



Epidemiological investigation on canine babesiosis in Tarai region of Uttarakhand

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Canine babesiosis is an important life hazard of haemopoietic diseases of canines which are reported round the world and in various parts of India (Kumar *et al.* 2006). It is an emerging disease and has zoonotic importance that signifies economic impact on livestock and pet animals, especially in the tropical and subtropical regions (Kivaria *et al.* 2007). The incidence was reported between 0.66 and 8.9% in the northern region of India (Chaudhuri 2006) while in southern India, the prevalence was 11.6% (Kumar *et al.* 2009). Prevalence of *B. canis* and *B. gibsoni* was 3.9 and 84.9%, respectively. Eljadar (2010) observed prevalence of Babesia species (*B. canis* and *B. gibsoni*) as 0.66 to 21.7% in India. Variation in percentage of these infections depends upon tick population that varies due to a wide variation in climate within the country. Canine babesiosis also known as ‘malignant jaundice’ is a common and clinically significant disease caused by an apicomplexan protozoa parasite (Penzhorn *et al.* 2017). They are transmitted primarily through tick bites during blood meals (Natala *et al.* 2013) and as such can infect a wide variety of domestic and wild animals as well as humans (Schnittger *et al.* 2012). The common ticks are *Dermacentor reticulatus*, *Rhipicephalus sanguineus*, and *Haemaphysalis leachi*. These ticks are usually specific to each species of Babesia. The appearance of *Babesia* spp. in dogs depends upon distribution of their vector species geographically (Solano-Gallego and Baneth 2011). Dog-to-dog transmission is through bite (Jefferies *et al.* 2007), blood transfusions (Stegeman *et al.* 2003) and transplacental transmission (Fukumoto *et al.* 2005). This protozoon parasite is similar to malarial parasite that parasitizes only red blood cells of wild as well as domestic animals. This organism can cause a syndrome similar to malaria, including fever, haemolysis along with severe hemoglobinuria (Vial and Gorenflot 2006). There were wide variations in canine babesiosis resulting into clinical signs such as anorexia, lethargy, hemolytic anemia, jaundice, vomiting and reduction in body weight (Vial and Gorenflot 2006). In advance stage, it leads to abnormalities in multiple internal organs such as the

lungs, kidneys, pancreases, and heart (Abalaka *et al.* 2018). Study was undertaken as epidemiological aspect of Babesiosis was not reported in Tarai region of Uttarakhand.

The epidemiological investigation of babesiosis in dogs was conducted at various Government Veterinary Hospitals of Tarai region of Uttarakhand during April 2017 to March 2018 on the basis of hospital record of different age, breed, sex, season and area wise.

Total dogs screened at different places were included in the epidemiological study. All the dogs were included in preliminary screening for the presence of canine babesiosis. The peripheral blood smears from ear tip or cephalic vein were collected from dogs exhibiting all or one of the following clinical signs including anaemia, melena, epistaxis, tick infestation, pyrexia or enlarged superficial lymph node and ascites etc. The peripheral blood smear examination was carried out as per standard protocols (Benjamin 1982). The identification of blood protista was based on the method described by Soulsby (1982).

Prevalence study was undertaken during April 2017 to March 2018 in Tarai region of Uttarakhand. During the investigation period, 1,244 animals were screened for the presence of babesiosis with the history of exhibiting clinical manifestation involving anaemia, fever, enlarged lymph nodes and tick infestation etc.

Out of total screened dogs, 294 dogs were found positive for babesiosis. Overall prevalence was 23.63% (Table 1) which was contradictory to Vatsya *et al.* (2010) and Singh *et al.* (2012) who reported 8.19% and 10.21% incidence of *hemoprotozoa* in Pantnagar and Mathura, respectively where as higher prevalence (57.31%) was reported at Guwahati (Bhattacharjee and Samrah 2013).

The overall prevalence of tick infestation recorded in present finding (55.44%) (Table 2) was higher compared to that reported by Smith *et al.* (2011) (14.90%) and lower than Bhadesiya and Modi (2015) (58.11%).

In the present study, the maximum prevalence was noticed in German shepherd (29.03%) and minimum in Bull Mastiff dogs (5.26%) (Table 3). Mahalingaiah *et al.* (2017) observed that the breed-wise incidence was higher in Labrador Retrievers (26%) compared to other breeds. The order of susceptibility was German Shepherd (17%) and lowest in Pit bull terrier (1.5%). However, Shrivastava *et al.* (2014)

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recorded maximum prevalence in German Shepherd (15.47%) and lowest in Spitz (10.13). Kumar *et al.* (2009) in Chennai reported a higher incidence of Babesiosis in hairy breed dogs, which may be due to more tick infestation and difficulties during tick control in hairy breeds because of their long hair coat.

The age wise prevalence of Babesiosis revealed highest prevalence rate, viz. 29.27% (89/304) in 1–3 years age group. However, lower prevalence was reported in the age groups of >9 years (12.31%, 8/65) (Table 4). In the present study, higher prevalence of disease was found in the age group of 1–3 years (29.27%) followed by < 1 year of age which is in correlation with the findings of Mahalingaiah *et al.* (2017), which could be due to the underdeveloped immune system in young dogs as compared to adults. Many authors reported babesiosis in different age group of dogs. Therefore, the age is not the criteria for babesia infection and depends on the transmitting vector and the immune status of the host.

Regarding sex wise prevalence, babesiosis was more prevalent in male dogs (25.89%; 204/788) as compared to female dogs (19.74%; 90/470). In the present study, male dogs (25.89%) were commonly affected than females, which is in agreement with the findings of Mahalingaiah *et al.* (2017). However, Das *et al.* (2015) recorded higher prevalence of babesiosis in females. Kumar *et al.* (2009) reported non-significant difference amongst sex in Chennai.

The month wise prevalence study of *Babesia* spp. revealed highest prevalence in July (33.33%). Comparatively lowest prevalence was reported in December (8.04%) (Table 6). This could be due to the fact that the disease is spread by ticks and their prevalence is also high during summer and rainy season. Higher incidence of disease might be due to high ambient temperature and humidity, which seems to be more conducive for the Slightenance of tick vectors *Rhipicephalus sanguineus* (Bansal *et al.* 1985). Samradhni *et al.* (2005) reported a very high number of positives (63.12%) for haemoprotozoan infections and reported that this high incidence was accounted with maximum temperature and relative humidity, as there appears to be increased tick activity during the period. In another observation, Bhaskara *et al.* (1986) reported frequent infections between May to September in Andhra Pradesh.

Area wise prevalence revealed highest prevalence in Pantnagar (28.82%) and lowest prevalence in Shantipuri (17.43%) (Table 7).

In the present work, the epidemiological pattern of canine babesiosis was investigated in and around Tarai region of Uttarakhand. The overall investigation revealed prevalence of canine babesiosis in Tarai region of Uttarakhand as 23.63% which was 'moderately high' in dogs in and around Tarai region. Higher prevalence may be attributed to the increased population of tick vectors and lower immune status of the host. Hence, proper control measures for ecto-parasite should be followed in dogs. In context to susceptibility, male dog are more susceptible than female which are less than 1 year of age.

Table 1. Overall prevalence of canine babesiosis

Time period	Dog suspected and examined	Positive dogs	Prevalence
April 2017 to March 2018	1,244	294	23.63%

Table 2. Overall prevalence of tick infestation in dogs

Attribute	No of dogs	Percentage
Tick infested	163	55.44%

Table 3. Breed wise prevalence of canine babesiosis

Breed	No. of dogs examined	No. of dogs positive	Prevalence (%)
Labrador	232	66	28.44
German Shepherd	248	72	29.03
Rottweiler	112	23	20.53
Non-descript	202	54	26.73
Pomerian	35	3	8.57
Spitz	140	27	19.29
Pug	102	19	18.63
Havanese	05	1	20.00
Bull Mastiff	19	1	5.26
Great Dane	15	2	13.33
Saint Bernard	115	24	20.87
Bhutia	08	1	12.50
Boxer	11	01	9.09
Total	1,244	294	

Table 4. Age wise prevalence of canine babesiosis

Age group	No. of animals examined	No. of dogs positive	Prevalence (%)
Less than 1 year	321	90	28.04
1–3 years	304	89	29.27
3–6 years	312	65	20.83
6–9 years	242	42	17.36
More than 9 years	65	8	12.31

Table 5. Sex wise prevalence of canine babesiosis

Sex	No. of animal examined	No. of dogs positive	Prevalence (%)
Male	788	204	25.89
Female	456	90	19.74
Total	1,244	294	

SUMMARY

Babesiosis is a haemoprotozoan disease caused by hemotropic protozoa of the *Babesia* genus. It is an emerging disease and has zoonotic importance which continues to emerge worldwide. It has significant economic impact on livestock and pet animals; especially in the tropical and subtropical regions. The present study was undertaken in

Table 6. Month wise prevalence of canine babesiosis

Month	No. of animals examined	No. of dogs positive	Prevalence (%)
April	98	24	24.48
May	119	33	27.73
June	105	31	29.52
July	147	49	33.33
August	128	38	32.81
September	131	39	30.53
October	123	33	26.83
November	107	16	14.95
December	87	7	8.04
January	63	8	12.69
February	44	6	13.63
March	92	10	10.86
Total	1,244	294	

Table 7. Area wise prevalence of canine babesiosis

Area	Animals screened	Animals found positive	Prevalence (%)
Pantnagar	282	81	28.82
Sitarganj	141	28	19.86
Rudrapur	154	39	25.32
Kichcha	112	24	21.43
Shantipuri	109	19	17.43
Haldwani	230	62	26.96
Kashipur	110	21	19.09
Lalkuan	106	20	18.87

different epidemiological aspect on canine babesiosis in Tarai region of Uttarakhand. The overall prevalence of canine babesiosis was recorded as 23.63% based on retrospective study; out of which 55.44% dogs were infested with ticks on hospital records. It was more prevalent in males (25.89%) as compared to female dogs (19.74%). The maximum prevalence was seen in German Shepherd (29.03%) as compared to Bull Mastiff (5.25%). Young dogs (1-3 years of age) were comparatively more affected in comparison to adult dogs. The highest prevalence was found in July (33.33%) whereas least was recorded in December (8.04%). High rise of temperature, tick infestation, anorexia, dehydration, lethargy, etc. were the characteristic clinical signs of canine babesiosis.

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