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Prevalence of Tick Infestation and Endo Parasites Infection of Dogs in Abuja, Nigeria

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ABSTRACT

A cross-sectional study on the prevalence of ticks, endo, and haemoparasites of dogs in Abuja was conducted. A total of 500 dogs were examined for ticks, endo, and haemoparasites by standard methods. Of the 500 dogs screened, 145 (29.0%) were positive for ticks, 280 (56.0%) were positive for endoparasites, while 55 (11.0%) for haemoparasites. Ticks detected comprised Amblyomma variegatum (1.6%) and Rhipicephalus sanguineus (27.4%), while endoparasites detected included Ancylostoma caninum (12.0%), Dipylidium caninum (10.0%), Isospora oocysts (10.0%), Taenia hydatigena (8.0%), Toxocara canis (12.0%) and Trichuris vulpis (4.0%) and haemoparasites detected were Babesia canis (10.2%) and Ehrlichia canis (0.8%). There was no statistically significant difference in the sex, age, location, and the breeds of dogs with the infestation of parasites. Though the prevalence was higher in females and young dogs examined. It was concluded that some species of the ticks, endoparasites, and haemoparasites present a public health concern considering that dogs are pet and companion animals, therefore regular treatment and tick control should be introduced.

Key words: Abuja, dog, endoparasites, haemoparasites, ticks

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INTRODUCTION

Dogs are the most successful canides, adapted to human habitation worldwide [1]. Dogs have contributed to physical, emotional and social well-being of their owners, particularly children where they are associated with a higher level of self-regard and have been used for hunting, guards, and source of meat for humans and as pet animals [2]. Nevertheless, in spite of their useful effects, dogs remain major threat to public health, as most of them harbour a bewildering number of infective stages of parasites transmissible to man and other domestic animals [3]. Most of these parasites of dog cause infections such as mange, hydatidosis, tungiasis, cutaneous larva migran and visceral larva migran [4]. A number of infections, in particular parasitic diseases, capable of being transmitted from pets to humans, have been reported [5]. In many parts of the world, house hold pets have been found to play a direct role in transmitting zoonotic diseases [6].

Dogs today often serve people in ways similar to those for which the breed was originally domesticated, such as guarding flocks of sheep against predators hunting, as police or army dogs, they lead the blind, patrol and do the kinds of jobs that make people's lives easier and safer [7]. There has been increased interest in keeping dogs in Nigeria mainly as security or pets and in some parts of the country for food. To perform these duties, the dog's ought to be alert and agile. In some parts of Nigeria, despite their role as companion animals, dogs also provide an important source of proteins to humans. Dog meat is a delicacy and highly required in some parts of the Nigeria [3]. There are common beliefs concerning canine cuisines in Nigeria which include prevention of poisoning and protection against witchcraft. Due to these unfounded claims, dogs often get missing especially if they are left to stray [8].

Numerous studies conducted in Nigeria and some parts of the world to evaluate the occurrence of parasitic infections in dogs have revealed dogs to harbour ticks such as *Amblyomma variegatum* and *Rhipicephalus sanguineus* [9], endoparasites such as *Ancylostoma caninum, Dipylidium caninum*, *Isospora oocysts*, *Taenia hydatigena*, *Toxocara canis* and *Trichuris vulpis* and haemoparasites such as *Babesia canis* and *Erhlichia canis* [10]. There is inadequate study on parasites of dogs in Abuja. The clinical signs of parasitic infections in dogs are varied and hardly some infected dogs present no symptom [11]. These factors, coupled with insufficient information by dog keepers on the risks of spreading disease, control of zoonotic diseases transmitted by domestic animals, control of stray dogs and poor level of hygiene have resulted in an increase in risk of exposure to zoonoses transmitted by these animals [12]. The objective of this study, is to determine the prevalence of ticks, helminths and haemoparasites of dogs in the Abuja, Nigeria

MATERIALS AND METHODS

Ethical Statement

The experiment was performed according to the care and use of experimental animals' protocol and was approved by the Faculty of Veterinary Medicine ethics and Research Committee, Ahmadu Bello University Zaria.

Study Area

The study was conducted in Abuja, the Federal Capital city of Nigeria located at the center of the country (longitude 7° 32E and latitude 9° 5N). Abuja is characterized by a tropical wet and dry climate with a warm, humid rainy season (from March to December) and a blistering dry season (December to March) [13]. Abuja has an estimated population of

776,298 people according to census conducted in 2006 [14]. Gbagyi (Gwari) and Bassa are the predominant ethnic groups of the indigenous inhabitants while it's now dominated by all major tribes of Nigeria (Igbo, Hausa and Yoruba) making it a cosmopolitan society. A great percentage of its dwellers are civil servants due to its status as the capital city of Nigeria. The Federal Capital Territory has six area councils namely: The study was conducted in Abuja Municipal, Bwari, Kwali, Kuje, Gwagwalada, and Abaji area councils, all within the savannah belt.

Study Design

A cross-sectional study was used to determine the prevalence of parasites and the risk factors associated with infection in dogs in Abuja FCT. This study was conducted between August, 2019 and February, 2020.

Sample Size Determination

The sample size for this study was determined using Thrusfield [16] formula, with a disease prevalence of 66.9% [15], absolute error of 5%, and a confidence level of 95% by using a simple random sampling design.

$$N = 1.96^2 \times \frac{PQ}{D^2}$$

N = required sample,
P = prevalence of the disease
Q = 1–P
D = level of precision
\About 344 samples was required
However, 500 samples were taken

Inclusion Criteria

Only dogs that were four (4) months and above were sampled
Only dogs owned and kept by residents of Abuja FCT were sampled
Only dogs that were restrained were sampled
Stray dogs were not included in the study

Sample Collection

The study was carried out on dogs owned and kept by residents of Abuja Municipal, Bwari, Kwali, Kuje, Gwagwalada and Abaji Area Council. A total of 500 dogs were sampled for ticks, helminths and haemoparasites. Dogs were thoroughly examined for ectoparasites by combing the body surface on a clean sheet of paper. To facilitate the extraction of ticks, forceps and hand picking were used. Recovered parasites were preserved in 70% alcohol for identification. Five milliliters (5mls) of blood sample were collected aseptically from the cephalic vein of each dog into clean sterile vacutainer tubes containing ethylene diamine tetra-acetic acid (EDTA) for hematology. Faecal samples were collected by rectal stimulation and from freshly voided stool in dog kennel. Samples were placed in clean pre-labeled universal bottles containing 10% formalin for preservation. All samples were taken to the Nigeria Veterinary Research Institute (NVRI) parasitology laboratory, Vom for analysis.

Mounting of Ticks and Identification

Ticks collected were placed on petri dish and observed directly under stereoscopic microscope (dark phase contrast). Ticks were identified using the classification keys of Soulsby [17].

Parasitaemic Examination

Thin and thick blood smears were prepared from blood samples, which were then fixed in absolute methanol for 30 seconds and rinsed off in tap water. Giemsa (10%) was used to stain for 30 minutes. The slides were rinsed off in tap water and air dried before examining under the microscope with x 100 oil immersion lens for haemoparasites which were identified based on the descriptions of Soulsby [17].

Helminthic Examination

Faecal samples collected were transported to the laboratory in pre-labeled universal bottles containing 10% formaldehyde solution. Two grams of faecal sample was weighed and dissolved in 20mls of distilled water. Ten milliliters of the mixture were strained through gauze into a centrifuge tube which was then centrifuged at 500g for 5 minutes. The supernatant was discarded and 3mls of distilled

water was added. This procedure was repeated four times until the supernatant was nearly clear. The supernatant obtained was poured off and 2mls of Zinc sulphate (38.6g/100ml of distilled water) was added to the sediment. The centrifuge tube was filled to within 5mm of the top. Again, it was centrifuged for 5 minutes and the sample was allowed to stand for another 5 minutes. Using a bacteriological loop, several loopfuls were dropped on a microscope slide for examination. Protozoan cysts and helminth eggs were identified based on morphological characteristics as described by Soulsby [17].

Data Analysis

Data obtained were subjected to Chi-square and other statistical analysis using SPSS (Version 20.0) and GraphPad InStat 3 to compare the prevalence between the sex and age of dogs at 0.05 level of significance.

RESULTS

Out of the 500 dogs examined, 145 (29.0%) was positive for tick infestation, 280 (56.0%) was positive for helminths and 55 (11.0%) was positive for haemoparasites. There was statistically significant difference between the rates of infestation of ticks, helminths and haemoparasites ($P<0.05$). Of the 202 male dogs examined for ticks, 54 (26.7%) was positive, and out of 298 female dogs 91 (30.5%) was positive, while out of the 269 female dogs examined for helminths, 157 (58.4%) was positive and of the 231 male dogs, 123 (53.2%) was positive. Out of the 198 male dogs examined for haemoparasites, 17 (5.6%) was positive, while 38 (12.6%) was positive out of 302 female dogs. There was no statistically significant difference between the sex of dogs examined and the rates of ticks, helminths and haemoparasites infestation ($P>0.05$; Table 1).

Table 1: Prevalence of ticks, endo- and haemoparasites of dogs based on sex distribution

Sex	Ticks		Helminths		Haemoparasites	
	Number examined	No. infected (%)	Number examined	No. infected (%)	Number examined	No. infected (%)
Male	202	54 (26.7)	231	123 (53.2)	198	17 (5.6)
Female	298	91 (30.5)	269	157 (58.4)	302	38 (12.6)
Total	500	145 (29.0)	500	280 (56.0)	500	55 (11.0)
Odds ratio		0.830		0.813		0.653
95 % CI		0.558- 1.235		0.570-1.158		0.357-1.192
P value		0.413		0.289		0.211

Table 2 showed age distribution of ticks in dogs, the highest prevalence was observed among dogs <1 year 98 (32.9%) and the least was among dog >1 year 47 (23.3%), while on helminths of dogs, the highest prevalence was observed among dogs <1 year, 189 (63.4%) and the least was among dogs >1 year 91 (45.0%). On haemoparasites of dogs, the highest prevalence was observed among dogs <1 year 51 (17.1%), while the least was among dogs >1 year 4 (1.9%). There was statistically significant difference between the ages of dogs examined and the rates of ticks, helminths and haemoparasites infestation ($P<0.05$).

Table 2 : Prevalence of ticks, endo- and haemoparasites of dogs based on age distribution

Age	Number examined	Ticks	Helminths	Haemoparasites
		No. infected (%)	No. infected (%)	No. infected (%)
< 1 year	298	98 (32.9)	189 (63.4)	51 (17.1)
>1 year	202	47 (23.3)	91 (45.0)	4 (1.9)
Total	500	145 (29.0)	280 (56.0)	55 (11.0)
Odds ratio		1.616	2.115	10.221
95 % CI		1.077 – 2.426	1.470 – 3.044	3.631 – 28.771
P value		0.026	<0.0001	<0.0001

CI: Confident interval

Table 3 showed the distribution of the identified parasites. Among the ticks, 2 species were recorded (*Rhipicephalus sanguineus* and *Amblyomma variegatum*), *Rhipicephalus sanguineus* was detected more than *Amblyomma variegatum* and there was statistically significant association between the parasite's infestation and the species of ticks examined ($P<0.05$). While the helminths identified with high prevalence are *Ancylostoma caninum, Toxocara canis, Dipylidium caninum* and *Isospora oocysts* while the least prevalence was in *Taenia hydatigena* and *Trichuris vulpis*. There was statistically significant association between the parasite's infestation and the species of the helminths examined ($P<0.05$). For haemoparasites, *Babesia canis* was detected with high prevalence than *Ehrlichia canis* and there was statistically significant association between the parasite's infestation and the species of haemoparasites examined (P<0.05).

Table 3 : Distribution of the species of ticks , helminths and haemoparasites identified in digs in Abuja

Parasite types	Parasite's species	No. infected (%)
Ticks	*Rhipicephalus sanguineus*	137 (27.4)
	Amblyomma variegatum	8 (1.6)
	Total	145 (29.0)
	P value	<0.0001
Helminths	*Ancylostoma caninum*	60 (12.0)
	Dipylidium caninum	50 (10.0)
	Isospora oocysts	50 (10.0)
	Taenia hydatigena	40 (8.0)
	Toxocara canis	60 (12.0)
	Trichuris vulpis	20 (4.0)
	Total	280 (56.0)
	P value	0.0028
Haemoparasites	*Babesia canis*	51 (10.2)
	Ehrlichia canis	4 (0.8)
	Total	55 (11.0)
	P value	<0.0001

DISCUSSION

In this study, 29% of the sampled dogs were positive for ticks which include *Amblyomma variegatum* and *Rhipicephalus sanguineus* with prevalence of 1.6% and 27.4%. *Amblyomma* ticks found to be less common in dogs and this would have been transmitted from ruminants [18] mostly in shepherd dogs, and *Rhipicephalus* ticks have been described to parasitize human beings [19] which may transmit rickettsial diseases and visceral leishmaniosis [20]. *Rhipicephalus sanguineus* was the most abundant tick species found here which is in agreement with the reports of Gotsch *et al.* [21], Ekanem *et al*. [22], Adamu *et al*. [1], and was commonly found in dogs in Africa and other countries of the world as reported by Gonzaleza *et al*. [23] and Aldemir [9], whereas *Amblyomma* ticks had been described by Bhatia *et al.* [18], as less common on dogs and picked up from ruminants, especially by shepherd dogs. With respect to sex and age, female dogs were more infested than their male counterparts. This might be due to the fact that, female dogs usually form a sedentary habit during nursing of their offspring: as a result, they easily get infested by ticks. This finding also conforms to the studies of James-Rugu and Jidayi [24] and Tanwia [25]. The infestation rate was higher in the young dogs (less than one year) than the adult (one year and above). This is in contrast to the reports of James-Rugu [26], that adult dogs were more infested by ticks than the young animals. This may be due to close proximity of the young animal's body to the ground. Continho *et al*. [20] described *Rhipicephalus sanguineus* to parasitize humans and may transmit rickettsia diseases and visceral leishmaniosis while *Rhipicephalus sanguineus* has been shown to transmit *Babesia canis* and *Ehrlichia canis* in dogs Bhatia *et al*. [18]. Among the 11% of dogs infected with haemoparasites, the only 2 species of haemoparasites encountered were *Babesia canis* 10.2% and *Ehrlichia canis* 0.8% respectively. *Babesia canis* parasitize and multiply in the erythrocytes leading to anaemia and loss of body condition. *Ehrlichia canis* in dogs can also lead to anaemia and thrombocytopaenia.

Two hundred and eighty (56%) samples were positive for helminth parasites out of the 500 samples of dog collected in Abuja. *Ancylostoma caninum* eggs were isolated from the faeces of 60 dogs (12%) in this study, which is higher than 6.1% reported by Adamu *et al*. [1] in Maiduguri, but lower than 16.9% reported by Ugbomoiko *et al*. [27] in Benin. Work done by Degefu *et al.* [10] in Ethiopia revealed, 64.4% of dogs were positive for helminthes parasites with *Ancylostoma caninum* recording 58.8% prevalence. Differences in frequency of gastrointestinal helminthes infection between countries is possible due to the differences in geographical location and climatic factors required for the ecology of the parasites, veterinary facilities and public awareness to take care of dogs as described by Ugbomoiko *et al*. [27]. *Ancylostoma caninum* and *Toxocara canis* in dogs can cause anaemia, diarrhea and slow growth. *Toxocara canis* may cause death in puppies due to migrating larvae in lungs leading to pneumonia. Yacob *et al*. [28] found out that infective larvae of *Ancylostoma caninum* and *Toxocara canis* could cause creeping eruption and visceral larval migrans respectively, and these constitute an important public health problem.

In conclusion, dogs in Abuja are potential reservoirs of ticks, ticks and endo parasites of zoonotic importance. There is the need for public health education on how to breed dogs, vaccination of stray dogs and periodic

veterinary check-up and treatment of all dogs.

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