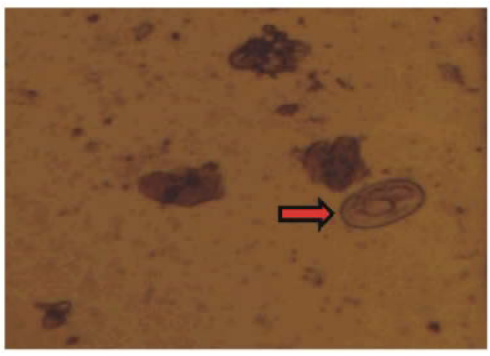

Fig 2d. Single *Physaloptera Ova*

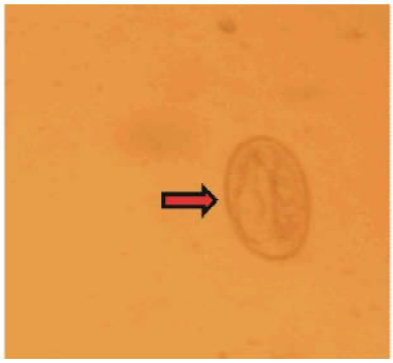

Fig 2e. Single *Strongloid* Ova

Fig. 2: Pictures of the identified helminthes parasite eggs from cats and dogs

single helminth parasites than multiple infestations (Table 1). *Ancylostoma* (fig 2c) was the dominant GIT parasites in both cat (37.5%) and dogs (70.5%) while *Physaloptera* (fig 2d) and *Diplidium* (fig 2b) were the least prevalent parasites with 1.1% and 1.7% prevalence in dogs and cat, respectively (Fig 1).

Regarding host related factors, Species and Age of the pet animal had significant (p<0.05) association with the prevalence of GIT helminthes prevalence. Dogs had significantly (p<0.05: OR=6.1) higher GIT parasite infestation than cats. Age wise, younger pet animals had significantly (p<0.05) higher (OR=2.4) parasite infestation than the adult one. On the other hands, sex of the animals had no considerable (p>0.05) relationship with the overall prevalence of GIT parasites (Table 2).

Overall, *Ancylostoma* and *Toxocara* (fig 2c) were the two most dominant helminthes parasite in pets animals with prevalence of 60.2 % and 31%, respectively. Whereas, *Taenia* and *Physaloptera* species were the least prevalence parasites with respective prevalence of 6% and 2.3%. Prevalence of all parasites genus had no significant (p>0.05) association with the sex of pet animals except *Toxocara* species (p=0.000). *Toxocara* (fig 2a), *Strongloid* (fig 2e) and *Taenia*s pecies had a significant (p<0.05) association with the age group of the animal in which their prevalence was higher in younger animal than the adult one (Table 3).

According to the present study, *Ancylostoma* parasite had significantly (p<0.05) higher prevalence in canine than felines (OR=4.1) and it also showed a considerable (p<0.05) association with the age of pet animals i.e highly prevalent in young animals than adult (OR=1.6) (Table 4). On the other hands, *Toxocara* parasites considerably (p<0.05) higher prevalence in female pets than male animal (OR=3.9). Additionally, *Toxocara* parasites had shown higher (p<0.05) prevalence in young animal than the adult one (OR=4) (Table 5).

The Questionnaire survey revealed that only 10% (n=15) of the owners were aware of helminthes parasitic zoonosis of pet dog and cat, while 53.3% (n= 80) of them knew zoonotic importance of Rabies and the rest 36.6% (n=55) of them were found to have no Information about zoonotic risk from pet. Out of 15 owners who were aware of parasitic zoonosis from pets, 60% (n=9) of them answered fecal contamination of food materials as the main mode of transmission while the remaining 40% (n=6) respondents answered direct contact with infected pet transmit the infection. Regarding means of disposal of their pet feces 20% (n=30) of the respondents were found to dispose it in toilet, 6.6% (n=10) dispose in a hole, 10% (n=15) dispose it in Garbage outside the compound and the remaining 63.3% (n=95) of the respondents do not dispose their pet feces. In an answer to the question whether they cook animal products they intended to feed their pets, none of them were found to practice this activity.

Table 1: Level of helminthes infestation in cat and dog

	Dog		Cat		
Level HelminthesInfestaion	no /264	Prevalence(%)	no/120	Prevalence (%)	Overall Prevalence
Single parasites	134	50.8%	53	44.2%	187(48.7%)
Two parasites	90	34.1%	26	21.7%	116(30.2%)
Three parasites	16	6.1%	-	-	16 (4.2%)
Total	240	91%	79	65.9%	319 (83.1%)

Table 2: Multi-variant logistic regression of risk factors for the prevalence of GIT parasites in pet animals.

Risk factors	Category level	Count in no (Prevalence)	Odds Ratio	p-value	Confidence Interval (95%)
Species	Cat	79 (65.9%)	-	-	-
	Dog	240 (91%)	6.144	0.000	3.385649 - 11.15297
Sex	Male	168 (82.4%)	-	-	-
	Female	151 (83.9%)	1.825219	0.051	.9966816 - 3.342515
Age	Adult	198 (80.2%)	-	-	-
	Young	121 (88.3%)	2.365058	0.011	1.220677 - 4.582293

Table 3: Prevalence of each species of helminthes along sex and age groups of pet animal

	Sex group			Age group			
Helminths Genus	Male/204	Female /180	*p*-value (χ^2)	Young/137	Adult/247	*p*-value (χ^2)	Over all prevalence
Ancylostoma	129(63.2%)	102(56.7%)	.190 (1.721[a])	91 (66.4%)	140(56.7%)	.062 (3.490[a])	231 (60.2%)
Toxocara	43 (21.1%)	76 (42.2%)	.000(19.990[a])	62(45.3%)	57 (23.1%)	.000 (20.269[a])	119 (31.0%)
Strongloid	35 (17.2%)	23(12.8%)	.232 (1.430[a])	10 (7.3%)	48 (19.4%)	.001 (10.118[a])	58 (15.1%)
Diplidium	15 (7.4%)	15 (8.3%)	.721 (.128[a])	9 (6.6%)	21 (8.5%)	.499 (.457[a])	30 (7.8%)
Taenia	10 (4.9%)	13 (7.2%)	.339 (.914[a])	1 (0.7%)	22 (8.9%)	.001 (10.464[a])	23 (6.0%)
Physaloptera	7 (3.4%)	2 (1.1%)	.134 (2.249[a])	3 (2.2%)	6 (2.4%)	.882 (.022[a])	9n (2.3%)

Table 4: Multi- variant logistic regression of risk factors for the *Ancylostoma* parasites in pet animals.

Risk factors	Category level	Count in no (Prevalence)	Odds Ratio	*p*-value	Confidence Interval (95%)
Species	Cat	45 (37.5%)	-	-	-
	Dog	186 (70.5%)	4.1	0.000	2.556923 - 6.480651
Sex	Female	102 (56.7%)	-	-	-
	Male	129 (63.2%)	1.002	0.994	.6418814 - 1.563463
Age	Adult	140 (56.7%)	-	-	-
	Young	91(66.4%)	1.62	0.044	1.0124859 - 2.5809216

Table 5: Multi- variant logistic regression of risk factors for the *Toxocara* parasites in pet animals.

Risk factors	Category level	Count in no (Prevalence)	Odds Ratio	*p*-value	Confidence Interval (95%)
Species	Dog	80 (30.3%)	-	-	-
	Cat	39 (32.5%)	1.12	0.646	0.6815899 1.854922
Sex	Male	43(21.1%)	-	-	-
	Female	76 (42.2%)	3.999	0.000	2.4036774 -6.6385281
Age	Adult	57(23.1%)	-	-	-
	Young	62 (45.3%)	4.01	0.000	2.4224049 - 6.6456663

DISCUSSION

The overall prevalence of GI helminthes found in this study was high (83.1%) (Table1). The prevalence of canines parasites (91%) was significantly ($p<0.05$; R=6.144) higher than feline parasites (65.9%) (Table 2). This finding is also shared by Joffe *et al*. [14] who reported intestinal parasites prevalence of 16.5% and 7.2% in dog and cat, respectively. This trend could be attributed to the fact that dogs were more outgoing than cats which may lead to high exposure to contamination in the study area. The Overall high prevalence of helminthes (83.1%) in the current study was in agreement with previous studies conducted in dogs in different parts of in Ethiopia including in Ambo by Zewdu *et al.* [15], in Hawassa by Dagmawi *et al.* [16] and Dejene *et al.* [17] and around Bahirdar by Zelalem and Mekonen[18] and Abere *et al*. [19] with prevalence level ranging from 78.1% to 86.8%.

Additionally, Comparable finding was also reported from studies in other country such as in Malaysia by Ngui *et al.* [20] with 88.3% and in Cameroon (88.5%) by Komatangi [21]. However, in the contrary to the present finding low prevalence rate was reported from studies conducted in Chile [22], Iran [23], Thailand [24] and Italy [25] with prevalence level ranging from 7.14-35.7%. In Ethiopia there was limitation of studies at investigation of cat helminthes parasite. However, various studies from other countries reported similar prevalence feline parasites to the current study (65.9%), which includes 65% from South Africa [26], 67.56% in Iran [27] and 67.12% in Brazil [28]. In contrasts to the above findings, lower prevalence of feline helminthes was reported from different parts of the world including by Yurong and Hongde [29] 41.39% in China, Gurler *et al.* [30] 32.1% in Turkey and Joffe *et al.* [14] 7.2% in Canada. The discrepancy of prevalence level among various studies could arise from difference in agro-ecological setting, management and awareness of

the owners and the health care practice along the respective study areas.

Age wise, younger pets were tend to be infested significantly ($p<0.05$, R=2.36) higher than adult pets (Table 2). This could be justified by the fact that the immune systems of young pets are not completely mature [8]. In addition, the larvae of this parasites remain in a state of latency in the muscular layer of female pets and during pregnancy larvae are reactivated and capable of infecting the fetus through trans-placental route and puppies or kitten via trans-mammary route whereas, adult pets may develop immunity which decrease the establishment as well as the fecundity of the of the parasites [31]. On the other hand, there was no significant ($p>0.05$) association between sex and prevalence of parasite except *Toxocara* parasites. Female pets were highly infested ($p<0.05$, OR=3.99) with *Toxocara* parasites than the male counter parts (Table 5). This finding could be explained by the fact that female had pregnancy stress and spend much more time with their young pet which may exacerbate re-infestation, since the young pets had proven to be more susceptible than adult pets.

In the current study, *Ancylostomma* hookworm was the most prevalent parasites with the overall prevalence of 60.2% (Table 3). Similarly, different researchers reported this parasite as the leading helminthes with prevalence of 78.89% [19], 54.5% [17], 53.8 % [32], 32.8% [18] and 32% [33]. In all mentioned studies, *Toxocara* parasite was also the second most common GI helminthes with respective prevalence of 39.79%, 38.8 %, 7.9 %, 26.6% and 21% in their respective studies according to order of appearance. This trend was also reflected in the current study by indicating *Toxocara* helminthes as the second most dominant parasite with over all prevalence of 31.0%.

Strongloid and *Diplidium* parasites were the third and fourth prevalent helminthes with respective prevalence of 15.1% and 7.8% in the current study (Table 3). However, previous studies from the other parts of the country reported higher prevalence of these two parasites, specifically, Dagmawi *et al.* [16], Dejene *et al.* [17], Zelalem and Mekonen [18] and Octavius *et al.* [34] reported respective prevalence of *Strongyloides stercoralis* and *Diplidium caninum* at 57.5%/39.9%, 30.6%/29.9%,21.6%/22.4%and46.1%/46.8%,respectively. On the other hands,*Taenia* (6.0%) and *Physaloptera* (2.3%) parasites were the least prevalent helminthes in the present study. Similarly, Uade *et al*. [35] from Nigeria reported 8.3% of *Taenidae* parasites in dog while Mohd *et al.* [36] from Malyasia indicated prevalence of 2% *Physaloptera* parasite in stray cats.

Questioner survey of the present study revealed that only small proportion of the owners 10% were aware of canine and feline parasite zoonos is effect while greater portion of the respondents (53,3%) did have an ample information about the zoonosis potential of Rabies. Likewise, Dagmawi *et al*. [16] reported 4.4% awareness regarding the presence of zoonotic pet parasites and much higher awareness in zoonotic importance of rabies 95.6%, while Dejene *et al.* [17] indicated 3 % and 96.96 % awareness among the respondent regarding zoonosis of canine GIT parasite and Rabies diseases, respectively. Similarly, Zewdu *et al.* [15] claim that there was no awareness about the zoonosis effect of canine parasite information among the respondents while 44.3% of respondents had awareness on zoonosis implication of Rabies. On the contrary, Zanzani *et al.* [25] from Northern Italy reported a relatively higher level of pet owner's awareness (49.19%) about parasite zoonosis of pets. This difference might be attributed to difference in accessing various sources for awareness including media, animal care service and public health sector. Overall, in addition to the low awareness level of the respondent most of the owners (63.3%) did not dispose feces of their pets, rather they left it on the ground which is an act that increases contamination level of environment and widen exposure risk of the public to canine and feline parasitic zoonosis diseases.

CONCLUSION

In conclusion, the present study indicated very high GIT helminthes infestation of pet animals in the study area. The study revealed that helminthic parasites were composed of parasites of major zoonotic importance such as *Toxocara* and Hook worm in addition to minor zoonotic significant parasites such as *Diplidium* and *Strongloides* species. Overall, the high prevalence of these parasites coupled with the very poor awareness level of the community increases the exposure of the society to zoonotic parasite helminthes of pets. Therefore, the appropriate control and prevention methods should be put in place in the area including periodic deworming pets and staging awareness creation event for the community.

REFERENCES

1. Soulsby, E.J.L., 1982. Helminthes, Arthropods and protozoa of Domesticated animals 7th edition, Baillie Tindal, London, pp: 809.

2. Foryet, J.W., 2001. Veterinary Parasitology: Reference Manual, 5th Edn., Blackwell, Inc. USA.
3. Hendrix, C.M., 2006. Diagnostic Veterinary Technicians. 3rd Edition., Mosby, Inc., USA.
4. Katagiri, S. and T.C.G. Oliveira-Sequeira, 2007. Prevalence of dogs' intestinal parasites and risk perception of zoonotic infection by dog owners in Sao Paulo State, Brazil.Zoonoses and Public Health, 55: 406-413.
5. Khante, G.S., L.A. Khan, A.M. Bodkhe, P.R. Suryawanshi, M.A. Majed, U.S. Suradkar and S.S. Gaikwad, 2009. Epidemiological survey of Gastro-intestinal parasites of Non-descript dogs in Nagpur city. Veterinary world, 2: 22-23.
6. Chrieki, M., 2002. Echinococcosis-an emerging parasite in the immigrant population. J. Am Fam Phy. New York, 66(5).
7. Andersen, F.L., 1997. Introduction to cystic echinococcosis and description of cooperative research project in Morocco. In: Compendium on echinococcosis in Africa and in Middle Eastern Countries with special reference to Morocco. Brigham Young Uni Print Services Provo Utah, pp: 1-17.
8. Oliveira-Sequiera, T.C., A.F. Amarane, T.B. Ferrari and L.C. Nunes, 2002. Prevalence of intestinal parasites in dogs from São Paulo State Brazil.Veterinary Parasitology, 103: 19-27.
9. Bugg, R.J., I.D. Robertson, A.D. Elliot and R.C.A. Thompson, 1999. Gastrointestinal parasites of urban dogs in Perth, Australia. Vet. J., 157: 295-301.
10. Habluetzel, A., G. Traldi, S. Ruggieri, A.R. Attili, P. Scuppa, R. Marchetti, G. Menghini and F. Esposito, 2003. An estimation of *Toxocaracanis* prevalence in dogs, environmental egg contamination and risk of human infection in the Marche region of Italy. Vet. Parasitol., 113: 243-252.
11. Hany, M., 2014. Parasites in cats and dogs: management and treatment. Available at http://www.vetsonline.com (Accessed: 23 November 2014).
12. HADB., 2010. Haramaya WoredaAgricultural Development Bureau,Haramaya District, Eastern Hararaghe Zone, Ethiopia.
13. Thrusfield, M., 2007. Veterinary Epidemiology. Blackwell Science Limited, USA, pp: 180-181, 224-225.
14. Joffe, D., V. Niekerk, F. Gagne, J. Gilleard, S. Kutz and R Lobingier, 2011. The prevalence of intestinal parasites in dogs and cats in Calgary, Alberta. Can Vet. J., 12(52): 1323-1328.
15. Zewdu, E., S. Yohannes, and M. Berhanu, 2010. Prevalence of helminthes parasites of dogs and owners awareness about zoonotic parasites in Ambo town, Central Ethiopia. Ethiop. Vet. J., 2010, 14(2): 17-30.
16. Dagmawi, P., A. Mekonnen, F. Abebe and M Berhanu, 2012. Prevalence of gastrointestinal helminthes among dogs and owners perception about zoonotic dog parasites in HawassaTown, Ethiopia. J. Public Health Epidemiol., 4(8): 205-209.
17. Dejene, G., G. Mesula, D. Efreim, A. Kassahun and M. Solomon, 2013. Gastrointestinal helminthes in dog and community perception on parasitic zoonoses at Hawassa city, Ethiopia. Glob. Vet., 11(4): 432-440.
18. Zelalem, G. and A. Mekonnen, 2012. Prevalence of Gastrointestinal Helminthes among Dogs in Bahir Dar Town, Ethiopia.World Applied Scis. J., 19(5): 595-601.
19. Abere, T., B. Bogale, and A. Melaku, 2013. Gastrointestinal helminth parasites of pet and stray dogs as a potential risk for human health in Bahir Dar town, north-western Ethiopia. Vet. World, 6(7): 388-392.
20. Ngui, R., S.C. Lee and N.J. Yap, 2014. Gastrointestinal parasites in rural dogs and cats in Selangor and Pahang states in Peninsular Malaysia. Acta Parasitologica, 59(4): 737-744.
21. Komatangi, M.C., 2005. Prevalence of gastrointestinal helminths of dogs in Dschang, Cameroon. J. Cam. Acad. Sc., (5): 11-14.
22. López J., K. Abarca, P. Paredes and E. Inzunza, 2006. Intestinal parasites in dogs and cats with gastrointestinal symptoms in Santiago, Chile. Rev. Med. Chil., 134(*2*): 193-200.
23. Mirzaei, M. and M. Foolad, 2012. The prevalence of intestinal helminths in owned dogs in Kerman city, Iran. Sci. Parasitol., 13(1): 51-54.
24. Rojekittikhun, W., K. Chaisiri,, A. Mahittikorn,, Pubampen, S. Sa-Nguankiat, T. Kusolsuk, W. Maipanich, R. Udonsom and H. Mori, 2014. Gastrointestinal parasites of dogs and cats in a refuge in NakhonNayok, Thailand.Southeast Asian J Trop Med Public Health, 45(1): 9-31.
25. Zanzani, S.A., L.G. Alessia, S. Paola, B. Federica and T.M. Maria, 2014. Intestinal Parasites of Owned Dogs and Cats from Metropolitan and Micropolitan Areas: Prevalence, Zoonotic Risks and Pet Owner Awareness in Northern Italy. Hindawi Publishing Corporation. Bio. Med. Research International, pp: 1-10.

26. Baker, M.K., L. Lange, A. Verster, D. Van and S. Plaat, 1989. A survey of helminths in domestic cats in the Pretoria area of Transvaal, Republic of South Africa. Part 1: The prevalence and comparison of burdens of helminths in adult and juvenile cats. J. S. Afr Vet. Assoc., 60(3): 139-42.
27. Bahrami, A., A. Doosti, H. Nahravanian, A.M. Noorian and S.A. Asbchin, 2011. Epidemiological Survey of Gastro-Intestinal Parasites in Stray Dogs and Cats. A J of Bas and App. Sci., 5(9): 1944-1948.
28. Ramos, D.G., R.G. Scheremeta, A.C. Oliveira, A.L. Sinkoc and R.C. Pacheco, 2013. Survey of helminth parasites of cats from the metropolitan area of Cuiabá, Mato Grosso, Brazil.ev Bras Parasitol Vet., 22(2): 201-6.
29. Yurong, Y. and L. Hongde, 2015. Prevalence and Risk Factors of Intestinal Parasites in Cats from China. Volume 2015, Article ID 967238,. Bio. Med. Research International, pp: 5, Hindawi Publishing Corporation, http://dx.doi.org/10.1155/2015/967238.
30. Gürler, A.T., C.S. bolukbaş, G.Z. Pekmezci, Ş. UMUR and M. Açici., 2015. Nematode and cestode eggs scattered with cats-dogs feces and significance of public health in Samsun, Turkey. Ankara Üniv Vet Fak. Derg., 62: 23-26.
31. Overgaauw, P.A.M., L. Van-Zutphen and D. Hoek,, 2009. Zoonotic parasites in fecal samples and fur from dogs and cats in The Netherlands. Vet. Parasitol., 163(2): 115-122.
32. Mukaratirwa, S. and V.P. Singh, 2010. Prevalence of gastrointestinal parasites of stray dogs impounded by the Society for the Prevention of Cruelty to Animals (SPCA), Durban and Coast, South Africa. Journal of the South African Veterinary Association, 81(2): 123-125.
33. Hailu, Y., T. Ayele, R Fikru and A.K Basu, 2007. Gastrointestinal nematodes in dogs from Debre Zeit, Ethiopia. Vet. Parasitol., 148: 144-148.
34. Octavius, J., K. Nigatu, K. Tesfu, T. Getachew and M. Chanada, 2011. Prevalence of dog gastrointestinal parasites and risk perception of zoonotic infection by dog owners in Wondo Genet, southern Ethiopia. J. public health Epidemiol., 3(11): 550-555.
35. Uade, S.U., A Liana and H. Jorg, 2008. Parasites of importance for humanhealth in Nigerian dogs: high prevalence and limited knowledge of pet owners. BMC Veterinary Research, 4: 49.
36. Mohd, Z.S.N., S. Norhidayu, P. Paul and W.L. John, 2013. Macroparasite communities in stray cat populations from urban cities in Peninsular Malaysia. Veterinary Parasitology, 196: 469-477.