The Prevalence of Intestinal Helminths of Dogs (*Canis familaris*) in Jos, Plateau State, Nigeria

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Abstract: One thousand faecal samples of dogs were examined for eggs of parasites in two local government areas of Plateau state, namely, Jos North and Jos South Local Government Areas using the sugar floatation method .Of the 1000 faecal samples examined, 661 (66.10%) harboured eggs of six different helminth parasites. The overall prevalence rates for the eggs of different types were 118 (11.80%) D*ipylidium caninum*, 58 (5.80%) for *Spirocerca lupi*, 382 (38.20%) for *Taxocara canis*, 318 (31.80%) for *Trichuris vulpis*) 501 (50.10%) for *Ancylostoma caninum* and 129 (12.90%) for *Taenia* species. Out of the 521 (52.1%) male dogs examined, six different parasites were found and recorded. Also, of the 479 (47.9%) female dogs examined, six different parasites were also found and recorded. Out of the 1000 faecal samples examined, 339 (33.9%) did not show any parasite, 101 (10.10%) showed single infections with different parasites, mixed infections were common. A total of 666 (66.10%) harboured multiple infections (polyparasitism) caused by 2 - 6 different parasites. [Researcher. 2010;2(8):51-56]. (ISSN: 1553-9865).

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1. Introduction

Dog is an intelligent animal and is man's favourable pet. For thousands of years, dogs have been the companions of men and have helped them hunt, work and guard their homes. Often dogs have risked their lives for their masters. Dogs are often credited with being almost "human", but their world is quite different from that of man. Dogs are much more keenly alert to odours and sounds (New standard encyclopedia, 1986) Dogs commonly share environments with human beings. They constitute an important reservoir for parasites transmitted to man (Umoh and Asake, 1982).

The dog, *Canis familiaris*, was the first animal to be domesticated by man some sixty thousand years ago. Dogs are kept for various purposes: for hunting, sporting, tending flocks and herds, crime detection and prevention, leading the blind and as a source of protein in some communities. The breeding and selling of dogs bring income to families engaged in such practices (Ajanusi and Gunya, 1998). The importance of dogs cannot be over emphasized, as can be seen in the words of George Graham West, United States senator from Missouri who was a lawyer. Once he represented in court a man whose dog was killed by another man. He addressed the court on the importance of dog and won the case (Kaitholil, 1999). Shortly before the commencement of England 66, the world cup trophy was stolen from West Minster display stand. After futile attempts by security operatives to find the trophy, it was a special trained sniffer dog called "Pickies" that found it where it was hidden in a bush (sports mind for sports minded people paper, 2003).

Despite its usefulness, dog may be infected with pathogens that are dangerous to man and other domestic animals. Such parasites include endoparasites such as helminths of the gastro intestinal tract (Soulsby, 1982). Gastrointestinal helminthes belong to two large phyla in the animal kingdom – the phylum platyhelminthes consists of cestodes while the phylum nemathelminthes consists of round worms (or nematodes). Common nematodes of dogs include the hookworms *(Ancylostoma)*, round worms (*Toxocara* and *Ascaris)*, the whipworms *(Trichuris species)* and the oesophageal worms *(Spirocerca species) Toxocara* and *toxoscaris* eggs are very resistant to environmental adversity and remain infective for years (Georgi, 1985). Common cestodes of dogs include the species in the genera *Taenia* and *Echinococcus*.

Gastrointestinal helminths constitute a major cause of canine disease in the tropics and some have been reported to be of zooonotic importance in many parts of the world (Aranbolu and Steele, 1976). Zoonoses are infections naturally transmitted between vertebrates and man. The public health implications of zoonoses are considerable and people

involved in agriculture, livestock industry, handling of laboratory animals and pets, meat inspection and in the handling of foods of animal origin, are specifically much more prone to zoonotic infections than other individuals. To date, not less than one hundred and fifty disease agents are known to be zoonotic, a few bacterial, spiro- chaetal, viral, rickettsial, parasitic and fungal zoonoses affecting pets, laboratory and food animals and man.

Dogs also harbour zoonotic infections like toxocariasis, echinococcosis, diphyllobothriasis, thelaziasis, spirocercosis and filariasis. Parasites harboured by dogs other than helminths include *Babesia, Theileria transmitted* by Ixodid ticks, *Hepatozoon* by mites and *Trypanosoma* transmitted by Tsetse fly and *Leishmania* transmitted by Phlebotomine sand flies. Other zoonotic infections transmitted by dogs are amoebiasis, sacrosporidiosis and rabies. Ajayi (1989) defined zoonosis as a disease or infection naturally transmitted between vertebrate animals and man. Zoonotic diseases are classified as direct, cyclo, sapro and metazoonoses. Direct zoonosis refers to direct transmission from infected vertebrate to susceptible vertebrate host species e.g. rabies from dogs. In cyclo-zoonosis, transmission from an infected vertebrate requires more than one vertebrate host species e.g. tapeworms. Metazoonosis refers to transmission from an infected vertebrate through infected invertebrate vectors e.g. plague.

Saprozoonosis – in this, transmission from an infected vertebrate may require both vertebrate host and a non-animal stage e.g. various skin diseases (Ajayi, 1989).

Toxocara canis is the common roundworm of dogs. Eggs passed in the faeces of dogs can remain in the soil for many years. Surveys have shown that 1-30% of soil samples from parks and playgrounds are contaminated.

Eggs in soil and faeces either in households or public areas are potential sources of infection. Young children with dirt pica (geophagia) or poor hygiene are particularly likely to ingest *Toxocara canis*. Visceral Larva migrans (VLM) is a disease produced by the extra-intestinal migration of larvae of nematodes of lower animals through human tissues. Animal parasites such as *Toxocara canis, T. cati, Ascaris suum, Capillaria hepatica* etc have been reported to infect man, but the common dog worm appears to be the primary causative agent of visceral larva migrans.

2. Materials and Methods

2.1. Study Areas:

The study areas were two Local Government Areas of Jos, namely: Jos North and Jos South. The main abattoir (Bwandang - Bukuru) and the other local abattoirs (Tudun Wada, Gada biyu, Nassarawa Gwom) where dogs are slaughtered for meat in the Local Government Areas were the main sources of faecal samples of dogs. Households in the areas were additional sources of samples.

2.1.1. Collection of samples:

Pre-labeled specimen bottles were given to the butchers and dog owners of households with the strict instructions to collect the faeces of dogs into the bottle a day before the researcher went back to collect the bottles. The sexes, ages (young and adult) breeds and the uses to which the dogs were, were put on a piece of paper on each bottle. The collectors of the faeces or their educated wards were trained on how to follow the instructions on the bottles for ease of collection. After collection, bottles were taken to the laboratory for the analysis of the faecal samples in them.

2.1.2. Processing of faecal samples:

The processing and of samples and identification of parasites was performed according to standard technique as described by Soulsby (1982). About 2g portion of each sample was taken and water added and mixed thoroughly. The mixture was put in a beaker and sieved through a tea strainer into another beaker.

The solution in the beaker was centrifuged in a centrifuge tube for 5 mins at 1000 rpm. The supernatant was discarded. To the sediment in the centrifuge tube was added a sugar solution and was occasionally mixed with a clean splinter (Soulsby, 1982). More sugar solution was added until a convex meniscus was formed and a glass cover put on top of it, and the tube was centrifuged as described above. The cover slip with the eggs of parasites was then lifted up carefully to prevent air bubbles and was placed on a clean glass slide; each slide so prepared was allowed to rest for about 30 mins to allow the eggs settle properly. The slide was then read under the microscope and the parasites eggs observed were identified with reference to Soulsby (1982).The specific gravity of the sugar solution used was 1.25 which allowed the debris (the faeces) to fall at the bottom of the tube and the eggs to float on top of the solution and get attached to the glass cover slip.

Samples collected in a day were so analyzed the same day. In some cases where it was not possible to do so on the same day, samples were preserved in 10% formalin in the collection bottle and analyzed the following day. A total of 1000 faecal samples of individual dogs was so treated and analyzed for parasites.

3. Results

As indicated in Table 1, 661(66.10%) of the 1000 faecal samples of dogs examined were found to carry eggs of parasites.

Table 1. Overall prevalence of Helminth parasites in Dogs

No. dogs examined	No. positive	Infection rate (%)
1000	661	66.1

The distribution of the different types of parasites and *Spirocerca lupi* their infection rates is as shown in Table 2. The parasites comprise of *Dipylidium caninum* which were found in 118 (11.80%) of the faecal samples, in 58 (5.80%, *Toxocara canis* in 382 (38.20%, Trichuris vulpis in 318 (31.8%), *Ancylostoma caninum* in 510 (50.10% and *Taenia* species in 129 (12.90%).

Table 2. Types of parasites and their infection rates

Parasite species	No. of dogs infected	Infection rate (%)
Dipylidium caninum	118	11.8
Spirocerca lupi	58	5.8
Toxocara canis	382	38.2
Trichuris vulpi	318	31.8
Ancylostoma caninum	501	50.1
Taenia spp.	129	12.9

Table 3 shows the distribution of the parasites among male dogs in the study. Of the 521 faeces examined from male dogs, *Dipylidium caninum* occurred in 58 (11.13%), *Taenia* species in 60 (11.52%), *Toxocara canis* in 241 (46.23%), *Ancylostoma caninum* in 300 (57.58%), and *Trichuris vulpis* in 210 (40.31%), while *Spirocerca lupi were found in 40* (7.68%).

Table 3. Prevalence of Helminths among 521 Male Dogs

Parasite Species	No. of dogs infected	Infection rate (%)
Dipylidium caninum	58	11.13
Taenia spp.	60	11.52
Toxocara canis	241	46.23
Ancylostoma caninum	300	57.58
Trichuris vulpis	210	40.31
Spirocerca lupi	40	7.68

The distribution of the eggs of the above parasites in the faeces of 479 female dogs is recorded in Table 4. *Ancylostoma caninum* recorded the highest prevalence, occurring in 201 (41.9%) dogs followed by *Toxacara canis* 141 (29.44%), *Trichuris vulpis* in 108 (22.55%), *Taenia* species in 69 (14.4%), *Diphylidium caninum in 60* (12.53%) and *Spirocerca lupi* in 48(10.02%).

Table 4. Prevalence of Helminths among 479 Female Dogs

Parasite species	No. of dogs infected	Infection rate %)
Dipylidium caninum	60	12.53
Taenia spp.	69	14.41
Toxocara canis	141	29.44
Ancylostomacaninum	201	41.96
Trichuris vulpis	108	22.55
Spirocerca lupi	48	10.02

In Table 5, it is observed that 339 (33.9%) of the 1000 dogs examined had no parasite infection where as 101 (10.1%) of the dogs had single infections. However, 661(66.1%) harboured multiple infections (polyparasitism) caused by 2 to 6 different parasites. Thus 149 (14.9%) of the dogs harboured doubled infections, 180 (18.0%) harboured triple infections, 121 (12.1%) were each infected by 4 different parasites, 69 (6.9%) were each found to be harbouring 5 different parasites of different combinations. Therefore, multiple infections were found to be more common than single or no infections.

Table 5. Frequency of single and mixed Helminth infections in Dogs

No. of Infection	No. of Dogs Affected	Infection Rate (%)
0	339	33.9
1	101	10.1
2	149	14.9
3	180	18.0
4	121	12.1
5	69	6.9
6	41	4.1

Table 6 shows the prevalence of Helminth parasites in different breeds of dogs studied. The different breeds of dogs examined were found to harbour different levels of parasites infection that ranged from 52.3% (cross breeds) to 91.0% (Alsatian breeds).The Alsatian breeds had the highest (91%) infection rate followed by German Shepherds (67.3%), Local breeds (66.0%), with mixed breeds having the least (52.6%). There is a highly significant difference in the infection rates according to the different breeds of dogs examined (X^2=43.12, df=3, p=0.0000).

Table 6.Prevalence of Helminth parasites in different breeds of Dogs

Breed of dogs	No. dogs examined	No. dogs infected	Infection rate (%)
Local	606	400	66.0
Alsatian	100	91	91.0
German Shepherd	104	70	67.3
Mixed (Cross)	190	100	52.6
Total	1000	661	66.1

X^2=43.12, df=3, p=0.0000

The prevalence of different helminth parasites in dogs of different functional categories is as shown in Table 7. The 1000 dogs examined were categorized into: Police dogs, Hunting dogs and Household dogs in relation to the functions they performed. The Household dogs had a significantly higher infection rate (77.7%), followed by hunting dogs (54.1%) and the least (33.9%) was among Police dogs (X^2=85.42, df=2, p=0.0000).

Table 7. Prevalence of Helminth parasites in Dogs of different functional categories.

Dog Function	No. Dogs Examined	No. dogs Infected	Infection Rate (%)
Police	59	20	33.9
Hunting	381	206	54.1
Household	560	435	77.7
Total	1000	661	66.1

X^2=85.42, df=2, p=0.0000

Table 8 shows the prevalence of Helminth parasites in different age groups of dogs studied. It is clear that puppies, below the age of 12 months had the highest infection rates, while the least was among older dogs. There is a statistically significant difference in infection rates among the different age groups of dogs studied (X^2=47.49, df=6, p=0.0000).

Table 8. Prevalence of Helminth parasites in different age groups of Dogs

Age group (Months)	No. Dogs Examined	No. dogs Infected	Infection Rate (%)
< 6	55	40	72.7
6 - 9	95	75	79.0
10 – 12	105	83	79.1
13 – 23	145	100	69.0
24 – 48	200	144	72.0
60 – 84	200	120	60.0
96 – 120	200	99	49.5
Total	1000	661	66.1

X^2=47.49, df=6, p=0.0000

4. Discussion

Results obtained in this study indicated that the faeces of the dogs examined contained eggs of different parasites, all of which were helminths. These included eggs of *Dipylidium caninum, Spirocerca lupi, Taenia species, Toxocara canis, Trichuris vulpis* and *Ancylostoma caninum.* These parasites are known to be causative agents of zoonotic diseases and causative agents of visceral larva migrans (VLM), ocular larva migrans (OLM) and cutaneous larva migrans(CLM). *Toxocara canis* has been implicated to be the causes of these various migran forms.The overall prevalence of helminths parasites encountered in the 1000 faecal samples of dogs examined showed that 661 (66.10%) dogs were infected by at least a parasitic helminth. The overall prevalence for the parasites encountered in this study were 11.80% for *Dipylidium caninum, 5.8% for S. lupi,* 38.2% for *T .canis,* 31.8% for *T. vinpis* , 50.1% for *A. caninum* and 12.9% for *taenia species.* This prevalence is similar to those obtained by previous workers. Arambulo and Steele (1976) reported the prevalence rate for eggs of parasites in 105 stool samples of dogs in Houston, Texas (USA). Hookworms contributed 39.0%, *T. canis* 6.6% and T. *vulpis* 9.5%. Nnochiri (1968) reported that the triad of hookworm, *Ascaris* and *Trichuris* is most common in Nigeria. In this study, *Ancylostoma caninum* was the greatest contributor as a parasitic disease that has the highest frequency of occurrence. Ajanusi and Gunya (1998) reported 30.6% prevalence rate for *Ancylostoma species, 20.9% for T. canis,* 19.4% for *Taenia* species and 23.10% for *Dipylidium* species in their study of 134 dogs in Zaria using the sugar floatation technique.

This high difference in infection rate could be due to the sampling size of the dogs and also could be due to the fact that male dogs usually wander around in search of the female dogs during which time they contract more infections than the females. Olufemi and Bobade (1979) reported a higher infection rate in 157 dogs (63.6%) male dogs out of 247 dogs examined at Ibadan. In the present study, *A. caninum* showed the highest rate of infection of 57 .58% in the male dogs and 41.96% in the female dogs. *Dipylidium caninum* recorded an infection rate of 11.13% in the male dogs and 12.53% in the female dogs. *D. caninum* has been reported in many previous works to be very common in dogs in Nigeria causing dipylidiasis and occasional death resulting mainly from diarrhoea.Umoh and Asake(1982) reported high infection rate in dogs around Plateau and Zaria areas .They reported an infection rate of 11.8% for *D. caninum.* This infection rate compares favourably with the results obtained in the present work where

D. caninum recorded 11.13%. Of the 1000 faecal samples of dogs examined, 560 (56.0%) of dogs had mixed infections while 101 (10.1%) dogs had single infection. However, an infection rate of 36.3% of mixed infection was reported in Zaria by Ajanusi and Gunya (1998). The difference in the infection rate between their results and the present result may be as to the number of dogs examined by the two groups. In this work 1000 dogs were examined whereas they in Zaria examined only 134 dogs using floatation technique.

In this present work, the result may be more reliable. Mixed infections in dogs are possible because of multiple sources of contracting infections by the dogs. Dogs may contract infections because of poor nutrition and poor sanitary conditions. Mixed infections of two to six different parasites confirm the importance of dogs as reservoirs of zoonotic gastro intestinal parasites and the greatest risk for pet owners of acquiring more than one zoonotic infection from dogs.

The dogs whose faecal samples were examined for eggs in this work were police dogs, household dogs and hunting dogs. Therefore, it was expected that there would be variations in the prevalence rates of parasites encountered in the different categories of dogs. The hunting dogs are more exposed to the outside hence they stood the chance of contracting more infections. However, the results showed that the household dogs recorded the highest infection rate of 77.68%. This could be as a result of the lack of proper care for the dogs by the owners, thereby allowing them to roam the street of the towns and because of the parasites laden refuse dumps and increased rate of transmission. Kagira and Kanyari (2000) reported that urban dogs were more frequently parasitized than non –urban counterparts when they worked on causes of canine death in Kenya. This high infection rate could also be due to where the dogs are chained or tied on the ground. This will lead to zooonotic problems especially where children play on the ground or eat the soil (geophagia).

The prevalence of helminth parasites in different age groups of dogs showed highest prevalence in dogs 10-12 months old (79.05%). This figure compares favourably with the findings of Ajayi (1989). Dogs within this age bracket may have high incidence due to their interaction with the ground and the mother dog. Dogs (bitches) within this age group can acquire infection when playing with the soil as well as transmmary infections.

In conclusion, the results obtained in this study indicated that helminths of dogs are common in Jos North and Jos South Local Government areas. The helminths may have adverse effects on the dogs as well as zoonotic implications on man. Therefore, the Centers for Disease Control (CDC) in 1995, suggested a number of ways for the prevention of hookworms of dogs and cat. Most cases of human ascarid and hookworms infections can be prevented by practicing good personal hygiene, eliminating intestinal parasites from pets through regular deworming and making potentially contaminated environments such as saved boxes off limit to children. It is also important to cleanup pet faeces on a regular basis to remove potentially infective eggs before they become disseminated in the environment.

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