Journal of Veterinary and Biomedical Sciences
Vol. 6 (2) 28–35, 2024 ISSN: 2659–0743
DOI: 10.36108/jvbs/4202.60.0240

Prevalence of Canine Babesiosis in Kuje Metropolis, Federal Capital Territory, Nigeria

Obeta Sylvester Sunday[1]*and Dem Fidelis Terka[1]

[1]Department of Parasitology and Entomology, Faculty of Veterinary Medicine,

University of Abuja, Nigeria

Corresponding author: Sylvester Sunday Obeta

Email: Sylvester.obeta@uniabuja.edu.ng

Abstract

Haemoparasiti cinfections in dogs, particularly those transmitted by ticks, are significant contributors to Canine Vecte r Borne Diseases (CVBD), posing both veterinary and public health risks. This study aimed to assess the prevalence of haemoparasites and some associated risk factors in dogs within the Kuje metropolis, Federal Capital Territory (FCT), Nigeria. A cross-sectional survey of 200 dogs was conducted during an antirabies campaign programme between March and July 2022. Blood samples were collected and analyzed for haemoparasites using Giemsa-stained thin blood smears. Results revealed an overall prevalence of haemoparasitic infection, with Babesia sp. being identified as the sole blood parasite present. Adult dogs (>1 year) showed a slightly higher infection rate (18.7%) compared to younger dogs (16.8%), while male dogs (17.3%) were marginally more infected than females (16.7%). Exotic breeds had a higher prevalence (18.2%) compared to local breeds (16.6%). Tick infestation gave a positive correlation with infection, with all infected dogs having tick infestation. Differences in Babesia infection based on sampling locations were observed, with Kayarda area having the highest prevalence (32.4%). Packed Cell Volume (PCV) of less than 35% was recorded among the infe cted dogs while the uninfected had PCV of between 35% 55%, thus, highlighting anaemia as a major consequence of Babesia infection. Risk factors considered were age, sex, breed, coat color and tick infestation. The findings underscore the need for effective tick control strategies to reduce the burden of haemoparasitic infections in dogs within the study location.

Keywords: *Canine, Babesia, Tick infestation, Kuje*

1.0 Introduction

Haemoparasites are unicellular protozoan organisms that invade the blood cells of their hosts, particularly red blood cells,

causing a variety of debilitating conditions [1] In dogs, these infections are collectively known as Canine Vector-Borne Diseases (CVBD), and are primarily transmitted by arthropod vectors like ticks and flies [1]. These vectors play a crucial role in spreading diseases by introducing parasites during blood meals. Ticks, in particular, are among the most significant vectors, second only to mosquitoes in their capacity to transmit a range of infectious agents such as protozoa, bacteria, and viruses [2]. The transmission of haemoparasites by ticks has significant consequences for both veterinary and public health, as some of these diseases are zoonotic, meaning they can be passed from animals to humans [2].

Among the most commonly transmitted haemoparasites are *Babesia*, *Ehrlichia*, *Anaplasma* and *Trypanosoma*, which cause diseases that vary in severity depending on the parasite involved and the immune status of the host [3]. These pathogens can cause a range of clinical signs in dogs, including anemia, jaundice, lethargy, and even neurological symptoms in severe cases [3]. *Babesia canis*, for example, is one of the most common and significant haemoparasites affecting dogs, causing babesiosis, a disease marked by the destruction of red blood cells and subsequent anemia. The brown dog tick, *Rhipicephalus sanguineus*, serves as the primary vector for *Babesia canis*, particularly in warm, humid environments [4].

Climate change has further exacerbated the spread of tick-borne diseases, as warmer temperatures allow tick populations to thrive in regions where they previously could not survive. Studies have shown that ticks are expanding their geographical range, with migrating birds also contributing to the spread of both ticks and haemoparasites to new areas [4]. This expansion of tick populations, driven by environmental changes, increases the interactions between vectors, pathogens, and hosts, heightening the risk of infection in previously unaffected regions [5]. As a result, there could be increasing concern about the emergence of CVBD in new areas, which poses significant challenges for both veterinary and public health.

In Nigeria, where dog ownership has been on the rise for various purposes such as hunting, guarding, and companionship, the prevalence of haemoparasitic infections has become a growing concern [5]. Studies have documented a high incidence of haemoparasites in dogs across different regions, with species such as *Babesia*, *Ehrlichia*, and *Anaplasma* frequently detected [6]. The clinical impact of these infections can be severe, often leading to significant economic losses for dog owners due to the costs associated with treatment and, in some cases, the death of infected animals [7]. Moreover, the zoonotic potential of these pathogens poses additional public health risks, underscoring the importance of routine screening and control measures.

The growing prevalence of tick-borne haemoparasitic infections highlights the need for comprehensive studies aimed at understanding the factors that contribute to the spread of these diseases. This includes assessing the prevalence of haemoparasites in different geographical locations and identifying risk factors that may increase the susceptibility of dogs to infection. In light of the public health implications, it is essential to develop effective strategies for controlling tick populations, improving diagnostic tools, and implementing preventive measures to protect both animals and humans from these diseases. Therefore, this study focused on determining the prevalence of haemoparasites in dogs within the Kuje metropolis, FCT, Nigeria, while also evaluating some intrinsic factors that may contribute to the vulnerability of dogs to CVBD.

2.0. Materials and Methods

2.1. Study area

The research was conducted in Kuje, one of the six Area Councils of the Federal Capital Territory (FCT). Kuje is characterized by significant seasonal rainfall variations, with the rainy season extending from April to October, peaking in August with an average accumulation of 9.4 inches of rainfall. The area's climatic extremes include a minimum temperature of 24.3°C in August and a maximum of 31°C in March [8]

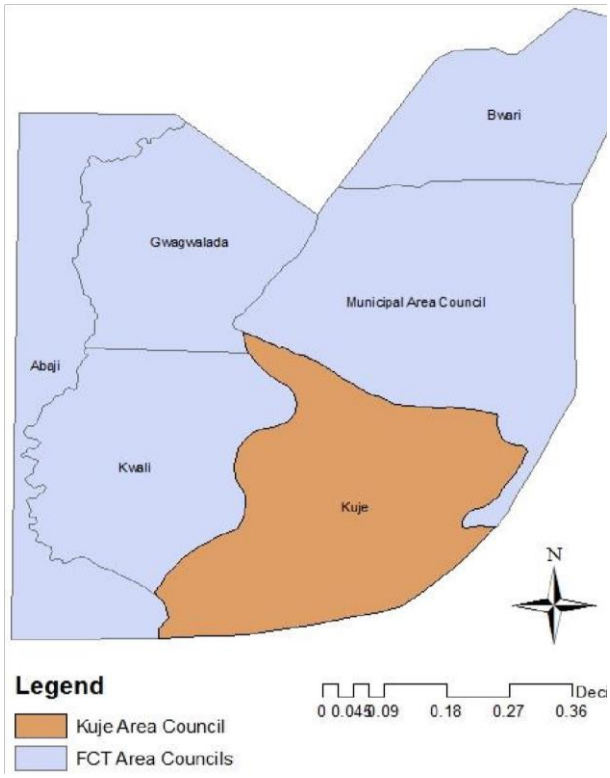

Fig 1: Kuje area council (https://www.researchgate.net/publication/309714528)

2.2. Study Design

This study was carried out, using crosssectional design as described by Edema, et al [9]. A total of 200 dogs were selected through random sampling during an antirabies vaccination campaign between March - July 2022.

2.3. Blood sampling and analysis

Blood samples (~4 mL) were collected aseptically from the cephalic vein of the dogs examined, using 5 mL syringes and 23-gauge needles, stored in bottles containing EDTA, and transported to the Parasitology and Entomology Laboratory of the Faculty of Veterinary Medicine, University of Abuja, Abuja, for further analysis.

2.4. Parasitological Examination

Thin blood smears were prepared on glass slides using a drop of peripheral blood. The slides were air-dried, fixed, using methanol, and stained with 10% Giemsa stain. Haemoparasites were identified through microscopic examination, as described by [10].

2.5. Determination of Packed cell volume (PCV)

The PCV was measured using the microhaematocrit centrifugation technique. Blood was collected into microhaematocrit tubes, sealed, and centrifuged at 1500g for 3 minutes. Packed cell volume readings were taken using a haematocrit reader.

2.6. Data analysis

Data generated were expressed in percentages and further analyzed using Statistical Package for Social Sciences (SPSS). Pearson's Chi-sqaure test was em ployed to evaluate the prevalence of haemoparasites with regards to age, sex, breed, coat color, tick infestation, and level of PCV. A significance threshold of $P < 0.05$ was set for statistical analyses.

3.0. Results

The result of this study showed that out of the 200 dogs screened for haemoparasites, 34 (17.0%) were infected, while 166 (83.0%) were uninfected.

3.1. Prevalence of Haemoparasites of dogs in Relation to Breed

Out of 55 exotic breeds examined for haemoparasites, 10 (18.2%) were infected, while 145 of the local breeds of dogs examined, showed that 24 (16.6%) were infected (Table 1). Prevalence of blood parasites in dogs was higher in exotic breed than the local breed 24 (16.6%), however, this difference was not significant.

Table 1: Prevalence of haemoparasite of dogs in relation to Breeds

Breed	No. Examined	No Infected (%)	No. uninfected (%)
Local Breed	145	24 (16.6) *	121 (83.4)
Exotic Breed	55	10 (18.2) *	45 (81.8)
Total	**200**	**34 (17.0)**	**166**

Legend– Same number of asterisks are not significant (p>0.05)

3.2. Prevalence of haemoparasites of dogs in relation to Age

Out of the 91 adult dogs (>1 year) examined, 17 (18.7%) were infected while 17 (15.6%) of the 109 young dogs (≤1 year), were infected, (Table 2). Although the adult dogs examined showed a slightly higher prevalence of *Babesia* infection, this was not significant.

Table 2: Prevalence of haemoparasites of dogs in relation to Age

Age group	No. Examined	No. Infected (%)	No. Uninfected (%)
Young (≤ 1 year)	109	17 (16.8) *	92 (84.4)
Total	**200**	**34**	**166**
Adult (> 1 year)	91	17 (18.7%) *	74 (81.3)

Legend– Same number of asterisks are not significant (p>0.05)

3.3. Prevalence of haemoparasites of dogs in relation to Sex

Out of 110 male dogs examined, 19 (17.3%) tested positive, while 15 (16.7%) out of 90 female dogs examined were infected (Table 3). There was no significant difference (X^2= 0.013, df= 1, P=0.910). in infection between the male and female dogs.

Table 3: Prevalence of haemoparsites of dogs in relation to Sex

Sex	No. Examined	No. Infected (%)	No. Uninfected (%)
Male	110	19 (17.3) *	91 (82.7)
Female	90	15 (16.7) *	75 (83.3)
Total	**200**	**34**	**166**

Legend– Same number of asterisks are not significant (p>0.05)

3.4. Prevalence of haemoparasites in relation to coat colour

Dogs with light coat showed a higher prevalence of haemoparasites, with 25 out of 120 (20.8%) testing positive, compared to 9 out of 80 (11.3%) dark-coated dogs (Table 4). This difference was statistically significant ($X^2 = 6.684$, df = 1, P = 0.035).

Table 4: Prevalence of haemoparsites of dogs in relation to Coat colo

Coat Colour	No. Examined	No. Infected (%)	No. Uninfected (%)
Light Colour	120	25 (20.8) *	95 (79.2)
Dark Colour	80	9 (11.3) **	71 (88.7)
Total	**200**	**34**	**166**

Legend– Different n umber of asterisk s are significantly diff erent (p<0.05)

3.5. Prevalence of haemoparasites of dogs in relation to Tick infestation

Tick infestation showed a strong correlation with haemoparasitic infection. Of the 109 tick-infested dogs, 34 (31.2%) were significantly (p<0.05) infected with haemoparasite, whereas the 91 dogs without tick infestation had no haemoparasite (Table 6).

Table 5: Prevalence of haemoparasites in relation t o Tick infestation

Tick Infestation	No. Examined		No. Infected (%)	No. Uninfected (%)
Presence of ticks	109	34 (31.2) *	75 (68.8)	
Absence of ticks	91	0 (0.0) **	91 (100)	
Total	**200**	**34**	**166**	

Legend– Different number of asterisks are significantly different (p<0.05)

3.6. Prevalence of haemoparasites of dogs in relation to sampled Site

Dogs from Kayarda showed the highest prevalence, with 11 out of 32 (32.4%) infected, followed by Low Cost (26.5%), Kuchiyako (14.7%), Tukpechi (8.8%), Sundaba (14.7%), and Sauka (2.9%) (Table 7).

Table 6: Prevalence of heamoparasites of dogs in relation to sampled Sites

Location	No. Examined	No. Infected (%)	No. Uninfected (%)
Kayarda	32	11 (34.4)	21 (65.6)
Low cost	28	9 (32.1)	19 (67.9
Kuchiyako	42	5 (11.9)	37 (88.1)
Tukpechi	37	3 (8.1)	34 (91.9)
Sauka	21	1 (4.8)	20 (95.2)
Sundaba	40	5 (12.5)	35 (87.5)
Total	**200**	**34**	**166**

3,7, PCV levels of dogs infected with haemopaeasite.
The PCV values of uninfected dogs were between 35-55% which is the normal range in dogs while it was below 35% in infected dogs (Table 7).

Dogs examined	No. Infected (%)	No. Uninfected (%)
No. examined	34	166
PCV status	(<35%)	35 - 55%

Table 7: PCV levels of dogs infected with haemoparasite
PCV range of healthy dog: Weiss et al. 2010

4.0. Discussion

The current study identified *Babesia sp* as the only haemoparasite found in dogs in Kuje Metropolis, which aligns with previous findings [6]. However, this result differs from the studies of [12], who recorded other haemoparasites such as *Ehrlichia canis*, *Mycoplasma haemocanis and Anaplasma platys* in addition to *Babesia sp* elsewhere. The variation in haemoparasite findings in these studies could be due to differences in the prevalence of the tick vector (*Rhipicephalus sanguineus)* responsible for transmitting these pathogens and environments where these studies were carried out. The 17.0% prevalence of *Babesia sp*.in this study was relatively higher than the 12.5% and 13.0% reported by [12] in Maiduguri and [13] Makurdi, respectively. However, it is lower than the 22.9% prevalence reported by [14] and 57.1% recorded by [15]. Such variations in prevalence rates could again be attributed to differences in geographical location, environmental factors that affect vector transmission and density of tick infestation.

A higher prevalence of *Babesia*infection was observed in exotic breeds (18.2%) compared to local breeds (16.6%), though not statistically significant. This may be attributed to increased susceptibility to tick bites in these breeds, and for the fact that the local breeds are autochthonous to the study sites where canine babesiosis is endemic [6]. Furthermore, exotic breeds with long fur may be more predisposed to tick infestation than the local with short fur.

In this study, higher prevalence of infection was observed in adult dogs than the younger ones. This agrees with earlier reports [6]and [16], which could be due resistance to infection mounted by the presence of maternal immunity at younger age.

The study reported a slightly higher prevalence of infection in male dog (17.3%) compared to female (16.7%). Although the difference was not statistically significant, it is possible that the higher roaming behavior of male in search of female for mating contribute to higher tick exposure and, consequently, higher risk of haemoparasitic infections. It has been reported [18] that environmental exposure, temperament, and genetic factors could influence the observed gender disparity in infection rates.

Light coloured dogs were significantly more infected with *Babesiosis* than the dark ones, because of higher tick infestation which act as the causative pathogen's vector. It has been reported [2] that lower tick infestation, especially on the mixed coloured and to some extent, other coloured animals suggests that this could serve as an important control strategy against tick infestations.

The influence of sampling site on prevalence of haemiparasite was also noted, with Kayarda area showing the highest prevalence (32.4%) and Sauka having the lowest (2.9%). The variation in prevalence of babesiosis across these areas may be linked to

environmental conditions, density of tick infestation, and management practices. The abundance of ticks, climatic conditions conducive for tick breeding, and access to veterinary care could have played significant roles in these disparities.

All dogs infected with *Babesia* sp, were infested with ticks and they had low packed cell volume (PCV), which reinforces the connection between tick infestation and anaemia in *Babesia* infections, as previously reported [5]. If perchance low PCV was observed in any uninfected dog, it may suggest that factors such as nutritional deficiency or other health conditions could be contributable.

Conclusion

This study identified *Babesia* sp. as the only haemoparasite present in the dogs examined in Kuje metropolis, with a relatively moderate prevalence of 17.0%. Tick infestation was greatly associated with the infection, confirming ticks as the primary vector for the transmission of *Babesia sp* in the area. Safe for breed, other documented risk factors such as age and sex did not significantly influence the prevalence of *Babesia* in the dogs examined. The findings also highlighted the fact that coat colour plays a prominent role in tick infestation and invariably, the prevalence of haemoparasitism. The infected dogs had significantly lower PCV levels, reaffirming anaemia as a key pathological consequence of canine babesiosis. These results emphasize the importance of tick control in reducing the burden of haemoparasitic infections in dogs.

Acknowledgement

The technical assistance of principal laboratory technologists of Parasitology laboratory, University of Abuja, Abuja; Mrs Onyekanihu Amaka Chisom and Mrs Arowolo Bukola are well appreciated.

References

1. Taylor MA, Coop RL, Wall RL (2016). *Veterinary Parasitolog y Fourth Edition* Wiley Blackwell
2. Opara MN, Maxwell NE. (2012). Ixodid ticks of cattle in Borno and Yobe States in the North-Eastern Nigeria: Breed and coat colour preference. *Animal Research International* 8(1):1359-1365.
3. Salih DA, Hussein AM. (2015). Diagnostic approach for tick-borne haemoparasitic diseases in livestock. *Journal of Veterinary Medicine and Animal Health* 7(2):45-56.
4. Geiger A, Poton F. (2015). Adult bloodfeeding tsetse flies, trypanosomiasis, microbiota, and the fluctuating environment in Sub-Saharan Africa. *International Society Microbial Ecology Journal* 9:1496-1507.
5. Sumbria D, Singla LD, Gupta SK. (2016). Arthropod invaders pedestal threat to public vigor. An Overview; *Asian Journal of Animal and Veterinary Advances* 11(4); 213-225.
6. Obeta SS, Ibrahim B, Lawal IA, Natala JA, Ogo NI, Balogun EO. (2020). Prevalence of Canine Babesiosis and their risk factors among asymptomatic dogs in the Federal Capital Territory, Abuja, Nigeria. *Parasite Epidemiology and Control* e0186.
7. Phuyal S, Jha V, Subedi M. (2017). Prevalence of blood parasites in dogs of Kathmandu Valley. *Nepal Veterinay Journal* 34:107-112.
8. Balogun, O. (2001). The Federal Capital Territory of Nigeria: Geography of its Development. University of Ibadan Press Limited, Ibadan,Nigeria, pp. 6- 7.
9. Edema KU, Mustapha M., Audu Y. and Malgwi S.A. (2021). Prevalance of heamoparasites of dog in Maiduguri, Nigeria. Journal of Sustainable Veterinary and Allied Sciences, 1(2): 47 - 51.

10. Soulsby EJL. (1982). *Helminthes, Arthropods and Protozoa of Domesticated Animals*. 7th ed. Bailliere Tindall; 765-777.
11. Weiss DJ, Wardrop KJ (2010). *Schalm's Veterinary Hematology*. 6th ed., WileyBlackwell.
12. Kamani J, Sannusi A, Dogo AG, et al. (2010). *Babesia canis* and *Babesia rossi* co-infection in an untraveled Nigerian dog *Veterinary Parasitology* 173:334335.
13. Jegede OC, Obeta SS, Faisal B. (2014). Infection of dogs with *Babesia canis* in Gwagwalada area of Federal Capital Territory, Abuja, Nigeria. *Sokoto Journal of Veterinary Science* 2:37-41.
14. Adamu M, Dzever SN, Ikurior SJ. (2017). Haemoparasite of dogs in Makurdi and associated risk factors. *Nigerian Journal of Parasitology* 2017;38(2):253-257.
15. Oguche M, Barde I, Olabode M, Anjili W, Haruna V, Apeh D, Mark S, Mafulul J, Wujat K. (2020). Prevalence of canine babesiosis in Jos South Local Government Area of Plateau State. *Open Access Library Journal 1*(6):1-8.
16. Opara M, Adewumi N, Mohammed BR, Obeta ss, Simon, M.K., Jegede, O.C., Agbede, R.I.S (2017) . Investigations on the haemoprotozoan parasites of Nigerian local breed of dogs in Gwagwalada Federal Capital Territory, FCT, Nigeria. *Parasitology Research* 10:1-7.
17. Egege SC, Okolocha EC, Nwanta JA, Mosimabale EO. (2008) . Prevalence and seasonality of babesiosis in dogs treated at University Veterinary Clinic in Kaduna, Nigeria from 1990-1999. *Nigerian Veterinary Journal* 29(3):2126.
18. Mellanby RJ, Handel IG, Clements DN, et al. (2011). Breed and sex factors for canine babesiosis in South Africa. *Journal Veterinary Internal Medicine* 25:1186-1189.