

Research Article

Study on Prevalence of Canine Babesiosis in Bishoftu Town, Central Ethiopia

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Abstract

A cross-sectional study was carried out from February 2021 to August 2021 in Bishoftu town, Eastern shewa zone, Central Ethiopia, to find out the prevalence of Canine babesiosis in dogs. Blood samples were collected from 265 dogs of different age groups, breeds, and sexes for babesia identification and packed cell volume determination. The blood smears were prepared from each blood sample followed by Giemsa staining to identify babesia under oil immersion microscope examination. Accordingly, 30 dogs (11.32%) were positive for babesia in this study. Whereas, out of 98 cross, 123 local and 44 exotic breeds of dogs were examined; 7(7.14%), 14(11.38%), and 9(20.45%) were found positive for babesia, respectively. However the difference is not statically significant. In this study, 187 male and 78 female dogs were examined and their corresponding babesia prevalence was 21(11.23%) and 9(11.54%). The prevalence of babesia based on age was 79(5.06%) in puppies, 168(13.69%) in adults, and 18(16.67%) in older dogs. Out of 265 examined dogs; 47(17.73%) were of poor body condition, 101(38.11%) medium body condition and 117(44.15%) good body condition. The prevalence of babesia was high ($P < 0.05$) in poor body condition dogs 11(23.40%), while comparing with 8(7.92%) medium and 11(9.40%) good body condition. Among the 265 dogs examined; 51(19.25%) dogs were found anemic based on packed cell volume result. Out of 51(19.25%) anemic dogs, the babesia was identified in 30(58.82%) of them. In general, the present study gave evidence that canine babesia is one of the enzootic and important diseases of dogs in the study area. Therefore, the application of preventive and control measures like designing good ectoparasite control in dogs should be well organized in the study area.

Keywords: Babesia; Bishoftu; Dogs and packed cell volume

Introduction

Babesia is one of the tick-borne protozoan parasites which belong to the phylum Apicomplexa, in the class Piropasmea, order of Piropasmeida and in the family Babesiidae, and defile erythrocytes of domestic and wild animals, and humans. While the distribution of canine babesiosis is worldwide and several different species of Babesia have been reported in dogs [1].

Among the genus of Babesia that readily parasitize the red blood cells of dogs they are morphologically classified into large (3.0 to 5.0 μm) and small (1.5 to 2.5 μm) forms, both revealing a worldwide distribution. Babesia canis (*B. canis*), Babesia vogeli (*B. vogeli*), and Babesia Rossi (*B. rossi*) are of the large Babesia species which are detected in the USA, while Babesia gibsoni (*B. gibsoni*) and Babesia annae (*B. annae*) are of small Babesia species that has been recorded as an infection of dogs [6].

Among the smaller parasites, *B. gibsoni* prevalently occurs in the Middle East, southern Asia, Japan, Africa, and South America and is one of the emerging infectious diseases in the USA, as well as having been recognized lately in Italy, Hungary, and Australia [24]. A more virulent subspecies of *B. gibsoni* have recently been recognized in California. *B. annae* (also known as *Theileria annae*) is the most endemic in dogs of northwest Spain [8].

B. vogeli is the least pathogenic as up-to-date. It occurs in France, Australia, Japan, Brazil, South Africa, and the USA, and more often causes mild disease in adult dogs, however, the severe disease is observed in some puppies [23]. *B. rossi* takes place predominantly in southern Africa and is seemingly the most fatal of the subspecies.

Babesia infection in dogs was recognized in the past mostly by the morphologic appearance of the parasite in erythrocytes under Giemsa staining and microscopy and all forms of the *B. canis* were recognized as large, while on the other hand small forms of Babesia were considered to be *B. gibsoni* [1]. Refined Polymerase Chain Reaction (PCR) techniques have currently been allowed for a better definition of these parasites [22].

A well-organized strong particular evidence exists that *B. gibsoni* is transmitted by dog bites [5], whilst vertical transmission from the dam to offspring has lately been proven as a supplementary method of transmission [15]. Different levels of fatality, dissimilar antigenic properties, and specific tick vector transmission competency have led to the presence of a larger variety of Babesia species, which can cause infection in dogs [1].

A small subgroup of dogs occurs with high hematocrits (relative haemo concentration), despite strenuous hemolysis, which is due to the reason that there is shifting of fluid from the intravascular to the extravascular component. These dogs are at a high risk of developing cerebral complications, as well as other organ failures [37].

Researches on canine babesiosis are deficient in Ethiopia, but on the other hand number of reports suggest that the parasite infects dogs is worldwide. In India, a variable prevalence of canine babesiosis has been reported viz. 0.66 to 8.9% in referral clinics canines in Uttar Pradesh [9]; 21.7% in Assam [10], 5.4% in Hissar, Haryana (Bansal *et al.*, 1985), and 3.17% of *B. gibsoni* and 1.26% *B. canis* in Punjab [14]. In Ethiopia canine babesiosis has been reported in Jimma town from 15.9% to 18.25% [16,33]. However, the prevalence of canine babesiosis in the study area is not yet known. Therefore, this study is crucial to know the status of the disease and its associated risk factor, and even tremendously very important to recommend measures to control the disease in the study area.

Therefore, the objectives of this study was

1. To determine the prevalence and associated risk factors of canine babesiosis in Bishoftu Town., Central Ethiopia.

Material and Methods

Study Area

The study was conducted from February 2021 to August 2021 at Addis Ababa University College of Veterinary Medicine and Agriculture Veterinary Teaching Hospital, Bishoftu Ethiopia. Bishoftu is a metropolis, positioned in Oromia Regional State at a distance of 47.9 kilometers southeast of Addis Ababa located at 9°N latitude and 40°E longitude and an altitude of 1870 meters above sea level with inside the crucial highlands of Ethiopia. The common most and minimum temperatures of the vicinity are 34.7°C and 8.5°C respectively, and the common relative humidity is 61.3%. The metropolis gets an annual rainfall of 1151.6 mm of which 84% is acquired at some point of the lengthy wet season protecting June to September and the last with inside the quick wet season extending from March to May (NMSA, 2003).

The 2007 countrywide census mentioned a complete population for Bishoftu of 99,928, of whom 47,860 have been men and 52,068 have been women (CSA, 2007).

Study Animals

All breeds, sex, and age groups of dogs visiting Addis Ababa

University Veterinary teaching hospital in study period were considered for sample collection. Most of the dogs come to the hospital were from Bishoftu town and its surrounding.

Study Design

A cross-sectional study was conducted from February 2021 to August 2021 to determine the prevalence of babesiosis in the dog visited Addis Ababa University, veterinary teaching hospital, Bishoftu, Ethiopia.

Sample Size Determination and Sampling Procedure

The sample size was determined based on the formula of Thrusfield (2005).

$$n = \frac{1.962Pexp}{d^2} (1-Pexp)$$

$$d^2$$

Where; n = required sample size, Pexp = expected prevalence, d = required precision

The expected prevalence of canine babesiosis was 50% to get the maximum number because there was no previous work of canine babesiosis in the study area. The precision was decided to 5(0.05) to 95% confidence level. By substituting the value in the above formula, the study got the sample size:

$$n = \frac{1.962 \times 0.5(1-0.5)}{(0.05)^2}$$

$$= 384 \text{ dogs}$$

Therefore, 384 dogs were expected to be collected, however, only 265 dogs were considered in this study due to a lack of dogs visiting the veterinary teaching hospital in the study period.

All dogs visited the Veterinary Teaching Hospital in the study period were considered for sampling depending on the owner consent.

Blood Sample Collection and Examination

Blood samples were collected aseptically from a cephalic vein in vials containing anticoagulant (EDTA and study design above). Data on breed, sex, and age of dogs was also collected parallel to blood collection. A thin blood smear was prepared for each sample, a drop of blood was placed on a clean glass slide, air dried, fixed in methanol, stained with Giemsa [11], and examined under a light microscope by using the oil immersion objective to identify and to examine the presence of babesia.

Packed Cell Volume (PCV) values of blood samples were determined using a hematocrit centrifuge and PCV reader. According to Walker, A.R., 2003. Dogs with PCV value $\leq 35\%$ were considered as anemic and dogs with PCV value $\geq 36\%$ were considered as non-anemic.

Statistical Analysis

The data was collected from the study area, the result obtained from blood examination was recorded in the format developed for this purpose and later on entered into Microsoft Excel 2013. Dogs were grouped based on age, sex, origin, and body condition scoring to determine whether these factors were associated with the prevalence of canine babesiosis. Statistical evaluations were carried out using a STATA 14.1 and the mean of infected and non-infected dogs was compared using an

independent T-test at a 95% confidence level ($p < 0.05$). Differences were considered significant when $p < 0.05$.

Result

Over all Prevalence of Dog Babesiosis

Giemsa-stained blood smear examination of 265 dogs confirmed 30 (11.32%) dog were positive for babesiosis. out of 98 crosses, 44 exotic and 123 local breeds of dogs examined; the prevalence was 7 (7.14%), 9 (20.45%), and 14(11.38%) were respectively. However, there were no statistically significant differences in the prevalence rate between local, cross, and exotic breeds of dogs ($P > 0.05$). In this study, 187 male and 78 female dogs were examined and their respective prevalence was found to be 11.23% and 11.54%. Furthermore, 79 puppies, 168 adults, and 18 older dogs were included in this study; and the prevalence was found to be 5.06%, 13.69%, and 16.67% respectively. The prevalence difference was statistically insignificant in both sex and age groups of the study animals ($P > 0.05$). During this study, animals were classified into their body condition based as; poor, medium, and good body condition. The respective prevalence for body condition was 11(23.40%) in poor, 8(7.92%) in medium, and 11(9.40%) good, such that the difference was statistically significant. Lastly, during conducting the study 265 dogs were came from 5 different kebelles of bishoftu town, and the dogs came from kebelle 15 were show high 49 (18.37%) prevalence, however, the difference between kebelles was not stastically significant ($P > 0.05$).

Table 1: Summary of canine babesia with variables.

Variables	No. Sampled	No. Affected	Prevalence	X ²	P-Value
Breed					
cross	98	7	7.14%		
exotic	44	9	20.45%	5.3608	0.069
local	123	14	11.38%		
Total	265	30	11.32%		
Age					
puppies	79	4	5.06%		
adult	168	23	13.69%	4.5334	0.104
old	18	3	16.67%		
Total	265	30	11.32%		
Sex					
male	187	21	11.23%	0.0052	0.942
female	78	9	11.54%		
Total	265	30	11.32%		
Body Con. Scor.					
poor	47	11	23.40%		
medium	101	8	7.92%	8.4279	0.015
good	117	11	9.40%		
Total	265	30	11.32%		
Place					
kebelle 01	98	11	11.22%		
kebelle 02	55	7	12.73%		
kebelle 05	34	3	8.82%	6.4462	0.168
kebelle 14	29	0	0.00%		
kebelle 15	49	9	18.37%		
Total	265	30	11.32%		
PCV					
anemic	51	30	58.82%		
normal	214	0	0.00%	141.9524	0
Total	265	30	11.32%		

Table 2:

Variables	No. Sampled	No. Anemic	Percentage	x ²	P-value
Breed					
cross	98	17	33.33%		
exotic	44	11	21.57%	1.1884	0.552
local	123	23	45.10%		
Total	265	51	100.00%		
Age					
puppies	79	6	11.76%		
adult	168	42	82.35%	10.5563	0.005
old	18	3	5.88%		
Total	265	51	100.00%		
Sex					
male	187	35	68.63%	0.1143	0.735
female	78	16	31.37%		
Total	265	51	100.00%		
Body Con. Scor.					
poor					
medium	47	22	43.14%	29.4369	0
good	101	17	33.33%		
Total	117	12	23.53%		
	265	51	100.00%		
Place					
kebelle 01	98	16	31.37%		
kebelle 02	55	9	17.65%		
kebelle 05	34	8	15.69%	2.9809	0.561
kebelle 14	29	5	9.80%		
kebelle 15	49	13	25.49%		
Total	265	51	100.00%		
Giemsa					
positive	30	30	58.82%		
negative	235	21	41.18%	141.9524	0
Total	265	51	100.00%		

Packed Cell Volume (PCV) Result

Packed Cell Volume (PCV) of the study animals was also assessed and dogs with $PCV \leq 35\%$ were considered as anemic and hence out of 265 dogs examined, 51 (19.25%) were anemic. Out of these anemic dogs, 30 (58.82%) of them were positive for babesia result and the rest 21 dogs (41.18%) were anemic without babesia, i.e. the difference was statically significant ($P < 0.05$) see table 2. In this study 79 puppies, 168 adults, and 18 older dogs were examined for their PCV values with the prevalence of 7.59%, 25.00%, and 16.67% respectively; in which the difference show statically significant ($P < 0.05$).

Discussion

In the current study, the overall prevalence of Babesia in dogs was found to be 11.32% this was relatively higher than the findings of SS obeta *et al* 2020 which was reported to be 10.8% in Abaji, AMAC, Bwari, Gwagwalada, Kuje, and Kwali Area Council in Nigeria. It is also higher than the finding of [20] who reported a prevalence of babesia in pet dogs to be 11.0%. But lower than that of [33] which reported 18.25% in Jimma town, Ethiopia. The difference could be due to several factors such as climatic factors required for the biology of the parasite and its vector and the provision of veterinary services and differences in public awareness regarding the care of their dogs. Additionally, most of our country dogs were stray dogs, and also owners mainly keep outdoors with less confinement; so they have a high chance to be infected from the stray dogs because stray dogs get less care than owned dogs.

In this study, a high prevalence of Babesia was recorded in exotic breeds of dogs (20.45%) than in local breeds (11.38%) and crossbreeds (7.14%). This was in line with the findings of KS Nalubamba *et al* 2015. who states that the exotic pure breed dogs are more prone to develop more severe clinical signs to canine babesia because cell-mediated immunity was reduced.

In this study, the overall prevalence of babesia in female dogs (11.54%) was relatively higher than in males (11.23%). Which is in line with S. Baidya *et al* 2015 that stated that higher incidence in female dogs (53.33%) than male (46.68%). And this finding is opposite to [13] which stated that Babesiosis was more frequently detected in males than in females (80% and 20% respectively).

The prevalence of canine babesia in different age groups of dogs was found to be relatively higher in old dogs (16.67%) than in puppies (5.06%) and adults (13.69%). This result was in agreement with Panti-May, J.A. and Rodríguez-Vivas, R.I., 2020 who stated higher probability of exposure to canine babesia was reported in older dogs than in adults in Latin America and the Caribbean. However, this finding was in contrast to the findings of Bashir *et al.* who reported a higher seropositivity rate of canine babesia in puppies (6.1%) than in other age groups of dogs in Pakistan.

On the other hand dogs <2 years archaic were a lot of probably infected with Babesia species than the dogs of alternative ages and in line with [17]. seropositivity for Babesia infection 1st increased than declined with age, reaching a most just in case of 3.1-to 5-year-old dogs (adult) which is opposite to the current study.

The variations among the various countries can be related to the distinctions in agro-climate that favors the survival and infection of dogs with the canine babesia and their vector, ticks also owner's capability and willingness to get appropriate treatments for their pets are one of the differences that have a big impact in general. Besides; in this study, dogs infected with Babesia had lower PCV than uninfected dogs this was consistent with previous results and was relatively similar with [4,31] in Slovak Republic and India respectively which reported that dogs infected with canine babesia had a lower PCV compared to non-infected dogs.

Conclusion

The current study shows that, there was significant (11.32%) Canine babesia prevalence in the study area. This indicates that, the canine babesia is the major health problem of dog well fare and dog own community. Therefore, based on this conclusion the following recommendation are forwarded:

1. Awareness creation and more research and surveys should be done and practiced in the area
2. Vector controls and prevention of disease should be taken care of to avoid the disease and purge zoonosis
3. Professionals should consider canine babesiosis in their diagnosis also use the drug of choice to avoid resistance and other control and prevention technique

Author Statements

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