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Infection of dogs with *Babesia canis* in Gwagwalada metropolis of Federal Capital Territory, Abuja, Nigeria

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Abstract

Epidemiological investigation was carried out to determine the prevalence of infection with *Babesia canis* in dogs in Gwagwalada metropolis of the Federal Capital Territory, Abuja Nigeria, from November 2013 to January 2014. Blood samples were collected from 101 dogs and examined for the parasite. Data obtained were analyzed to determine the prevalence of *Babesia canis* and the correlation of infection with age, sex, breed, types of management and presence or absence of tick infestation on the animal. Dogs screened were those from randomly selected house holds within the area. Overall results show an infection rate of 9/101 (8.9%). The prevalence was higher (P <0.05) among adults than puppies and also higher (P<0.05) among dogs with tick infestation than those without.

Keywords: *Babesia*, Canine, Epidemiology, Gwagwalada, Prevalence

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Introduction

Babesiosis, a tick-borne protozoan disease of animals caused by the parasite of the genus *Babesia* is of worldwide importance (Irwin, 2005). Infection in dog may occur by tick transmission, direct transmission via blood transfer from dog bites, blood transfusion, or transplacental transmission. The most common mode of transmission is by tick bite, the *Babesia canis* uses the tick as a vector to reach host mammals. Once infected, the *Babesia* organisms multiply within the erythrocytes of the host (Uilenberg, 2006).

Canine babesiosis ranges in severity from relatively mild to fatal and haemolytic anemia is the main clinical sign. Many species of *Babesia* belonging to the two forms of *Babesia* (lager form *Babesia canis* measuring 3-5 µm and smaller form, *Babesia* gibsoni measuring 1-3 µm) are pathogenic to the dog. The major *Babesia canis* are both host and vector specific; thus *Babesia canis* (subtype *vogeli*) is found exclusively in the dog with the tick *Rhipicephalus sanguineus* as its major vector (Soulsby 1982). *Babesia gibsoni* occurs mainly in Asia, North America and North and East Africa (Taboada, 1998). The common brown dog tick, *R. sanguineus* is the most predominant dog ticks in Nigeria. It does not readily attack humans but usually prefers non-human hosts for completion of its development (Okoli *et al*., 2006).

Canine babesiosis is endemic in Nigeria and according to Dipeolu (1975), tick vectors of *Babesia canis* occur in large numbers in most parts of Nigeria. The prevalence of babesiosis varies from one part of the country to another as Oduye and Dipeolu (1976) noted from blood smears of 500 dogs in Ibadan, Nigeria, that *Babesia canis* accounted for 53% parasitemia. Saror *et al*. (1979) on examining 254 dogs in Zaria for blood parasites found out that 22% had *Babesia canis*; Odewunmi and Uzoukwu (1979) while investigating the prevalence of blood parasites in 116 dogs at Enugu found out that *Babesia canis* accounted for 55.1%. *Babesia canis* can affect dogs of all ages, although young dogs are mostly affected (Lobetti, 1998).

Babesiosis is a source of worry to dog owners. In Gwagwalada metropolis, dogs are kept mainly as household guards and to a lesser degree, as pets. Hence, most dogs are prone to ectoparasites infestation. This study was prompted by increasing population of dogs occasioned by the rising security challenges and the large number of cases of tick infestation in dogs presented to clinics within and around Gwagwalada metropolis. The study was therefore aimed at investigating the prevalence of *Babesia* infection in dogs and the possible correlation between age, sex, breed, management and presence or absence of tick infestation and infection rate for the purpose of prophylaxis and effective control of the disease.

Materials and methods

Study area

Gwagwalada metropolis is within Gwagwalada Area Council which is one of the six Area Councils of the Federal Capital Territory, Abuja, Nigeria. The town lies between latitudes 8^{o}-25^{11} and 9^{o}-29^{11} N and longitudes 6^{0}-45^{11} and 7^{o}-45^{11} E. It has a guinea savannah type of vegetation, with raining season stretching from April to October and dry season from November to March.

Study population

Blood samples were collected from 101 apparently healthy and asymptomatic dogs in randomly selected households in Gwagwalada metropolis. The study was carried out between the months of November 2013 and January 2014 (early dry season). Their age, sex, breed, management and ticks infestation were also recorded.

Collection and examination of blood

2ml blood sample were collected aseptically, using disposable syringes from the cephalic vein of each dog into heparinized tubes and sent to the Parasitology and Entomology laboratory of the Faculty of Veterinary Medicine, University of Abuja for examination. A drop of blood was placed near one end of a clean glass slide and a spreader was used to prepare the thin smear. The smear was allowed to air-dry. The dried blood smear was fixed in Methylalcohol (absolute) for 2 minutes and allowed to dry. The smears were placed on a staining trough and stained with 3% Giemsa stain for 30 minutes. After that, the smears were washed with phosphate buffered saline (PBS) to remove excess stains. The slides were then air-dried and examined under oil immersion (x100) lens for *Babesia*.

Statistical analysis

The data collated were analyzed using descriptive statistics (percentages and tabulations). The chi square and odds test was used to determine the association between the occurrence of *Babesia canis* in relation to age, sex, breed, degree of confinement and level of tick infestation. Values of $P<0.05$ were considered significant.

Results

The infection of dogs by *Babesia canis* in Gwagwalada Area Council of the Federal Capital Territory based on age is as shown in Table 1. A total of one hundred and one (101) dogs were sampled in the area, 57 were adult dogs with age ranging from six months and above, while 44 were puppies less than six months old. Nine (15.8%) out of the 57 adult dogs were infected with *Babesia canis*. No *Babesia canis* was detected in the blood sample of the puppies. There was statistically significant association ($X^2 = 8.568$, $P<0.05$) between age of dogs and infection with *Babesia canis*.

Table 2 shows infection of dogs with *Babesia canis* based on sex of the dog. Out of the 101 total sampled dogs, 59 were males while 42 were females. Six (10.2%) males and 3(7.1%) females were infected with *Babesia canis*, while no *Babesia canis* were found in 53 males and 39 females respectively. There was no statistically significant association ($X^2 = 0.324$, $P>0.05$) between occurrence of infection based on sex of dogs sampled.

Table 1: Age distribution of *Babesia* infection in dogs in Gwagwalada Area Council, FCT

Age	No. of dogs sampled	No. (%)infected	No. (%) not infected
Adult(>6mnths)	57	9(15.8)	48(84.2)
Puppy (<6mnths)	44	0(0)	44(100)
Total	101	9(8.9)	92(91.1)
$\chi^2 = 8.568$	DF=1	P=0.003	

Table 2: Sex distribution of *Babesia* infection in dogs in Gwagwalada Area Council, FCT

Sex	No. of dogs sampled	No. (%)infected	No. (%) not infected
Male	59	6(10.2)	53(89.8)
Female	42	3(7.1)	39(92.9)
Total	101	9(8.9)	92(91.1)
χ^2 = 0.324	DF=1	P=0.569	

Table 3: Breed distribution of *Babesia* infection in dogs in Gwagwalada Area Council, FCT

Breed	No. of dogs sampled	No. (%)infected	No. (%) not infected
Local	46	5(10.9)	41(89.1)
Foreign	55	4(7.3)	51(92.7)
Total	101	9(8.9)	92(91.1)
χ^2 = 0.089	DF=1	P=0.766	

Table 4: Prevalence of *Babesia canis* in relation to confinement in Gwagwalada Area Council, FCT

Confinement	No. of dogs sampled	No. (%)infected	No. (%) not infected
confined	70	4(5.7)	66(94.3)
Not confined	31	5(16.1)	26(83.9)
Total	101	9(8.9)	92(91.1)
χ^2 = 1.945	DF=1	P=0.163	

Table 5: Prevalence of *Babesia canis* in relation to tick infestation in Gwagwalada Area Council, FCT

Tick infestation	No. of dogs sampled	No. (%)infected	No.(%) not infected
Present	44	8(18.2)	36(81.8)
Absent	57	1(1.8)	56(98.2)
Total	101	9(8.9)	92(91.1)
χ^2 = 5.993	DF=1	P=0.014	

Table 3 presents the breeds of dogs sampled in relation to infection with *Babesia canis*. 46 and 55 out of the total sampled dogs were local and foreign breeds respectively. 5(10.9%) of local and 4(7.3%) of foreign dogs were infected with *Babesia canis* respectively. There was no statistically significant association (X^2 = 0.089, P>0.05) between breed and infection with *Babesia canis*.

Table 4 shows the management of dogs in relation to *Babesia canis*. 31 out of the total 101 sampled dogs were not confined while 70 dogs were confined. 5(16.1%) of the non confined dogs were infected with *Babesia canis* while 26 were negative. 4(5.7%) of the confined dogs were infected while 66 were not infected. Statistically, there was no significant association (X^2 = 1.945, P>0.05) between the management style of the dogs and infection with Babesia.

Table 5 describes the rate of infection in relation to tick infestation. Of the 101 dogs sampled, 44 had tick infestation on their body while 57 were free of tick infestation. 8(18.2%) of the 44 tick-infested dogs were infected with *Babesia canis* while 36 of the infested dogs were free of *Babesia canis*. Only one (1.8%) out of the 57 non-tick-infested dogs was positive for *Babesia canis*, while 57 were negative of *Babesia canis*. Statistically, there was significant relationship (χ^2 = 5.993, P<0.05) between the presence of ticks and *Babesia canis*.

Discussion

Babesia infection is highly pathogenic and is the major cause of haemolytic anaemia in dogs in the tropics (Kamani *et al.*, 2011) *Babesia* is among the most widely distributed haemoparasites of dogs occurring in almost anywhere the tick vector *Rhipicephalus sanguineus* is reported (Taylor *et al.,* 2007). The present study shows an 8.9% prevalence of *Babesia canis* in dogs in Gwagwalada Area Council of the Federal Capital Territory, Nigeria. This result is similar to the earlier studies of Obeta *et al.* (2009) which recorded 11.66% prevalence of haemoparasites of dogs in the same study area during the months of October to December. Also earlier study carried out in Makurdi by Amuta *et al*. (2010) during the months of February and May recorded 10.2% infection rate, which was slightly higher than the result of the present study probably due to geographical differences and period of the study resulting to differences in tick availability may have contributed to the lower prevalence in Gwagwalada.

The prevalence rate of *Babesia* infection was significantly higher among adult dogs than pups. This probably reflects that older dogs have more time in their life to become infected. It could also be due to lowered immunity/resistance associated with older dogs as a result of frequent exposures to tick bites (Egege *et al*., 2008). This was in agreement with Obeta *et al*. (2009) that recorded higher prevalence of blood parasites among older dogs than puppies, but in contrast to the report of Okubanjo *et al*. (2013) who reported a higher prevalence in younger dogs below one year than in older dogs, although, the age bracket used by Okubanjo *et al*. (2013) is higher than the one used in this study. The infection rates among gender showed no significant difference. However, the higher rate of infection observed among male dogs than their female counterparts could be due to their frequent roaming in search of mates and establishing territories thereby picking the vectors. This agrees with earlier studies carried out by other researchers that gender generally does not play a major role in susceptibility to parasitic infections in dogs (Omudu *et al*., 2007). This was contrary to earlier findings of Obeta *et al*. (2009) that bitches had a higher infection rate of haemoparasites than the males, though not significant.

The breeds of dogs identified include foreign (exotic) and local breeds. The higher prevalence of babesiosis was found in local dogs than exotic though statistically not significant. The result could be due to nonchalant attitude of local dog owners who rarely treat or even immunize them (Amuta *et al,* 2010). This is in agreement with the study carried out in Markurdi which indicated a significantly higher rate of *Babesia* infection among local breeds than exotic breeds.

Dogs were grouped based on the degree of restriction; as not confined or confined. There was no significant difference in the infection rates among the non-confined and the confined dogs though the infection rate is higher in the former than the later. This could be attributed to continuous exposure of non-confined dogs to the parasite vectors than the confined ones (Tinoco-Gracia *et al*., 2009). This is in agreement with earlier studies of Obeta *et al*. (2009) indicating higher prevalence of blood parasites among non-confined dogs than confined ones.

There was a higher prevalence of canine babesiosis in dogs with tick infestation than those without. All the dogs infected with the *Babesia canis* were as well infested with the tick vector indicating that the tick is responsible for the transmission of the parasite. The prevalence of canine *Babesia canis* in this study was low, despite the heavy infestation of dogs with ticks. Mamman and Abdullahi (1989) and Carter (2001) reported similar findings and reasoned that pre-immunity against the disease in dogs found in endemic areas was the factor for the low prevalence.

In conclusion, the clinical and epidemiological implications of babesiosis in infected dogs and those at risk cannot be overemphasized as this could influence their nutritional, physiological and behavioural well-being (Mamman & Abdullahi, 1998; Jacobson *et al*., 2006; Carter, 2001). Prevention and control can only be achieved through administration of prophylaxis, weekly bathing with acaricides, monitoring and grooming of dogs, fumigation of kennels and houses and above all, provision of laws to enforce a high standard of public and veterinary health.

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