



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; SP-11(2): 500-502  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 17-12-2021  
Accepted: 21-01-2022

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## Prevalence of canine babesiosis in Lakhimpur and Dhemaji districts of Assam and adjoining areas of Eastern Himalayan foothills in Arunachal Pradesh, India

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### Abstract

An intra-erythrocytic protozoan known as *Babesia canis* and *Babesia gibsoni* causes babesiosis in dogs, which is prevalent in many countries of the world, including India. It occurs in subclinical, per-acute, acute, or chronic forms with the wide range of inconsistent clinical manifestations or presentations. In order to establish an effective treatment plan for canine babesiosis, it is necessary to identify the causal organism. Hence, the present study was designed to record the prevalence of canine babesiosis in the present area of study from where scanty previously documented reports were observed. The prevalence of canine babesiosis was found to be 33.17 per cent overall in this study (68/205) with a prevalence of *B. canis* at 16.17 per cent and a prevalence of *B. gibsoni* at 83.82 per cent. Babesiosis was found to be more common from April to October, with isolated cases occurring at other times of the year. In the present study *B. gibsoni* was found to be the most prevalent species in this investigation. The occurrence of babesiosis in male and female animals was found to be 48.52% and 51.47% respectively.

**Keywords:** Prevalence, *Babesia canis*, *Babesia gibsoni*

### Introduction

Canine babesiosis is a tick-borne, potentially fatal disease that occurs in many parts of the world, including India. It is caused by intra-erythrocytic protozoa, *Babesia canis* and *B. gibsoni* (Laha *et al.*, 2014; Das *et al.*, 2015) [10, 6]. These two *Babesia* species are morphologically distinct and can be distinguished by their size. Based on the geographical distribution of tick vector, differences in pathological and clinical syndrome, antigenic property and molecular analysis (Boozer and Macintire 2003) [3] *B. canis* have been categorized into subspecies as *B. canis rossi*, *B. canis canis* and *B. canis vogeli*. In case of the small form *Babesia gibsoni*, three morphologically similar but genotypically distinct types were identified (Zahler *et al.*, 2000) [20]. The clinical entity exhibit subclinical, per-acute, acute or chronic forms (Breitschwerdt, 1984 and Das *et al.*, 2015) [3, 6] with the exhibition of a wide range of inconsistent clinical manifestations or a wide range of presentations characterised by fever, depression, pallor, jaundice, lymphadenopathy, splenomegaly, weakness and collapse associated with intravascular and extravascular haemolysis, hypoxic injury, systemic inflammation and thrombocytopenia. Once the acute infection has passed, the animal may develop into a chronic carrier (Irwin, 2009) [8]. Proper identification of the causative organism in canine babesiosis is critical for developing a treatment strategy that results in the animal's successful recovery (Boozer and Macintire 2003) [2]. Though the prevalence of tick-borne haemoprotozoan diseases is relatively high in India due to favourable climatic conditions, data on their occurrence are sparse (Sundar *et al.*, 2004, Chaudhuri, 2006, Chaudhuri and Varshney, 2007, Senthil Kumar *et al.*, 2009, Balachandran *et al.*, 2010, and Karunakaran *et al.*, 2011) [16, 4, 5, 12, 1, 9]. The purpose of this study is to determine the prevalence of canine babesiosis and the pattern of its occurrence in this region of the country, where only a few previously documented cases have been observed.

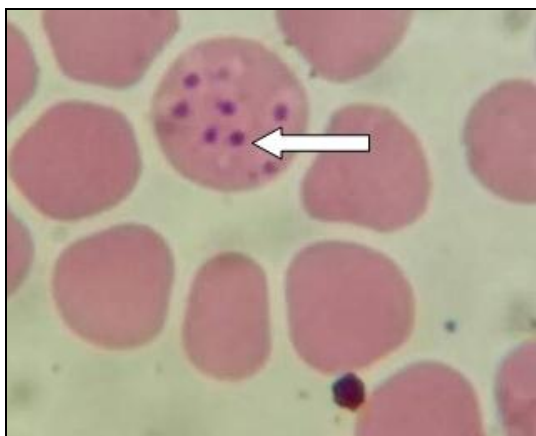
### Materials and Methods

The current study was carried out for the period from January 2017 to December 2019.

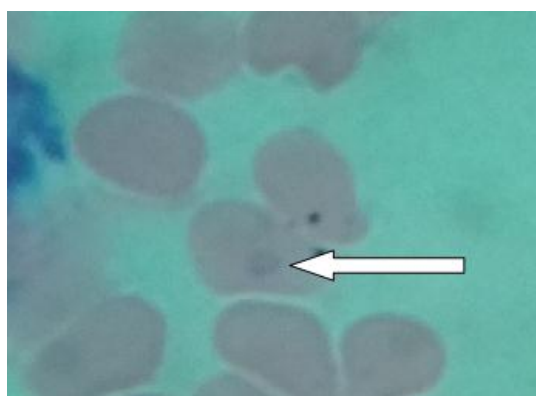
The study took place at the Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing, North Lakhimpur, Assam. The present study involved suspected animals (dogs) that were brought to the Veterinary Clinical Complex (VCC), LCVSc with symptoms such as elevated temperature, anaemia, anorexia, and occasionally haemoglobinuria. Blood was collected from dogs' aseptically in EDTA vials via cephalic/ saphenous vein and sent to the Veterinary Parasitology Laboratory for confirmation diagnosis. After fixation with absolute methanol, thin blood smears were prepared and stained using the Giemsa staining technique. All procedures were carried out according to established protocols (Zajac and Conboy, 2011) [21]. Later, the blood smears were examined under an oil immersion objective of a light microscope for the presence of any Babesia species intra-erythrocytic piroplasms. The organisms are classified morphologically (Soulsby, 1982) [15]. The prevalence rate was determined by comparing the number of confirmed cases to the number of suspected cases.

**Results and Discussion**

The microscopic examination of the smears revealed the presence of intra-erythrocytic piroplasms of *B. canis* (Fig. 1) and *B. gibsoni* (Fig. 2).



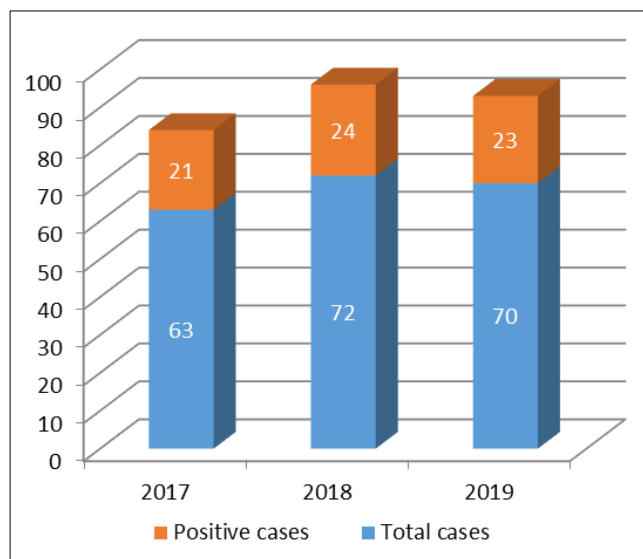
**Fig. 1:** *Babesia canis* (8 nos. of pyriform organisms within a single erythrocyte)



**Fig. 2** *Babesia gibsoni*

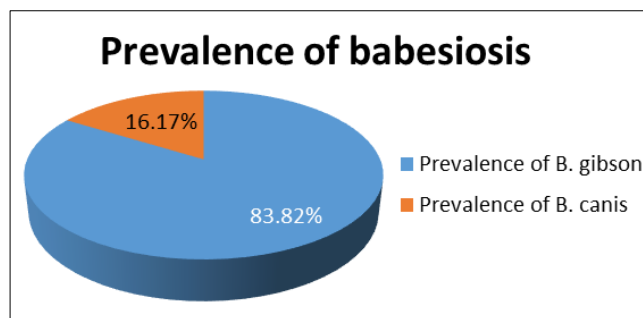
The organisms were identified on the basis of their standard morphological features. Large pyriform structures were seen inside erythrocytes that are identified as *B. canis* (Fig. 1). In some other cases small pleomorphic forms without pyriform shape having a rod, cocci or signet ring shape (Fig. 2) recognized as *B. gibsoni* were seen inside erythrocytes. Single or multiple organisms inside a single RBC was observed. Total numbers of cases encountered during the period was

205 out of which 68 positive cases were recorded. The numbers of cases encountered and the positive cases per year is presented in Fig. 3.



**Fig. 3** The numbers of cases encountered and the positive cases per year

Hence, the overall prevalence of canine babesiosis in the present study was found to be (68/205) 33.17% (Table. 1). (Saud and Hazarika 2000) [11] in Assam previously observed 45.45% cases of babesiosis in the month of June. In the present study the prevalence for *B. canis* was recorded 16.17% and for *B. gibsoni* it is 83.82% (Fig. 4).



**Fig 4:** Comparative prevalence of *B. gibsoni* and *B. canis*

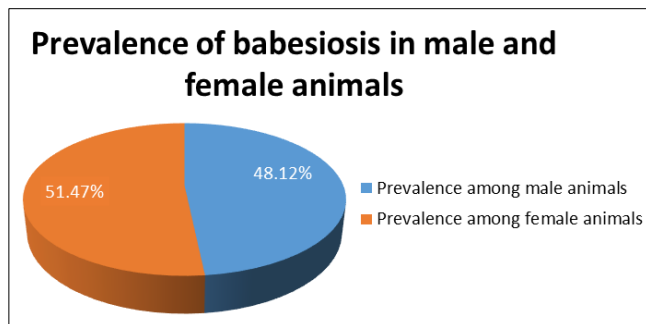
Babesiosis is more prevalent in dogs between April and October (Table 1), though it occurs seldomly throughout the year. This finding corroborates the findings of (Varshney *et al.*, 2003) [19], who observed that babesiosis occurred in varying degrees throughout the year, but 60 per cent of cases occurred between March and June. (Singh *et al.*, 2014) [13] discovered that *B. gibsoni* was more prevalent in the summer than in the winter and in younger dogs. Climate variations may have a significant impact on the abundance of tick vectors for transmission and thus on the prevalence of these haemoparasites. This conclusion can be drawn from data collected in various parts of Northern India, where prevalence rates ranged between 0.66 and 8.9 per cent (Singh *et al.*, 2011, Varshney and Dey, 1998, and Chaudhuri, 2006) [14, 17, 4]. In contrast, the prevalence of *B. canis* and *B. gibsoni* was reported to be 3.9 percent and 84.9 percent, respectively, in Southern India (Senthil Kumar *et al.*, 2009) [12]. *B. canis* was reported as the dominant species in Tamil Nadu (Harikrishnan *et al.*, 2002) [7] and *B. gibsoni* was reported as the dominant species in Uttar Pradesh (Varshney *et al.*, 2004) [18].

**Table 1:** Numbers of cases encountered in 3 years

	2017	2018	2019
January	-	2	-
February	1	-	1
March	3	-	1
April	7	4	6
May	5	6	9
June	11	13	14
July	10	17	13
August	9	9	6
September	8	12	15
October	6	6	5
November	3	2	-
December	-	1	-
Total cases	63 (21)	72 (24)	70 (23)
Total cases in 3 years	<b>205 (68)</b>		

\*Within bracket numbers of positive cases.

In the present study *B. gibsoni* was found to be the predominant species. Occurrence of babesiosis in male animals is found to be 48.52% and in female it is 51.47% (Fig. 5).



**Fig 5:** Comparative prevalence of babesiosis in male and female animals

Similar findings were observed in (Das *et al.*, 2015) <sup>[6]</sup>, where females had a slightly higher rate of infection than males. On the other hand, Singh *et al.*, (2014) <sup>[13]</sup> found no evidence of a link between the host's breed and sex and the occurrence of the disease.

### Conclusion

According to the current study, canine babesiosis occurs primarily during the summer months and the predominant species is *Babesia gibsoni*. The current study's findings may help to expand the database on the prevalence of these parasites and also aid in the development of effective treatment and control strategies for canine babesiosis in this region of the country.

### Acknowledgement

The author acknowledges the Associate Dean, Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing, North Lakhimpur for providing all the facilities required for successful completion of the present study.

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