Prevalence of *Rhipicephalus sanguineus* and *Babesia canis* infection among dogs in Ugep, Yakurr Local Government Area of Cross River State, Nigeria

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***Abstract*: - Epidemiological investigation on the prevalence of brown dog tick (*Rhipicephalus sanguineus*) and *Babesia canis* infection among household dogs was conducted in Ugep between March and August 2018. A total of 200 dogs randomly sampled from the four wards of Ugep were examined for tick infestation and *B. canis* infection. Of the 200 local and exotic dogs screened, 160 (80.0%) were positive for *R. sanguineus*. Out of 300 *Rhipicephalus sanguineus* collected, the most preferred sites for tick attachment were the ear 152 (50.7%), back 92 (30.7%), inter-digital space 28 (9.3%), neck 17 (5.7%) and abdomen 11 (3.7%). There was significant difference ($x^2 = 88.8$. $p< 0.001$) in the prevalence of *R. sanguineus* according to the months of the year. Parasitological examination of 200 blood samples from randomly selected dogs in the four wards of Ugep, revealed that 23 (11.5%) were infected with *B. canis*. Blood samples screened from local and exotic breeds showed higher infestation of babesiosis in local dogs than exotic, although statistically insignificant ($x^2 = 3.9$ $p > 0.05$) Male dogs were more infected 14 (12.4%) than females 9 (8.0%), with significant difference of ($x^2 = 9.3$ $p < 0.01$). In respect to age, dogs within age group 1 – 6 showed the highest 11 (17.2%) infestation with significant difference of ($x^2 = 14.3$ $p < 0.01$) between age groups. The high prevalence of *R. sanguineus* is of public health importance.**

Keywords: **Epidemiology, *Rhipicephalus sanguineus*, *Babesia canis*, Ugep, Cross River, Nigeria.**

I. INTRODUCTION

Rhipicephalus sanguineus also known as the brown dog tick is the most cosmopolitan species among the families transmitting a wide range of pathogens to dogs and other animals, including humans [1],[2],[3],[4]. Among different species of ticks infesting dogs, the brown dog tick (*R. sanguineus*) is the most common worldwide [5],[6],[3]. Other ixodid ticks infesting dogs include haemaphysalis, Ixodes, Booophilus, Dermacentor and Amblyomma species and occur at varying level of prevalence in different parts of the world [7],[8],[9]. *Otobius megnini* is the only soft tick species found in dogs [10]. The common brown dog tick (*R. sanguineus*) is the most predominant dog tick in Nigeria [11]. It does not readily attack humans but usually prefers non-human hosts for completion of its development [12]. Babesiosis is a tick-borne protozoan disease of domestic and wild animals caused by the parasite of the genus Babesia [13],[14]. The disease is world widely distributed [15],[16]. The disease is transmitted by tick bite, and the *Babesia canis* uses the tick as a vector to reach host mammals [11]. Once infected, the Babesia organism multiply within the erythrocytes of the host [17]. Dogs (*Canis farmilaris*) are the most widely kept working, hunting and companion animal in human history, and they provide assistance to individuals with physical or mental disabilities [18]. The playfulness of dogs and their ability to learn and fit into human household are the attributes which have earned them unique relationship with humans [19]. The use of dogs for security, as pet and even serve as meat has been on the increase in Ugep, Yakurr Local Government Area of Cross River State, Nigeria. As good as these services are welcome by households; there is need for information on the zoonotic implication of keeping dogs as pet and for food by household. This investigation is therefore aimed at determining the prevalence of *R. sanguineus* and *B. canis* infection of household dogs in Ugep.

II. MATERIALS AND METHODS

2.1 The study area.

The study was conducted in Ugep in Yakurr Local Government Area of Cross River State, Nigeria. Ugep lies between latitudes 4^0 and 6^0North of the Equator and longitudes 6^0 and 8^0 East of the Greenwich Meridian. The area is populated largely by the Yakurr people who are primarily subsistence farmers. The Efiks, Ibibios and other ethnic groups are resident here. The long dry season, and humid weather conditions of the area, favoured development of pathogens.

2.2 Ethics Statement

Ethical clearance was received from the ethics committee of Cross River University of Technology, Calabar. I also had verbal clearance from dog owners after explaining the essence of the study to them. Each dog was treated after blood collection.

2.2 Study Population

Ticks and blood samples were collected from 200 randomly selected dogs (113 males and 87 females) from households in Ugep. The dog sex, age, and breed were also recorded. Ticks

were collected from the ear, neck, back, inter-digital spaces and abdomen.

2.3 Collection and Processing of Blood Samples

About 2ml of blood were collected using disposable syringes from the ear vein of each dog into heparinized vials, before transportation to the Biological Science laboratory of Cross River University of Technology for parasitological processing. In the laboratory, a thin blood smear was prepared. The smear was air-dried and fixed in absolute methyl alcohol for 5 – 7 minutes, before staining with Giemsa stain solution for 30 minutes. The smears were cleared of excess stain by washing them with distill water before examination under the microscope.

2.4 Identification of Parasite

The parasite, Babesia canis, was identified by its' oval-shaped form seen in the erythrocytes as described by [20].

2.5 Statistical Analysis

Data collected were subjected to chi-square test analyses to determine the prevalence of *Babesia canis* in relation to age, sex, and breed of dog.

IIII. RESULTS

Out of 200 dogs examined for ticks infestation, 160 (80.0%) were infested with *Rhipicephalus sanguineus* (Table 1). There was significant difference (x^2 = 88.8. p < 0.001) in the prevalence of *R. sanguineus* between months. In Table 1, Ketabebe council ward had the highest prevalence of 62 (31.0%), followed by Lekpankom 53 (26.5%) and then Yenon 43 (21.5). April had the highest prevalence of ticks (19.4%) and August the least (15.0%).

Prevalence of *B. canis* in household local and exotic dogs is shown in Table 2. A total of 23 out of 123 blood samples of local dogs examined for parasites, 6, 5, and 4, in Ketabebe, lekpankom and Yenon council wards respectively were positive for *B. canis*. For the exotic breed, 3, 3, and 2 dogs from Ketabebe, lekpankom and Yenon respectively were infected. A total of 15 local and 8 exotic breeds were infected with *B. canis*. There was no significant difference (x^2 = 3.9. p > 0.05) in the infection of local and exotic dogs (Table 2)

Table 3 illustrates prevalence of *B. canis* among household dogs according to sex. From 113 male blood samples of dogs examined, 14 (12.4%) were positive for *B. canis*, while out of 87 female blood samples screened, 9 were positive. There was significant difference (x^2 = 9.3. p < 0.01) in the infection of *B. canis* among male and female dogs.

Age related prevalence of *B. canis* among 200 dogs examined, dogs between 1 – 6 months revealed the highest infection11 (17.2), compared to those between 7 – 12 months 7 (11.1%) and above 12 – 108 month 5 (6.8%). There was significant difference (x^2 = 14.3. p < 0.01) in the infection of *B. canis* according to the age of dogs (Table 4).

The distribution of ticks according to their site of predilection is shown on Plate 1. An overall 300 ticks were collected from the preferred sites of tick attachment. The ear revealed the highest preferred site of tick attachment 152 (50.7%). The back showed the second preferred site of tick attachment in dogs 92 (30.7%).

Babesia canis recovered from the blood of sampled dogs and their vector, *Rhipicephalus sanguineus*, are shown in Plates 2 and 3 reapectively.

Table 1.Prevalence of *R. sanguineus* in relation to location and month

Month	Number examined	Location			% Prevalence
		Ketabebe	Lekpankom	Yenon	
March	32	9	10	6	25 (78.1)
April	35	11	10	10	31 (88.6
May	34	14	8	7	29 (85.3)
June	33	9	Ii	5	25 (75.8)
July	34	9	8	9	26 (76.5)
August	32	10	8	6	24 (75.0)
Total	200	62 (31.0)	53 (26.5)	43 (21.5)	160 (80.0)

x^2 = 88.8 Df = 15 p < 0.001)

Table 2. Prevalence of *Babesia canis* in household dogs of Ugep in relation to breed

Breed	Number examined	Number infected			
		Ketabebe	Lekpankom	Yenon	Total infection (%)
Local	123	6	5	4	15 (12.2)
Exotic	77	3	3	2	8 (10.4)
Total	200	9	8	6	23 (11.5)

x^2 = 3.9 Df = 2 p > 0.05

Table 3. Prevalence of Babesia canis in household dogs of Ugep in relation to sex

Sex	Number examined	Number infected			
		Ketabebe	Lekpankom	Yenon	Total Infection (%)
Male	113	6	3	5	14 (12.4)
Female	87	3	4	3	9 (10.3)
Total	200	9	7	8	23 (11.5)

x^2 = 9.3. Df = 2 p < 0.01)

Table 4.Prevalence of *Babesia canis* among household dogs in relation to age

Age (Months)	Number examined	Number infected			
		Ketabebe	Lekpankom	Yenon	Total infection (%)
1 – 6	63	3	3	1	11 (17.2)
7 – 12	64	3	4	4	7 (11.1)
13- 108	73	2	2	1	5 (6.8)
Total	200	8	9	6	23

(x^2 = 14.3. Df = 4 p < 0.01)

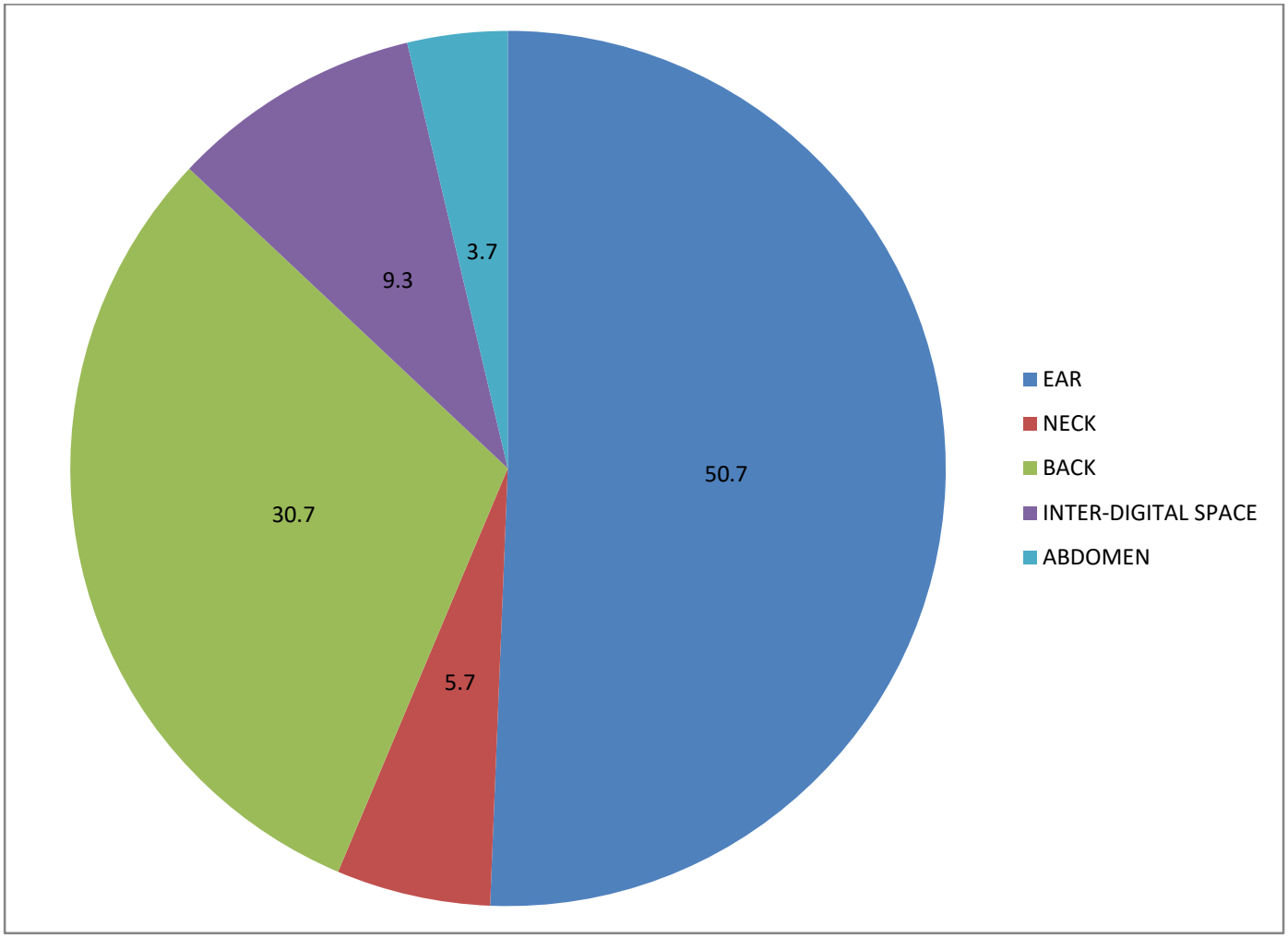

Plate 1. Pie chart showing prevalence of *R. sanguineus* on dogs in relation to preferred site of attachment

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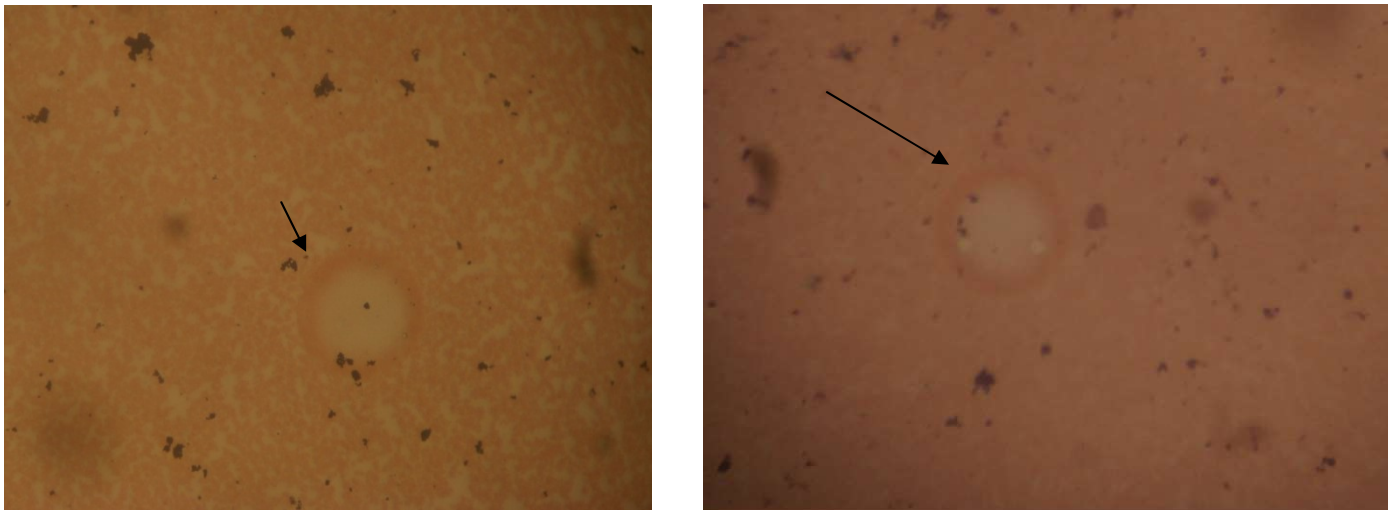

Plate 2. *Babesia canis* **x**40mg

Plate 3. Rhipicephalus sanguineus x40mg

IV. DISCUSSION

The prevalence of 80.0% (160/200) *Rhipicephalus sanguineus* and 23 (11.5%) of *Babesia canis* infection of household dogs in Ugep corroborates the studies of some researchers in Nigeria as [21], in Calabar; [22] in Maidugiri; and [23] in Ogun State, who reported 77.6%, 96.0% and 68.2% respectively. A total of 300 *R. sanguineus* were collected from local and exotic dogs in the study area. The high prevalence of *R. sanguineus* in this investigation is not unconnected with the high humidity and vegetation cover in the study area, which

provided a conducive environment and protection for it, as earlier reported in [22].

There was significant difference in tick infestation of dogs based on predilection site of attachment. The ear was revealed in this study as most preferred site of attachment as shown in Plate 1. It could be inferred that tick preferential attachment is controlled by certain qualities in its host skin like temperature, thinness of skin and easy contact with blood vessels. The dog ears have all these qualities and therefore most infected. Similar reports have earlier been given as in [22], [24].

Babesia canis is highly pathogenic and is the major cause of haemolytic anaemia in dogs in the tropics [25]. The present study revealed 11.5% prevalence of *Babesia canis* in dogs at Ugep, Yakkur Local Government Area of Cross River State, Nigeria. This result supports previously reported findings of [14], [25], [26], [27], [28], who recorded 10.2%, 10.2%, 11.66%, 12.19, and 17,3% respectively, of *Babesia canis* infection in dogs. However, the result in this study is at variance with the findings of [29], [30], [31], who recorded 30.3%, 42.0% and 45.0% respectively of *Babesia canis* prevalence in dogs. The difference in low prevalence rate of 11.5% in the study area could be attributable to the season, immune status of the host, prevalence of tick population and increased veterinary management practices in Ugep as earlier observed by [30]. Canine babesiosis is caused by a protozoan in the genus *Babesia* and transmitted by Ixodid ticks like *R. sanguineus*. This is the most prevalent tick in the study area and therefore implicated as the vector of *Babesia canis* as earlier reported by [32]. In the present study, local dogs were more infected than exotic dogs. This result agrees with the findings of [33], [11]. The higher infestation of local dogs could further be explained by their straying attitude into dirty environment where they are easily contaminated. This observation is in line with the report of [14]. There was significant difference in gender infestation of babesiosis with males being more infected than females. One could infer that the frequent roaming about of local male dogs in search of mates and food in contaminated areas, predisposes them to tick vectors of *Babesia canis*. In most cases, female dogs are restricted to their kernels especially during delivery and breast feeding of puppies, thus less infected. This agrees with earlier studies of [11], [28], but in contrast to the report of [24], who posited that female stress during pregnancy and parturition reduces their immune status and therefore more susceptible to infection. Babesiosis infection was highest in dogs between 1 – 6 months than those above this age bracket. Explanation to this could be that younger dogs of less than 6 months of age are highly susceptible to babesiosis because of their underdeveloped immunity as earlier reported by [34], [14], [25], [30]. Babesiosis have been reported by several researchers in different age groups of dogs, indicating that age is not the major factor for transmission, but the host immunity status and the transmitting vector. It was observed that despite the beneficial effects of dogs to man, their close bonds to human poses a threat to public health, since dogs harbour a bewildering number of infective stages of parasites transmissible to man and other domestic animals. This observation conforms to the findings of [35], [36]. *Rhipicephalus* ticks have been described to parasitize humans as in [3], and may transmit rickettsial disease as in [37] and visceral leishmaniasis as in [38]. *Babesia* species (*Babesi microti* and *Babesia divergens*) have been implicated as the ethiological agents of human babesiosis in North America and Europe, with 92 cases already reported in Europe by [20].

The increasing acquisition of dogs as pets, guards and even for meat, poses great danger to zoonotic babesiosis and public health in the study area. Dog owners should be able to wash dogs with appropriate chemicals as a means of ameliorating the burden of *R. sanguineus* infestation and babesiosis, which in turn enhance good marketability.

In conclusion, this study revealed high infestation of babesiosis in dogs, due to the presence of abundant *R. sanguineus*, the vector of *Babesia canis*. Although *Babesia canis* are large organisms that appear a singular or paired piroplasm and may be oval, pears-shaped or ovoid, in this study the ovoid form was recovered. Ears of dogs were the most preferred site of *R. sanguineus* attachment, while male dogs were more infected than female. I therefore advocate for improved veterinary services on dogs by dog owners to keep zoonotic babesiosis at bay in the study area.

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