GLOBAL JOURNAL OF MEDICAL SCIENCES VOL 9, NO. 1&2, 2010: 35-42

COPYRIGHT© BACHUDO SCIENCE CO. LTD PRINTED IN NIGERIA. ISSN 1596-2911
www.globaljournalseries.com; Email: info@globaljournalseries.com

PREVALENCE OF GASTROINTESTINAL PARASITES IN DOGS FROM UMUAHIA CITY OF ABIA STATE

R. I. O NWOHA AND J. O EKWURUIKE

ABSTRACT

A total of 210 faecal samples from owned indigenous (puppies and adults) and exotic (puppies and adults) breeds of dogs were collected from the city of Umuahia, Abia state. Samples were examined for the presence of gastrointestinal parasites using faecal floatation and sedimentation techniques. Out of the 210 samples examined 10 were negative for helminths eggs and protozoans oocysts. The 10 negative samples were all from exotic breeds with history of deworming. The 9 species found were: *Toxocara canis* (95%); *Uncinaria stenocephala* (95%); *Dipylidium caninum* (90%); *Ancylostoma braziliense* (90%) *Spirocerca lupi* (36%); *Diphyllobothrium latum* (40%); *Troglotrema salmincola* (64%); *Linguatula serrata* (36%) *and Filaroides osleri* (57%) The prevalence of *T. canis (95%); Uncinaria stenocephala (95%)* and *Ancylostoma braziliense (90%)* were highest in the dogs. From our data the pattern of the disease was age dependent. Puppies had higher prevalence (100 %) than the adults (57%). *Linguatula serrata* (36%) and *Spirucerca lupi* (36%) were found only in the indigenous breed. The general high prevalence of these parasites of public health importance highlights the importance of this work which will provide a baseline to enforce policies that will govern dog keeping in Nigeria such as demand for monthly veterinary assistance in deworming of dogs.

KEYWORDS: Dogs, Toxocara canis, Ancylostoma braziliense, Linguatula serrata.

INTRODUCTION

Dogs are the most common pet animal worldwide and perform a range of cultural, social and economic functions in society [Swai, *et al*., 2010]. Some studies suggest that pet keeping is associated with high level of self esteem especially in children [Paul, and Serpell, 1996; Knoble, *et al*., 2008; Dohoo, *et al*., 1998; Robertson, *et al.,* 2000]. Most of these pet dogs are known to harbour pathogenic gastrointestinal parasites that are zoonotic to humans especially to children [Robertson, *et al*., 2000]. Such zoonotic infections include cutaenous larval migrans, hydatid disease and tungiasis [Dakkak , 1992; Heukelbach, *et al.,* 2003; Heukelbach, *et al.,* 2002; Akao and Ohta, 2007].

Gastrointestinal helminths and protozoans are the major impediment to dog health world wide through direct and indirect losses. Most dogs are subclinically infected and continuously shedding infective helminth eggs in their faeces contaminating the environment and increasing health risk to man [Craig, and Macpherson, 2000]. In developing countries like Nigeria the risks of zoonotic infection from dogs are high owing to lack pf prevalence studies to determine their existence in the environment [Macpherson, 2005].

Therefore, the importance of this coprological study of dogs in Umuahia city of Abia state. To determine the prevalence and extent of gastrointestinal parasite in apparently health dogs.

R. I. O Nwoha, Department of Veterinary Medicine, Micheal Okpara University of Agriculture, Umudike, P. O. Box 824, Nigeria.
J. O Ekwuruike, Department of Veterinary Medicine, Micheal Okpara University of Agriculture, Umudike. Nigeria.

Research Methodology

Map of umuahia North LGA of Abia state.

Study area

Umuahia is the capital city of Abia state. The town is comprised of two L.G.A, Umuahia north and Umuahia south. Umuahia north has about 35 communities bordered at the northwest by a river. It is located at longt 5^{o} 35′N and Lat 7^{o} 25′E. The main city of Umuahia is located within Umuahia north L.G.A where the study was done. The standard of living is not particularly low however there are few Veterinary clinic establishments in the city and a substantial proportion of inhabitants keeping dogs have no access to Veterinary services. Therefore, most indigenous and few exotic breeds of dogs have never had any form of treatment against parasitic diseases prior to the study.

Faecal sample collection

Two hundred and one faecal samples of domiciled dogs (indigenous and exotic breeds) of different age bracket (puppies and adults) were randomly collected within Umuahia city of Abia state. The study lasted for four months (September to December 2010).

Sampling procedure and data collection

In conducting this study, a cross sectional design in which data was collected at a single point and time was used [Thrusfeild, 2005]. Data was collected from dog owners on the dog's demographic characteristics (age, breed,). Faecal samples were obtained from privately owned dogs presented to Veterinary practitioners for clinical investigation and also by house to house visitation and sample collection. The dog population studied include 80 indigenous (local breeds that scavenge food for themselves) and 130 exotic breeds (most of them are housed in a kennel and are sometimes taken out for a walk within and outside the compound) both have close contact with man. Out of a total of 80 indigenous dogs (50 were puppies i.e those up to 6 months of age) those up to one year old dogs (30) were classified as adult. The exotic breeds were of different breeds, most of them of mixed-breeds (130), and were classed as puppies (70) and adult (50).

The frequencies of parasites of highest prevalence, i.e. *Filaroides osleri;Uncinaria stenocephala; Ancylostoma braziliense; Linguatula serrate; Troglotrema salmincola; Dipylidium caninum; Diphyllobothrium latum; Spirocerca lupi* and *T. canis* were calculated for puppies and adults of various breeds. Their prevalence in percent with respect to different gastrointestinal species was determined.

Sampling and parasitological technique

Five grams of faecal samples were collected from 210 dogs per rectum into a labelled container with merthiolate iodine formalin (MIF) solution as fixative (Pessôa, and Martins, 1982) and kept cool before transportation to the Department of Veterinary Medicine laboratory for immediate analysis or stored in the refrigerator at 4 ^{oC} for a day before analysis. The faecal samples were analyzed using the sedimentation and floatation technique as described by Soulsby, (1982) and Urquhart, *et al*., (1987) for the presence of gastrointestinal parasites and Oocyst of protozoans of dogs.

Statistical analysis

Collected data were analysed using descriptive statistics [Swai, *et al.*, 2010] and presented as tables. The prevalence (P) of various types of gastrointestinal parasites in different age groups of dogs were calculated using the formula P=d/n. where d is the number of positive samples analyzed at that point in time and n= total number of dog sample analysed at that material point in time [Thrusfeild, 2005]. The prevalence was calculated as a percentage.

Result

Table 1: Gastrointestinal parasites diagnosed from the faeces of 210 dogs from Umuahia city, Abia state and their respective prevalence from September 2010 to December 2010.

PARASITE SPP	NUMBER EXAMINED	NUMBER POSITIVE	PREVALENCE (%)
Filaroides osleri	210	120	(57%)
Ancylostoma braziliense	210	190	(90%)
Linguatula serrata	210	60	(36%)
Uncinaria stenocephala	210	200	(95%)
Troglotrema salmincola	210	165	(64%)
Dipylidium caninum	210	190	(90%)
Diphyllobothrium latum	210	85	(40%)
Spirocerca lupi	210	75	(36%)
Toxocara canis	210	200	(95%)

From table 1: The coprological study of a total of 210 faecal samples from dogs in Umuahia city, revealed high prevalence of *Toxocara canis* (95%); *Uncinaria stenocephala* (95%); *Dipylidium caninum* (90%); *Ancylostoma braziliense* (90%); *Troglotrema salmincola* (64%) *and Filaroides osleri* (57%) in the dogs. However, *Diphyllobothrium latum*(40%); *Linguatula serrata* (36%) and *Spirocerca lupi*(36%) were relatively of low prevalence.

Table 2: Number and prevalence in percent of infected dogs (indigenous and exotic) per worm species according to breed from September 2010 to December 2010.

PARASITE SPP	Indigenous breed (n=80)	Prevalence (%)	Foreign breeds (n=130)	Prevalence (%)	Total n=210	Prevalence (%)
Filaroides osleri	70	(88%)	50	(38%)	120	(57%)
Ancylostoma braziliense	80	(100%)	110	(85%)	190	(90%)
Linguatula serrata	75	(94%)	0	(0%)	60	(36%)
Uncinaria stenocephala	80	(100%)	120	(92%)	200	(95%)
Troglotrema salmincola	65	(81%)	100	(77%)	165	(64%)
Dipylidium caninum	80	(100%)	110	(85%)	190	(90%)
Diphyllobothriu latum	45	(56%)	40	(31%)	85	(40%)
Spirocerca lupi	75	(94%)	0	(0%)	75	(36%)
Toxocara canis	80	(100%)	120	(92%)	200	(95%)

From table 2: The prevalence of different species of gastrointestinal parasites of domiciled indigenous breed of dog in Umuahia were generally higher than in the exotic breeds. The indigenous breed had high prevalence with almost all the species of gastrointestinal parasites except with *Diphyllobothrium latum* (56%). Exotic breeds had high prevalence with *Ancylostoma braziliense* (90%); *Uncinaria stenocephala* (95%); *Dipylidium caninum*(90%)*; Toxocara canis*(95%); *Troglotrema salmincola* (64%) *and Filaroides osleri* (57%) and relatively low prevalence with *Spirocerca lupi* (36%)*; Diphyllobothriu latum* (40%) and *Linguatula serrata* (36%).

Table 3: Number and percent of infected dogs (indigenous and foreign) per worm species according to age from September 2010 to December 2010.

PARASITE SPP	Indigenous breed (n=80)		Exotic breeds (n=120)		Total n=210	Total Prevalence (%)
	Adult N=30	Puppy N=50	Adult N=50	Puppy N=70		
Filaroides osleri	20 (67%)	50 (100%)	20 (40%)	30 (43%)	120	(57%)
Ancylostoma braziliense	30 (100%)	50 (100%)	40 (80%)	70 (100%)	190	(90%)
Linguatula serrata	40 (80%)	20 (67%)	0 (0%)	0 (0%)	60	(36%)
Uncinaria stenocephala	50 (100%)	30 (100%)	50 (100%)	70 (100%)	200	(95%)
Troglotrema salmincola	40 (80%)	25 (83%)	30 (60%)	70 (100%)	165	(64%)
Dipylidium caninum	50 (100%)	30 (100%)	40 (80%)	70 (100%)	190	(90%)
Diphyllobothrium latum	30 (60%)	15 (50%)	10 (20%)	30 (43%)	85	(40%)
Spirocerca lupi	50 (100%)	25 (83%)	0 (0%)	0 (0%)	75	(36%)
Toxocara canis	50 (100%)	30 (100%)	50 (100%)	70 (100%)	200	(95%)

From 3: The was no significant difference (P≥ 0.05) in the prevalence of almost all the gastrointestinal parasites between the indigenous puppies (67%) and adults except with *Linguatuala serrata* where the prevalence in adults (80%) was higher and in *Filaroides osleri* very high in puppies(100%) than in adults (56%). There was a significant difference (P≤ 0.05) in the prevalence between Puppies and adults of exotic breeds. The prevalence of the different species of gastrointestinal parasites was generally higher in puppies (100%) than in the adults (8.0%). Both puppies and adult exotic breeds had no *Linguatula serrata* (0%) and *Spirocerca lupi* (0%) parasite in their faeces. Indigenous breed adults had high prevalence with *Spirocerca lupi* (100%); *Toxocara canis* (100%); *Dipylidium caninum*(100%) *Uncinaria stenocephala* (100%) and *Ancylostoma braziliense* (100%). While the puppies had high prevalence with *Filaroides osleri (100%); Ancylostoma braziliense* (100%); *Uncinaria stenocephala (100%); Dipylidium caninum* (100%) *and Toxocara canis* (100%). Exotic Puppies had very high prevalence with *Toxocara canis* (100%); *Dipylidium caninum* (100%), *Ancylostoma braziliense* (100%)*; Uncinaria stenocephala* (100%) *and Troglotrema salmincola* (100%) while the exotic adults had high prevalence with only *Uncinaria stenocephala* (100%) and *Toxocara canis* (100%).

DISCUSSION / CONCLUSION

The results of this study revealed the existence of gastrointestinal parasites in apparently healthy dogs in Umuahia city of Abia state. This agrees with other workers in this area that helminthosis is one of the main problems in dogs worldwide (Minnaar, 2002; Akao*, et al.,* 2003; Davoust, *et al.,* 2008). Out of a total of 210 dogs within Umuahia city that was randomly sampled 10 dogs were negative for any gastrointestinal parasite. The 10 negative dogs were all of exotic breeds with history of deworming at one point in time. The remaining 200 positive cases had high prevalence of different species of helminth eggs and protozoan oocyst. This agrees with Swai, *et al*., (2010) who recorded high prevalence in gastrointestinal parasites in their work. This could be due to lack of improvement in our animal health management programme or even due to non-adoption of the modern animal health care programme by dog owners.

All positive dogs had mixed infections comprised of *Spirocerca lupi; Toxocara canis; Dipylidium caninum; Uncinaria stenocephala; Ancylostoma braziliense; Filaroides osleri; Troglotrema salmincola*; *Linguatula serrata* and *Diphyllobothrium latum.* This is in line with the reports of Akao, (2003); Aleksandra, (2008); Katagiri, and Oliveira-Sequeira, (2008); Sowemimo and Asaolu (2008); Swai, (2010) who recorded mixed infections in their prevalence studies.

The parasites isolated from this work had been isolated elsewhere in Nigeria, and the difference lies in the prevalence and population density between regions (Anene and Nnaji, 1996; Sowemimo and Asaolu , 2008).

From our data, the prevalence pattern was age dependent, puppies showing higher prevalence (10.0%) than the adults (6.0.0%) which is in agreement with other studies (Swai, *et al.,* 2010; Anene, and Nnaji, 1996; Dohoo, 1998; Sowemimo and Asaolu, 2008). The high prevalence in puppies may be due to their juvenile immune system .Repeated exposure of adults helped them to build up adequate immunity that ameliorate the level of parasite eggs in their faeces (Sprent, 1961).Generally, the prevalence of gastrointestinal parasites in indigenous breeds are higher than in the exotic breeds. The most important helminth parasite eggs of zoonotic significance isolated from this work was *Toxocara cani, Ancylostoma braziliense* and *Linguatula serrata*.

Toxocara canis from our data was of high prevalence both in the indigenous and exotic breeds irrespective of the age as was reported by Overgaauw, (1997) and (Papazahariadou, *et al*., 2007) both studies recorded high prevalence of *T. canis* in all age bracket of dogs. Adult dogs have been known to remain susceptible to *T. canis* despite repeated infections which would have helped them build up adequate immunity against it, thereby contributing to environmental contamination and spread of infection (Maizels, and Meghji, 1984). This finding is very important because these infected dogs are living in close association with man, although there was no existing epidermiological data on the infection rate of *T. canis* in man, there was a record of 35.5% toxocara seropositivity in children with eosinophilia in Brazil municipal (Matos, *et al.,* 1997). *T. canis* is currently the leading cause of visceral larva migrans in man and could lead to blindness when it migrates into the eye (Taylor, 2001).

Ancylostoma braziliense also showed a high prevalence in both indigenous (100%) and exotic (100%) breeds irrespective of age bracket. This is contrary to the findings of Minnaar, *et al.,* (2002) who recorded high prevalence in kennelled dogs (32%) than stray dogs (17%) but is in line with (Rahman, and Soliman, 1977). There was a slight decrease in the prevalence in adult exotic dogs (80%) which may be due to existing immunity from previous infections however weak. Puppies are very susceptible to ancylostomosis because of low immunity and possibly due to infection through their mother's contaminated milk (collostral route) (Kalkofen, 1987). Indigenous adults showed a high prevalence (100%) which they may have acquired from the contaminated environment seen in Umuahia that is very conducive for the development and maturation of infective larvae. Hookworm being endemic in our environment can cause cutaneous larval migrans in man during percutaneous infection (Heukelbach, 2005)

Linguatula serrata is a respiratory parasite only seen in stray dogs (Meshgi, and Asgarian, 2003). This parasite is not a common isolate in most of the prevalence of gastrointestinal parasite studies carried out worldwide. However, Kenya recorded a frequency of (10%), (Aydenizoz, and Gudu, 199); 43% in street dogs in Bangaldesh (Rahman, and Soliman, 1977); 20% in stray dogs in Turkey (Akyol, 1995)) and 8% in Cairo (Khalil, 1970). In

this study, the prevalence was higher in indigenous adults (80%) than in puppies (62%) and was zero in the exotic kennelled dogs. The infection seen in indigenous breeds may have been gotten through scavenging and consumption of contaminated goat and sheep liver and lungs while the zero prevalence in the exotic breed may be the fact that most exotic dog owners feed them prepared food free from contamination. This Parasite is of great public health importance can cause visceral organ damage and nasopharngeal pentastomiasis resembling hypersensitivity reaction on ingestion of its eggs and nymph. The presence of the nymph in the nasopharynx and associated hypersensitivity reaction is known as halzoun syndrome (Schacher, *et al.,* 1969). There was a recorded case of linguatulosis in a 28 years old woman in Tehran, Iran (Maleky, 2001). Infection in man can be through consumption of uncooked goat or sheep visceral harbouring the third stage larva of the parasite causing a disease known as marrara in Sudan (Elbadawi, *et al*., 1978).

The other parasites isolated in this work are of little or no public health importance but also require great attention. In conclusion, this work calls for an existing law governing dogs keeping in Umuahia, creation of awareness programme to educate people on the existence of zoonotic parasites in their dogs and strict demand for monthly veterinary assistance in deworming of their dogs.

ACKNOWLEDGEMENT

I wish to acknowledge Mr J. O. Ekwurike of the department of Veterinary Medicine, Michael Okpara University of Agriculture Umudike for his great assistance rendered to me in the course of this work.

REFERENCES

Akao, N and Ohta, N., 2007. Toxocariasis in Japan. *Parasitol Int*. (56): 87–93.

Akao, N. T., omoda, M., Hayashi, E., Suzuki, R., Shimizu-suganuma, M., Schichionohe, K and Fujita, K., 2003. Cerebellar ataxia due to toxocara infection in meningo gerbils, meriones unguculatus. *Vet parasitol* (113): 229-237.

Aleksandra, N., Sanda, D., Sofija, K. R., Ivana, K., Branko, B and Olgica, D. D., 2008. High prevalence of intestinal zoonotic parasites in dog from Belgrade, Serbia. *Parasitol.* 335-340.

Anene, B. M and Nnaji, T. O., 1996. Chime AB. Intestinal Parasitic infections of dogs in the Nsukka area of Enugu, Nigeria. *Prev Vet Med*. (27): 89–94.

Akyol, C. V., Coskun, S. Z., Sonmez, G and Senlik, B., 1995. Linguatula serrata infection in bursa of stray dogs and its importance from the point of public health. *Turkiye parazitol. dergisi* 267-272.

Aydenizoz, M and Gudu, F., 1997. The prevalence of linguatula serrata (Frohlich, 1989) in Kenya province. *Turkiye parazitol. dergisi* 21, 75-78.

Chiejina, S. N and Ekwe, T. O., 1986. Canine toxocariasis and the associated environmental contamination of urban areas in Eastern Nigeria. *Vet Parasitol.* (22): 157–161.

Craig, P. S and Macpherson., 2000. Dogs and cestode zoonoses in dogs Zoonoses and public health. CAB international, Oxon, united kingdom. *J. Vet. Res*. 75, (4): 359-364.

Dakkak, A., 1992. Guidelines for diagnosis, surveillance and control of echinococcosis. Veterinary Public Health, World Health Organization, Geneva Switzerland; *Echinococcus*-hydatidiosis in North Africa: geographical distribution of species and strains and prevalence in man and animals.

Davoust, B. T., Normand, O., Bourry, H., Dang, E. Leroy and Bourdoiseau, G., 2008. Epidermiological survey on gastrointestinal and blood borne helminths of dogs in north east Gabon. Ondersteport. *J. Vet. Res.* 75, (4): 359-364.

Dohoo, I. R., McDonell, W. N., Rhodes, C. S and Elazhary, Y. L., 1998. Veterinary research and human health. *Can Vet J*. (39): 549–556.

Eguia-Aguilar, P., Cruz-Reyes, A and Martinez-Maya, J. J., 2005. Ecological analysis and description of the intestinal helminthes present in dogs in Mexico City. *Vet*

Parasitol. (127): 139–146.

Elbadawi, E. K. S., Gezuli, F. L. A. Y., Eisa, M. A and Slepnev, N. k., 1978. Linguatula serrata nymph in a goat in the Sudan. *Vet. Rec.* 102, 171.

Gennari, S. N., Kasai, N and Cortez, A., 1999. Ocorrencia de protozoarios e helminths em amostrus de fezes de case e gatos dacidade de sao Paulo *Brazil. J. Vet Res Anim. Sci*. 36, (2):

Heukelbach, J., Mencke, N and Feldmeier, H., 2002. Cutaneous larva migrans and tungiasis: the challenge to control zoonotic ectoparasitoses associated with poverty. *Trop Med Int Hlth*. (7): 907–910.

Heukelbach, J., Wilcke, T., Meier, A., Moura, R. C. S and Feldmeier, H., 2003. A longitudinal study of cutaneous larva migrans in an impoverished Brazilian township. *Travel Med Infect Dis*. (1): 213–218.

Heukelbach, J., Wilcke, T., Harm, G and Feldmeier, H., 2005. Seasonal variation of tungiasis in an endemic community. *Am J Trop Med Hyg*. (72): 145–149.

Kalkofen, U. P., 1987. Hookworms in dogs and cats. *Vet. Clin. North Am.* (17): 1341–1354.

Khalil, G. M., 1970. Incidence of linguatula serrata infection in Cairo mongrel dogs. *J. Parasitol*. (56): 485.

Macpherson, C. N. L., 2005. Human behaviour and the epidermiology of parasitic zoonoses. *Int. J. Parasitol*. 1319-1331.

Maleky, F., 2001. A case report of linguatula serrata in human throat from Tehra central Iran. *Ind. J. med. sci*. 439-441.

Matos, M. F., Militão, D. N., Brum, M. A. R., Omais, M., Quilião, M. E., Dorval, M. E., Pereira, A. C., Possi, L. A., Sauer, L., Camargo, E. D and Tundisi, R. N., 1997. Presence of anti-*Toxocara* antibodies in children selected at Hospital Universitário, Campo Grande, MS, Brazil. *Rev. Inst. Med. Trop. São Paulo* (39): 49–50.

Maizels, R. M and Meghji, M., 1984. Repeated patent infection of adult dogs with *Toxocara canis*. *J. Helminthol.* (58): 327–333.

Meshgi, B and Asgarian, O., 2003. Prevalence of linguatula serrata infestation in stray dogs of Shahrekord, Iran. *J. Vet. Med.* (50): 466-467.

Minnaar, W. N, Krecek, R. C, Fourie, L. J., 2002. Helminths in dogs from a peri-urban resource-limited community in Free State Province, South Africa. *Vet. Parasitol*. (107): 343–349.

Katagiri, S and Oliveira-sequeira, T. C. G., 2008. Prevalence of dog intestinal parasites and risk perception of zoonotic infection by dog owners in Sao Paulo state, *Braz. Zoo. pub hlth*. 1-8.

Knoble, D. L., Laurenson, M. K., Kazwala, R. R., Roden, L. A and Cleaveland, S., 2008. Across sectional study of factors associated with dog ownership in Tanzania. *BMC. Vet. Res*. (4): 5.

Oliveira-sequeira, T. C. G., Amarante, A. F. T., Ferrari, T. B and Nunes, L. C., 2001. Prevalence of intestinal parasites in dogs from Sao Paulo state, *Braz.. Vet. Parasitol*. 19-27.

Omudu, E. A and Amutu, E. U., 2007. Parasitology and urban livestock farming in Nigeria: Prevalence of ova in faecal and soil samples and animals ectoparasites in Makurdi. *J S Afr Vet Assoc*. (78): 40–45.

Overgaauw, P. A. M., 1997. Aspects of *Toxocara* epidemiology: toxocarosis in dogs and cats. *Crit. Rev. Microbiol.* 23, 233–251.

Papazahariadou, M., Founta, A., Papadopoulos, S., Chiliounakis, K., Antoniadou-sotiriadou and Theodorides, Y., 2007. Gastrointestinal parasites of shepherd and hunting dogs in the serres prefecture, borthern Greece. *Vet parasitol*. Vol. 148, issue (2): 170-173.

Paul, E and Serpell, J., 1996. Obtaining a new pet dog: Effects on middle childhood children and their families. *Appl. Anim.*

Behav. Sci. (47): 17-29.

Pessôa, S. B and Martins, A. V., 1982. Parasitologia Médica, 11th Edition. Guanabara Koogan, Rio de Janeiro, 872

Rahman, H and Soliman, K. N., 19771. A preliminary study on the occurrence of linguatula serrta in street dogs of Bangladesh. *Bangladesh vet . J.* (5): 65-67.

Robertson, I. D., Irwin, P. J., Lymbery, A. J and Thompson, R. C. A., 2000. The role of companion animals in the emergence of parasitic disease. *Int J Parasitol*. (30): 1369–1377

Schacher, J. F., Saab, S., Germanos, R and Boustary, N., 1969. The aetiology of halzoun in Lebanoni; recovery of linguatula serrata nymph from two patients. *Trans. R. Soc. Trop. Med. Hyg*. (63): 854-858.

Soulsby, E. L. J., 1982. Helminths, Arthropodes and protozoa and domestic animals. 7th edth. The English language book society and Bailliere Tindall, London.

Sowemimo, O. A and Asaolu, S. O., 2008. Epidemiology of intestinal helminth parasites of dogs in Ibadan, *Nig. J Helminthol*. (82): 89–93.

Sprent, J. F. A., 1961. Post-parturient infection of the bitches with *Toxocara canis*. *J Parasitol*. (47): 284.

Swai, E. S., Kaanya, E. J., Mshanga, D. A and Mbise, E. N., 2010. Asurvey ongastrointestinal parasites of non-descript dogs in and around Arusha Municipality, Tanzania. *Int.J.Ani Vet Advan*. 3, (2): 63-67.

Thrusfeild, M. V., 2005. Veterinary epidermiology. 3rd edition. Blackwell science Oxford, London. 234-238.

Uade, S. U., Liana, A and Jorg, H., 2008. Parasites of importance for human health in Nigerian dogs; high prevalence and limited knowledge of pet owners. *BMC Vet Res* (4): 49.

Ugochukwu, E. I., Ejimadu, K. N., 1985. Studies on the prevalence of gastrointestinal helminths of dogs in Calabar Nigeria. *Int J Zoonoses*. (12): 214–218.

Urquhart, G. M. J., Armour, J. L., Duncan, J. M., Dum and Jennings, J. W., 1987. Veterinary parasitology. 3rd Edn, Longman scientific and technical, Burnt mill, Harlow, UK. 338.

Taylor, M. R., 2001. The epidemiology of ocular toxocariasis. *J Helminthol*. (75): 109–118.