Prevalence of haemoparasites of dogs in Maiduguri, Nigeria

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ABSTRACT

Dogs are known to be infected by different blood parasites which are transmitted through vectors and produce illness collectively termed canine vector borne diseases (CVBD) in tropical and subtropical countries including Nigeria. This study investigated the prevalence of haemoparasites of dogs in Maiduguri, as well as the risk factors associated with their occurrence. The study was carried out from February 2019 to November 2019. Five wards namely Bolori 1, Bulabulin, Gwange 2, Lamisular and Limanti were selected out of the fifteen wards in the Metropolis using simple random sampling technique. Individual dog selection was based on systematic random sampling technique. Blood samples were collected from dogs via cephalic venipuncture. Wet mount, thin blood smear and buffy coat techniques were used to detect the presence of haemoparasites. A total of one hundred and twenty (120) dogs were sampled, out of which fifty one (51) were males and sixty nine (69) were females, fifty six (56) were adults (> 1 year) while sixty four (64) were young (0 – 1 year). The numbers of local, exotic and cross breeds were 64, 45 and 11 respectively. Eighty eight (88) of the dogs were confined while thirty two (32) were roaming freely. This study showed an overall prevalence of haemoparasites (14.16%) with *Babesia canis* (12.50%) and *Ehrlichia canis* (1.66%). Chi-square showed significant (P ≤ 0.05) association between haemoparasitism and age, sex and management practice. There was no association between haemoparasitism and breed (P > 0.05). It was concluded that haemoparasites are detectable among dogs in Maiduguri Metropolis and hence, the need to raise awareness on the prevention and control of haemoparasitic infections in dogs due to possible threat to animal and human health in the study area.

Keywords: Haemoparasites, dogs, Maiduguri, prevalence, risk factor

INTRODUCTION

Dogs are among the earliest domesticated animals by man. Domestication of dogs in Nigeria and particularly in Maiduguri is on the increase due to their emerging importance for security, food and as pets. Companion animals such as dogs and cats are associated with different haemoparasites which can pose serious health concern with significant economic impact to owners (Manandhar & Rajawar, 2008). These blood parasites have always been a major challenge in dogs because of their adverse effect on haematological parameters and rate of spread from one animal to the other (Phuyal *et al.,* 2015). Dogs are exposed to ectoparasites such as ticks, fleas, biting flies and mites that transmit haemoparasites and other pathogens of domestic animals and humans (Adamu *et al.,* 2017). Haemoparasites of pets play a significant role in human disease transmission (Moriello, 2003). Haemoparasites of dogs such as *Babesia*

canis, Trypanosoma cruzi and *Ehrlichia canis* can cause illness such as canine vector-borne disease (CVBD) in the tropical countries (Bhattacharjee & Sarmah, 2013). These blood parasites are mostly diagnosed and identified through blood smear examination under light microscope, however molecular tools have contributed to the diagnosis of more parasites in dog population in Nigeria (Amuta *et al.,* 2010). This had led to the renewed interest in the epidemiology of haemoparasites of dogs in Nigeria. Several reports had been conducted to determine prevalence of haemoparasitic infection in various states of the country, across various geographical locations (Obetta *et al.,* 2009; Amuta *et al.,* 2010). However, there is paucity of information on the prevalence of haemoparasites and its associated risk factors in Maiduguri. Therefore, the objective of the present study was to determine prevalence of haemoparasites of dogs in

Maiduguri metropolis and also evaluate its possible association with age, breed, sex and management practice.

MATERIALS AND METHODS

STUDY AREA

This study was conducted in Maiduguri, the capital and largest city of Borno State, North Eastern part of Nigeria. (Figure I). The state is situated within the semi-arid zone of West Africa. It lies within latitude $11^{°}5'N$ and $13^{°}5'E$. It has a total area of 72,609 square km. The temperature ranges from $35^{°}C$ to $40^{°}C$ for most part of the year. It is characterized by two distinct seasons, a short rainy season (June – September) and a long dry season (October – June) Borno is home land of Kanuri people in Nigeria and several other ethnic groups (Kawka, 2002).
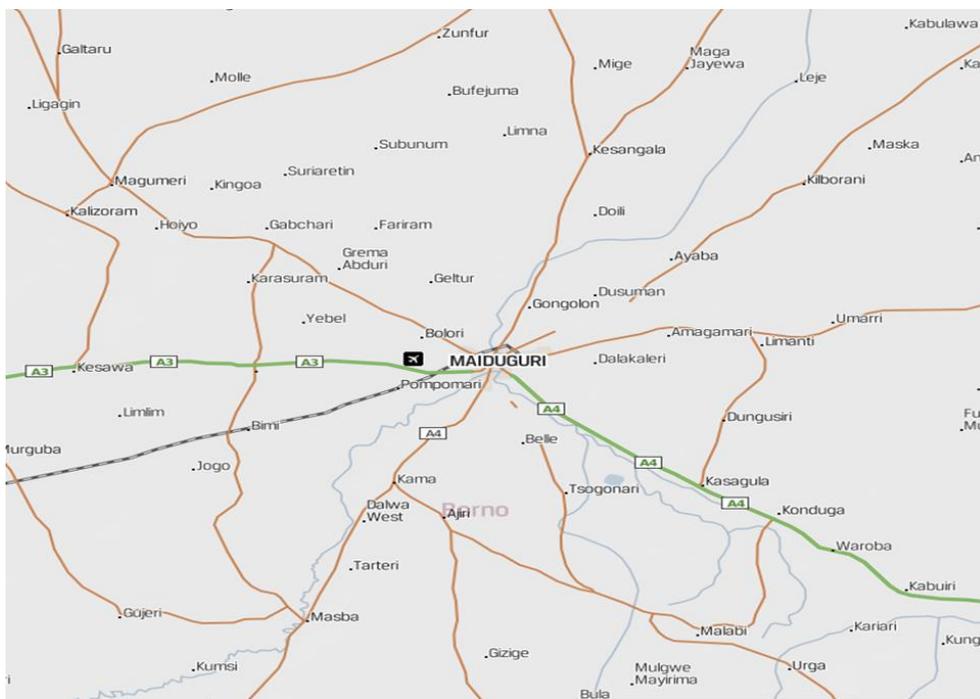
Figure 1: Showing Map of the study area

STUDY POPULATION AND SAMPLING PROCEDURE

A cross sectional study was conducted from February, 2019 to November, 2019 to determine the prevalence of haemoparasites in dogs in Maiduguri, Borno State, Nigeria. Maiduguri Metropolitan Council (MMC) has fifteen (15) wards namely: Bolori 1, Bolori 2, Bulabulin, Fezzan, Gamboru liberty, Gwange 1, Gwange 2, Gwange 3, Hausari zango, Lamisular jabba-mari, Limanti, Mafoni, Maisandari, Shehuri north, Shehuri south. Five (5) wards were randomly selected namely; Bolori 1, Bulabulin, Gwange 2, Lamisular and Limanti. The number of samples collected from each of the five wards was based on availability and accessibility. Individual dog selection was based on systematic random

sampling technique with the selection of one out of every two dogs seen on the day of sample collection (Pfeiffer, 2002). The sample size was determined based on the formula described by Thrusfield (2005) using the prevalence of 5.5% reported by Adamu *et al.* (2012) in Maiduguri at 95% Confidence level. The calculated sample size was 79, but was increased to 120 for precision.

SAMPLE COLLECTION

Each dog was properly restrained. Collection of blood sample was done via the cephalic vein, about 5mls of blood was collected aseptically and transferred into sample bottles containing EDTA as anticoagulant. The blood samples were labelled and preserved in a cold chain (ice pack box), and transported to the University of Maiduguri Veterinary Teaching Hospital (UMVTH) parasitology laboratory where the samples were processed.

LABORATORY ANALYSIS
WET MOUNT

A drop of fresh blood and new methylene blue were placed and properly mixed on a clean and grease free glass slide using an applicator stick. A cover slip was applied over the suspension without creating bubbles. The entire cover slip was examined systematically with the low power objective (10x) and low light intensity and then with high dry objective (40×) as described by Cheesbrough (2006).

THIN BLOOD SMEAR

A drop of blood was placed on a grease-free clean glass slide at about 2cm from the right end; the drop is touched with the edge of another slide. It was held at an angle of $30^{°}$ and pushed gently to the left, till the blood is exhausted. The film was allowed to dry. The slide was fixed with methanol for 5 minutes and stained with dilute 10% Giemsa stain according to standard procedures (Cheesbrough, 2006). The stained slides were examined at × 100 under oil immersion, for the detection of haemoparasites.

BUFFY COAT TECHNIQUE

One end of the capillary tube was placed on blood sample and allowed to fill to about three-quarters by capillary action and then sealed by plastacine at the other end. It was placed in the haematocrit centrifuge machine and was centrifuged for five minutes at 10,000 rpm. The capillary tube was placed above a glass slide, fixed with plastacine. The buffy

coat region of the capillary tube was then examined microscopically at low magnification (10×) as described by Cheesbrough (2006).

STATISTICAL ANALYSIS

The data were presented using descriptive statistics, frequency and percentage. The data were analysed using Graph pad prism version 5. The prevalence was calculated for all data as the number of infected individuals divided by the total number of dogs examined and was expressed in percentage by multiplying by 100. Chi-square test was employed to determine the association between haemoparasitism and age/ sex/breed/management practice of dogs. Values of $P \leq 0.05$ were considered significant.

RESULTS

In this study, out of the 120 dogs sampled, 15 (12.50%) and 2 (1.66%) were found to be positive for *Babesia canis* and *Erhlichia canis* respectively. There was no mixed infection.

The overall prevalence of haemoparasites was found to be 14.16% in the study area (Table I). The prevalences of 17.39%, 14.81% and 5.26%, were recorded in Bolori 1, Bulabulin and Gwange 2 respectively. Lamislar had prevalence of 13.64%, while that of Limanti was 12.82% (Table II).

Adult dogs had a higher prevalence of 13 (23.21%) compared to the young 4 (6.25). Studs had a higher prevalence of 11 (21.56%) than bitches. Chi-square showed association (P<0.05) between haemoparasitism and age, sex of the dogs (Table III).

On management, confined dogs had a higher prevalence rate of 8 (25.0%) compared to the unconfined 9 (10.22%). Exotic breed had a higher prevalence rate of 9 (20.0%) than both the local and cross breed dogs with 6 (9.37%) and 2 (18.8%) respectively. Chi-square showed association (P<0.05) between haemoparasitism and management, whereas there was no association (P>0.05) between haemoparasitism and breed of dog (Table IV).

Table 1: Prevalence of Haemoparasite infection in dogs in Maiduguri, Nigeria   (n = 120)

Haemoparasite Species	Number of Dogs Infected	Prevalence (%)
Babesia canis	15	12.50
Ehrlichia canis	2	1.66
Total	17	14.16

Table II: Distribution of the Prevalence of haemoparasites of dogs in Maiduguri, Nigeria based on location (n = 120)

locations	Number examined	Number infected	Prevalence (%)
Bolori 1	23	4	17.39
Bulabulin	27	4	14.81
Gwange 2	19	1	5.26
Lamisular	22	3	13.64
Limanti	39	5	12.82

Table III: Distribution of the Prevalence of haemoparasites of dogs in Maiduguri, Nigeria based on Age and Sex

Variables	Categories	Number of dogs Sampled	Number of dogs Infected	Prevalence (%)	Chi-square (P≤0.05)	P-value
Age	0 – 1 year	64	4	6.25	7.069*	0.0078
	> 1 year	56	13	23.21		
Sex	Male	51	11	21.56	3.996*	0.0456
	Female	69	6	8.69		

* Significant

Table IV: Distribution of the Prevalence of haemoparasites of dogs in Maiduguri, Nigeria based on Breed and Management Practice

Variables	Categories	Number of dogs Sampled	Number of dogs Infected	Prevalence (%)	Chi-square (P≤0.05)	P-value
Breed	Local	64	6	9.37	1.546	0.4615
	Exotic	45	9	20.00		
	Crosses	11	2	18.18		
Management	Confined	88	9	10.22	4.212*	0.0401
	Unconfined	32	8	25.0		

*= significant

DISCUSSION

This study revealed an overall prevalence of 14.16% of haemoparasites in dogs from Maiduguri metropolis, North-Eastern Nigeria. This result is similar with the findings of Ehimiyein *et al.* (2018) who recorded 19.67% prevalence of haemoparasites in dogs in Zaria and Okubanjo *et al.* (2013), who reported 17.3% prevalence of haemoparasites (*Babesia canis* and *Hepatazoon canis*) in dogs within Zaria, North-West Nigeria. However, the prevalence recorded in this present study was lower than the 42.1% reported by Kamani *et a.* (2011) in Vom, Plateau State, Nigeria. The disparity is obviously attributed to different duration of time during which the two studies were conducted (Nine months versus 24 months respectively) as well as variety of samples collected (blood only versus blood plus faecal samples).

On the other hand, our study reported higher prevalence of *Babesia canis* (12.50%) than *Ehrlichia canis* (1.66%). These are similar to the findings of Adamu *et al.* (2017) and Ehimiyein *et al.* (2018) who all reported higher prevalences of 16.00% and 19.67% in Makurdi and Zaria respectively.

The significant higher prevalence rate of infection in the adult dog population (> 1 year) compared to younger dogs (0-1 year) and an association between haemoparasitisim and age observed in this study agree with the report of Ehimiyein *et al.* (2018), Jalali *et al.* (2013) and Subedi, (2009) who all reported higher haemoparasites prevalences in older dogs. On the contrary, our results are at variance with the report of Adamu *et al.* (2017) who reported higher prevalence in younger dogs. This could be due to the fact that younger dogs easily show clinical disease and thus often attract attention of the owners.

A higher prevalence rate was observed in studs compared to bitches. This is in agreement with the report of Subedi (2009) and Adamu (2017). The high prevalence of infection in males could be attributed to the fact that male dogs walk long distances in search of female mates on oestrus and territorial establishment with consequent exposure to the vectors of these blood parasites (Mundin *et al.* 2008).

In terms of breed, the exotic breed had the highest prevalence of infection; however the association was not statistically significant. This agrees with the report of Manandar *et al.* (2008) who reported higher prevalence of blood parasites in exotic breeds of dogs. Confined dogs had a significantly lower prevalence rate compared to those unconfined. Confined had a lower prevalence rate compared to those unconfined. This could possibly be due to limited health care management and continuous exposure of unconfined dogs to vectors of the parasites. This agrees with the report of Obetta *et al.* (2009) and Tinoco-Gracia *et al.* (2009) who all reported higher prevalence of the haemoparasites in unconfined dogs. In addition, confined dogs are given better attention and provided with better veterinary care to forestall transmission of these haemoparasites into the human owner and household.

CONCLUSION

In conclusion, the haemoparasites detected in this study were *Babesia canis* and *Ehrlichia canis*. The study shows the endemicity of haemoparasites in Maiduguri, North Eastern Nigeria. Therefore, it is recommended that further investigation using more sensitive diagnostic technique such as Polymerase Chain Reaction (PCR) is carried out to obtain a better insight into the epidemiology of blood parasites in the study areas. This will facilitate adoption of efficient control and preventive measures against the parasites and eliminate any possible threat of diseases caused by these parasites to animal and human in the study areas.

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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