RESEASRCH ARTICLE

Incidence of Canine Babesiois based on Rapid Antibody Diagnostic Test in and around Navsari, Gujarat

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Abstract

The present study was carried out with an aim to report incidence of canine babesiosis based on rapid antibody diagnostic test in and around Navsari, Gujarat, over a period from October 2022 to June 2023. Out of 1040 cases of dogs registered at Veterinary Clinical Complex (VCC), Navsari, 52 cases were suspected for canine babesiosis based on clinical symptoms, blood smear examination and haematological findings. Blood samples from these suspected cases were subjected to rapid antibody diagnostic test. The overall incidence of canine babesiosis was 2.79 % (29/1040). Among 52 suspected cases, the incidence was 55.77 % (29/52). Comparatively, higher incidence was observed in dogs aged between 3-6 years (34.48 %) followed by 1-3 years (20.70 %), ≤1 year (17.24 %), 6-9 years (17.24 %) and >9 years (10.34 %). The incidence was higher in males (58.62%) than females (41.38%). Season-wise, the incidence was higher in summer (62.07%) followed by winter (34.48%) and monsoon (3.45%). The incidence was the highest in Labrador retriever (34.48%) followed by German shepherd (17.24%), Non-descript (17.24%) and Lhasa Apso & others (3.45% each).

Key words: Babesiosis, Canine, Gujarat, Incidence, Rapid antibody diagnostic test.

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Introduction

Canine babesiosis which is known as 'Malignant Jaundice' is an emerging tick borne infectious disease caused by parasites of the genus *Babesia*, belonging to the family *Babesiidae* (Karasova *et al*., 2022). It can infect a wide variety of domestic and wild animals as well as humans (Schnittger *et al*., 2012). This disease in dogs is caused by two groups of the *Babesia* spp., *viz.,* small (1.0-2.5 µm) and large (2.5-5.0 µm) sized parasites. Among these, *B. canis* and *B. gibsoni* are the most frequently found *Babesia* species in dogs. The disease is characterized by a wide range of clinical manifestations; from subclinical to life-threatening conditions. Clinically, the disease is characterized by various types of anaemia, pyrexia, anorexia, icterus, tachypnoea, tachycardia, splenomegaly with or without multiple organ dysfunctions (Mittal *et al*., 2019). The variable prevalence of canine babesiosis was observed in all over the world. In India, state wise prevalence varies from 6-64 % with geographic location (Kumar *et al*., 2015; Mahalingaiah *et al*., 2017; Gurjar *et al*., 2023). Particularly in Gujarat, Bilwal *et al*. (2017) and Murabiya *et al*. (2018) reported the overall prevalence of canine babesiosis as 30.38 % and 16.27 %, respectively. The incidence of canine babesiosis depends on various factors including the species of Babesia involved, age, breed, concurrent infections, immune and physiological status of the host etc (Neelawala *et al*., 2021).

Since beginning, microscopic blood smear examination is considered as gold standard method for diagnosis of haemoprotozoan infections (Reddy *et al*., 2016) and later on conventional PCR was used for confirmatory diagnosis (Singh *et al*., 2014). But, the cases caused by the small sized organism and/or relatively low or intermittent parasitemia in chronically infected or subclinical carrier dogs results into lower incidence of canine babesiosis based on these techniques (Jain *et al*., 2017; Mittal *et al*., 2019). Therefore, various sero-diagnostic tests have been developed for diagnosis of the disease, such as the indirect fluorescent antibody test (IFAT), the enzyme-linked immunosorbent assay (ELISA) (Fukumoto *et al*., 2005), and the immunochromatographic test (ICT)

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(Verdida *et al*., 2005) with native or recombinant proteins as antigens. Due to high specificity and sensitivity of ICT with advantage of being simple, economical, rapid and easy to manipulate even in laboratory or field conditions, it is being used for on spot rapid diagnosis (Luo *et al*., 2012). Therefore, this study was aimed to report incidence of canine babesiosis based on rapid antibody diagnostic test in and around Navsari district in Gujarat.

Materials and Methods

A total of 1040 dogs were registered at Veterinary Clinical Complex (VCC), College of Veterinary Science & AH, Kamdhenu University, Navsari (India) over a period from October 2022 to June 2023. Among these, 52 dogs were suspected for canine babesiosis based on clinical symptoms such as high body temperature, pale mucous membrane, vomiting, yellow coloured urine, distended abdomen/ascites (Fig. 1a), blood smear examination, and haematological findings like anaemia, leucopenia and/or thrombocytopenia etc (Fig. 1b). Approximately 5 mL of whole blood was collected from cephalic or saphenous vein of suspected cases in vacutainers containing K_3EDTA for haematological analysis and rapid antibody diagnostic test. The commercially available test kit (®PetX Rapid Test Kit) was procured from Secure Diagnostic Private Limited, Bhopal (India). This test kit detects the presence of antibodies against *Babesia canis* (BC Ab) and *Babesia gibsoni* (BG Ab) in dog's serum, plasma or whole blood based on a principle of sandwich lateral flow immuno-chromatographic assay (Fig. 2a,b). The test was performed as per protocol given by the manufacturer. Data pertaining to incidence of canine babesiosis overall, and age-, breed-, and sex-wise were analysed using chi-square test at confidence interval of 95% on IBM SPSS statistical software version 20.0.

Results and Discussion

Overall Incidence

Among the registered cases (1040), 52 cases were suspected based on clinico-haematological findings and samples were subjected to rapid antibody diagnostic test. Of which, 29 cases were found positive with overall incidence of 2.79 % (29/1040), which concurred with the reported incidence (2.9%) of canine babesiosis by Badawi and Yousif (2020). However, a lower (1.15%) overall incidence was reported by Gonmei *et al.* (2020), while few scientists reported overall incidence between 5 and 10 % (Kumar *et al*., 2015; Cimpan *et al*., 2020) and even higher (>10%) (Senthil *et al*., 2020; Yang *et al*., 2022).

Of 52 suspected cases, the incidence of canine babesiosis was 55.77 % (29/52). Higher incidence (>40%) of canine babesiosis among suspected cases was also reported by Mahalingaiah *et al.* (2017) and Tayyub *et al.* (2019), while others reported incidence below 40 % (Murabiya *et al*., 2018; Gonmei *et al*., 2020; Gurjar *et al*., 2023). Few reports mentioned cent percent incidence of canine babesiosis among suspected cases (Neelawala *et al.,* 2021). The disparity in incidence of canine babesiosis could be due to difference in the study locations, duration of the study, experimental design, season of the year, and inclusion and exclusion criteria employed (Gonmei *et al*., 2020).

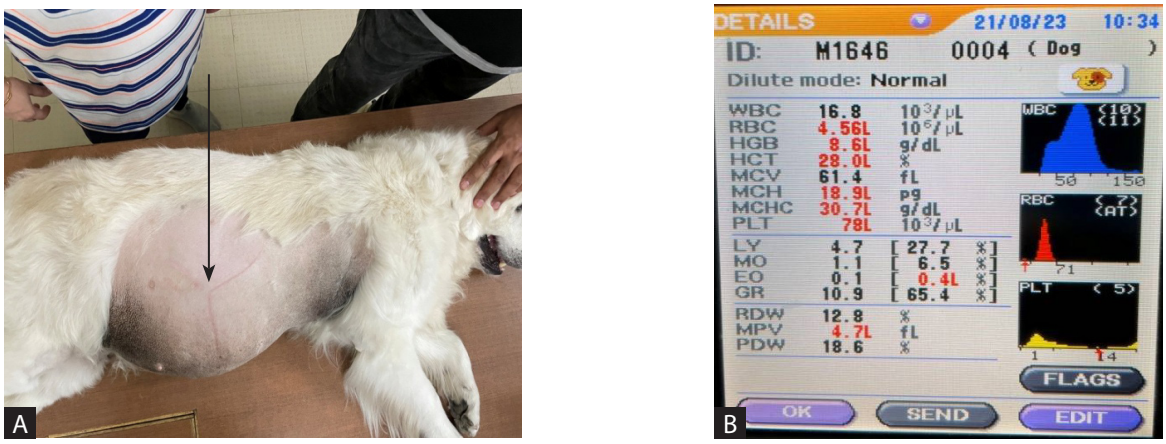

Fig.1: Ascities (A) and classical haematological findings (B) in *Babesia* infected dogs

Fig. 2: Positive (A) and negative (B) result on rapid antibody diagnostic test for *Babesia* infection in dogs

Age-Wise Incidence

During the present study, comparatively higher incidence was observed in dogs aged between 3-6 years (34.48 %) followed by 1-3 years (20.70%), ≤1 year (17.24%), 6-9 years (17.24%) and > 9 years (10.34%) (Table 1). The finding of higher incidence in age group between 3-6 years is in agreement with report of Gurjar *et al.* (2023), in which they found comparatively higher incidence in dogs aged between 2-5 years followed by dogs aged > 5 years, > 1 year and between 1 to ≤ 2 years. Hornok *et al.* (2006) reported the highest incidence of canine babesiosis in middle age dogs (3-5 years) and thereafter decreased with increasing of age. On the contrarily, comparatively higher incidence of canine babesiosis was reported in dogs aged below 3 years as compared to other age groups by others (Mahalingaiah *et al.*, 2017; Murabiya *et al.*, 2018; Badawi and Yousif, 2020). The overall effect of age groups on incidence of canine babesiosis was non-significant (p>0.05) in the present study, which concurred with Tayyub *et al.* (2019) and Seleznova *et al.* (2020). The reason of higher infection rates in middle aged dogs might be due to increases chances of getting infected as they spend more time outdoors (Rene-Martellet *et al.*, 2013), although Mahalingaiah *et al.* (2017) and Murabiya *et al.* (2018) opined that age is not a criterion for *Babesia* infection and it depends on the transmitting vector and immune status of the host.

Breed-Wise Incidence

Individually, the incidence of canine babesiosis was the highest in Labrador retriever (34.48%) followed by German shepherd (17.24%), non-descript (17.24%) and other breeds comprised of Lhasa Apso, Pug, Saint Bernard, Mastiff, Golden Retriever, Pomeranian, Beagle, Husky and Shih Tzu) (3.45% each) (Table 1). The finding of higher rate of infection in Labrador retriever is in agreement with previous reports (Singh *et al.*, 2014; Mahalingaiah *et al.*, 2017; Murabiya *et al.*, 2018; Gurjar *et al.*, 2023). However, a few reports from other countries mentioned comparatively higher breed-wise incidence in breeds other than Labrador retriever (Badawi and Yousif, 2020; Neelawala *et al.*, 2021; Yang *et al.*, 2022). The overall effect of breeds on incidence of canine babesiosis was non-significant (p>0.05) which was in agreement with previous reports (Hornok*et al.*, 2006; Mahalingaiah*et al.*, 2017).

Table 1: Age, breed, sex and season wise incidence of canine babesiosis

Factors	Parameters		Suspected cases	Infected cases			
				No.	%	χ^2	*p* value
Age	≤1 year		7	5	17.24		
	1-3 year		10	6	20.70		
	3-6 year		19	10	34.48	1.06	0.900
	6-9 year		10	5	17.24		
	> 9 year		6	3	10.34		
Breed	Labrador Retriever		19	10	34.48		
	German Shepherd		8	5	17.24	3.54	0.471
	Non-descript		8	5	17.24		
	Lhasa Apso		5	1	3.45		
	Others	Pug	2	1	3.45		
		Husky	2	1	3.45		
		Golden Retriever	2	1	3.45		
		Shih Tzu	2	1	3.45		
		Pomeranian	1	1	3.45		
		Beagle	1	1	3.45		
		Saint Bernard	1	1	3.45		
		Mastiff	1	1	3.45		
		Total	12	8	27.59		
Sex	Male		30	17	58.62	0.023	0.879
	Female		22	12	41.38		
Season	Winter (Nov-Feb)		18	10	34.48		
	Summer (Mar-June)		31	18	62.07	0.68	0.711
	Monsoon (July-Oct)		3	1	3.45		
Overall	**Total**		**52**	**29**	**100**		

The variation in breed-wise incidence depends on different variable like total dog population of each breed in the city, breed preference of pet owners and also interest of owners towards care and management of their pets. Thus, the higher incidence in Labrador retriever might be due to comparatively more population in area of study as mentioned by Murabiya *et al*. (2018) and Gurjar *et al.* (2023).

Sex-Wise Incidence

During the present study, higher incidence of canine babesiosis was observed in males (58.62%) than in females (41.38%) that concurred with previous reports (Mahalingaiah *et al.,* 2017; Murabiya *et al*., 2018; Neelawala *et al*., 2021). On the contrarily, few reports showed higher rate of infection in female dogs than male dogs (Singh *et al*., 2014; Kumar *et al*., 2015; Gurjar *et al*., 2023). Higher incidence of canine babesiosis in male dogs might be due to over presentation of male in the study population (Rene-Martellet *et al*., 2013). Murabiya *et al*. (2018) further stated that the higher rate of infection in males could be due to increased risk of direct dog-to-dog vector transmission during inter-dog aggression or fighting in males than females.

Season-Wise Incidence

The incidence of canine babesiosis was non-significantly higher in summer (62.07%) followed by winter (34.48%) and monsoon (3.45%) in present study (Table 1). This was in agreement with report of Singh *et al.* (2014), who found higher prevalence in summer season (18.75%) followed by rainy season (17.94%) and winter season (9.72%). Senthil *et al.* (2020) reported the highest prevalence of canine babesiosis in winter (35%) followed by monsoon (32.2%), summer (21.6%) and autumn (20.6%). Badawi and Yousif (2020) also observed the highest prevalence in spring (14.29%) followed by summer (2.33%) and winter (0%). The higher prevalence of canine babesiosis in hot and humid period of the year might be due to it's favourable effect on the life cycle of different ectoparasites and further spread of vector-borne diseases (Singh *et al*., 2014; Mittal *et al*., 2019).

Conclusion

The findings of the present study showed that the incidence of canine babesiosis was comparatively higher in middle aged dogs (3-6 years), mainly in most commonly adopted breed (Labrador retriever) in a population under study. The disease was more prevalent in males and in hot and humid period of summer season of south Gujarat, which favours seasonal activity of the brown dog ticks that spread the disease.

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