CLINICAL AND HAEMATOLOGICAL STUDIES ON NATURALLY OCCURRING TICKBORNE DISEASES IN CANINE

Raguvaran R*, Mondal, D.B., Dimri, U. and Amarpal[1]

[1]Division of Medicine, Indian Veterinary Research Institute, Bareilly, UP

ABSTRACT

Dogs are known to be affected with various hemoprotozoan parasites and rickettsial organism namely *Ehrlichia canis*, *Babesia canis, B. gibsoni, Anaplasma phagocytophilum. Hepatozoon canis*. These diseases are transmitted by arthropod vectors which are most prevalent in tropical and subtropical countries. Tickborne diseases are characterized clinically by anorexia, anaemia, pyrexia, multiple internal organ damage. Detailed investigation of clinical and hematological changes associated with tick borne disease is very important for prompt diagnosis and treatment. The present study deals with clinical and haematological changes in the naturally occurring tickborne diseases in canines along with epidemiological parameters like season, breed and age of the animals.

Key words: Canine, Tickborne disease, Ehrlichiosis, Anaplasmosis, Hematological changes

INTRODUCTION

Different haemoparasite and ricketsial organism viz. *Babesia spp, Trypanosoma spp, Leishmania spp, Hepatozoon spp, Ehrlichia spp, Anaplasma spp, Haemobartonella and Dirofilaria spp* infect the dogs. These parasites are transmitted through arthropod vectors like ticks, lice, triatomines, mosquitoes, tabanids and phlebotomine sand flies and produce illness collectively termed as canine vector borne diseases (CVBD) in tropical and subtropical countries including India. Canine babesiosis is a tick-borne disease caused by hemoprotozoan apicomplexan parasites of the genus *Babesia*. The clinical signs of canine babesiosis vary depending on *Babesia* species, host immunity, age, concurrent diseases and geographic location (reflecting the distribution of different *Babesia* species and/or serotypes). Canine babesiosis can be classified clinically as either uncomplicated or complicated, or can be described as peracute, acute, chronic and subclinical. In uncomplicated babesiosis, clinical signs are due to hemolytic anemia and include fever, anemia, tachypnea, tachycardia, splenomegaly, icterus and depression. Complicated babesiosis is characterized by additional organ involvement such as renal failure, hepatopathy, respiratory distress, myocardial lesions and central nervous system signs. The nervous signs may be related to both cerebral babesiosis and neurological signs derived from

[1] Division of Surgery, Indian Veterinary Research Institute, Bareilly, UP

* Corresponding author email ID: raguivri@gmail.com, 08171409869

hypoglycemia) (Lobetti, 1998; Lobetti *et al*., 2002).

Canine ehrlichiosis is primarily caused by *Ehrlichia canis*, which predominantly invades monocytes. It is transmitted by the brown dog tick, *Rhipicephalus sanguineus*, which is found worldwide. *E canis* causes the most potentially severe clinical presentation involving haemic and lymphoreticular systems and commonly progresses from acute to chronic, depending on the strain of organism and immune status of the host (The Merck Manual, 2005).

MATERIAL AND METHODS

Fifty dogs of different breeds and of both sexes (26 males and 24 females), aged between 1–10years, naturally infected by hemoprotozoan disease were studied between May 2016 and July 2016. Most of the animals came from in and around Bareilly region of Uttar Pradesh. Major clinical signs and vital parameters were recorded in each case. Blood was collected for detection of haematological changes and blood smear was made and stained with Giemsa stain for diagnosis of parasites (Souslby, 1982)

RESULT AND DISCUSSION

Babesiosis is an important disease of domestic and wild Canidae in Asia but the epidemiology of canine babesiosis in India is poorly understood. In a large study conducted in Chennai, *Babesia gibsoni* was reported with a prevalence of 0.1% (Sundar *et al*., 2004) in client-owned dogs (n = 5,832) using bloods smear evaluation only. Another large scale study at Chennai revealed *Babesia gibsoni* with prevalence of 84.9%, followed by *Ehrlichia canis* with prevalence of 6 % (Senthilkumar *et al*., 2009). Other studies reported 9% and 22% of dogs affected in Uttar Pradesh (Chaudhuri, 2006) and Assam (Chaudhuri and Varshney, 2007), respectively. *Ehrlichia* is an alpha-proteobacterium belonging to the family Anaplasmataceae. Species that are able to produce infection in dogs are *Ehrlichia canis* (tropical canine pancytopenia) and *Ehrlichia ewingii* (canine granulocytic ehrlichiosis) (Anderson *et al*., 1991; Irwin and Jefferies, 2004). A few studies investigating the prevalence of canine ehrlichiosis in India using conventional examination of stained blood smears have reported prevalences of 0.35% (n = 752) in Punjab (Juyal *et al*., 1994), 18.9% in Nagpur (n = 238) (Samarandi *et al*., 2003) and 55% in stray dogs in Maharashtra (Mallapur, 2002). One study utilizing an *E. canis*-specific nested PCR found 46/98 (46.9%) owned dogs in Chennai positive for *Ehrlichia* spp. compared to 19% by microscopy (Lakshmanan *et al*., 2007).

In the present study, the majority of blood protozoans and ricketsial organism identified on blood smear examination was *B. gibsoni* 41, (82%) followed by *Ehrlichia canis* 9, (18%). Of the 50 positive samples for tickborne disease the highest percentage of incidence was among the middle aged dogs ranging from 1 to 5 years (60%) (Fig. 5, 6). When all tickborne infections were taken into consideration, the incidence was most commonly noticed in Labrador dogs (Fig. 5, 6). No distinct difference in the incidence was observed between the sexes.

The incidence of tickborne disease in our study was in accordance with the

observation of Bhaskara Rao *et al*. (1986), who reported frequent infections between May and September in Andhra Pradesh. A higher incidence of Babesiosis (82 %) observed in the present study was in accordance with Samradhni *et al*. (2005) who reported 64.28 per cent for Babesia infections. In our study, dogs aged between 1 to 5 years were involved to a greater extent (60 %), whereas other studies revealed that prevalence of haemoprotista was highest in dogs below one year of age (Abulljahi *et al*.1990, and Samradhni *et al*., 2005). It may be due to increased attention and close association of the owners towards their pets at this age. With regards to prevalence of tickborne infections in various breeds, it was observed that Labrador breed was most commonly encountered infestation. It could be due to the increased availability of the breed in the Bareilly region. There was significant difference in the neutrophil count in *B. gibsoni* and *E. canis* infected dogs ($p<0.01$). Lymphocyte count in the *E. canis* infected dogs was significantly ($p<0.03$) higher than that in *B. gibsoni* infected ones. In *E. canis* infected dogs, morula stage would be seen in monocyte but in our study, drastic elevation in lymphocyte count was noticed in affected dogs. Clinical diagnosis of ehrlichiosis by peripheral blood smear examination lacks sensitivity, because low numbers of organisms make demonstration difficult (The Merck Manual, 2005). Molecular techniques such as ELISA and nPCR found to have more sensitivity than blood or buffy coat smear examination (Chetan *et al*., 2013; Senthilkumar and Srikala, 2015) . Hence, early diagnosis can be made by combination of clinical signs, change in the blood count (Increased lymphocyte count) and response to treatment. However, no significant difference could be noticed in other blood parameters in *E. canis* and *B. gibsoni* infected dogs (Table 1).

Dogs infected with *Babesia gibsoni* were treated with Clindamycin 15 mg/kg b.wt and Doxycycline 5 mg/kg b.wt for 10 days along with antipyretics, antihistamine, antioxidant, liver tonics and Spot on FIPRFORT PLUS® (Fipronil and S-methoprene, SAVAVET). In our study, we found recurrence of the infection in 10 (24%) cases of babesiosis where recovered animal later developed kidney failure. This finding was in accordance with the observations of other authors who have reported that complicated babesiosis is characterized by additional organ involvement leading to renal failure, hepatopathy, respiratory distress, myocardial lesions and central nervous system signs (Lobetti, 1998; Lobetti *et al*., 2002). Hence, it is advisable to add antioxidant in the prescription to avoid free radicals induced damage to blood vessels and internal organs in order to prevent the development of SIRS and MODS in canine babesiosis.

Dogs infected with E. canis were treated with Doxycycline 5 mg/kg b.wt for 3 weeks along with antipyretics, antihistamine, antioxidant, steroids, liver tonics and Spot on FIPRFORT PLUS® (Fipronil and S-methoprene, SAVAVET). All the animals were recovered without any complication. Immune mediated destruction of platelet and RBC is the main reason for severity of the infection (The Merck Manual, 2005). Hence, it is beneficial to add steroids (Immunomodulant dose) to

preserve vascular integrity and anti-oxiadant to prevent free radicals induced damage to vital organs. These two approaches would prevent the incidence of SIRS and MODS if the treatments had started at very onset of the disease.

SUMMARY

The study was conducted to evaluate the clinical and haematological changes in the naturally occurring tickborne diseases in canines in and around Bareilly region. It revealed high occurrence of *B. gibsoni* (82%) followed by *E. canis* (18%) in canine population. The present study also showed higher incidence of tickborne disease in Labrador dog and dogs aged between 1 and 5 years were most commonly affected. Addition of antioxidant (Vitamin C/ Vitamin A) and steroid (Dexamethasone) in hemoprptozoan diseases along with specific therapy could reduce the onset of SIRS and MODS.

Future Scope

A large scale study is needed to vividly understand the oxidative stress during pre and post treatment period and detailed investigation should be carried out to study the damage to vascular integrity in hemoprotzoan diseases of canines in order to standardize the treatment protocol.

ACKNOWLEDGEMENT

I would like to thank Dr. Amarpal, (Incharge, RVP, IVRI), Dr. Umesh Dimri (HD, Medicine) and Dr. D. B. Mondal (Pr. Sci, Medicine) for their valuable suggestion during the training period. I specially thank Dr. Banerjee, P.S. (Head, Parasitology) for his timely help in diagnosis of disease.

REFERENCES

Abullahi.,S.U., Mohammad., A.A. and Trimnell, A.R. 1990. Clinical and haematological finding in 70 naturally occurring cases of canine babesiosis. J. Small Anim. Pract. 31:145-147.

Anderson B.E., Dawson, J.E., Jones, D.C. and Wilson, K.H. 1991. *Ehrlichia chaffeensis*, a new species associated with human ehrlichiosis. J. Clin Microbiol. 29: 2838-2842.

Bhaskara Rao, P, Ramanathan, S. and Karkhani, R.S. 1986. Haemoprotozoan infection in animal of Andhra Pradesh. Livestock Advisor. 11 : 34-48.

Chaudhuri, S. 2006. Studies on clinico-therapeutic aspects of babesiosis in dogs. M.V.Sc. thesis. Indian Veterinary Research Institute, Izzatnagar, Bareilly, UP, India.Part I.Epizootiological aspects: Molecular studies on Babesia, Thelieria and Hepatozoon in southern Europe. Vet. Parasitol. 113: pp 189-201.

Chaudhuri, S. And Varshney, J.P: 2007. Clinical management of babesiosis in dogs with homeopathic Crotalus horridus 200C. Homeopathy. 96: 90-94.

Chetan, P., Riddhi, P., Anant, J. and Mukulesh, G. 2013. Comparative diagnostic methods for canine ehrlichiosis. Turk J Vet Anim Sci. 37: 282-290

Irwin, P.J. and Jefferies, R. 2004. Arthropod-transmitted diseases of companion animals in Southeast Asia. Trends Parasitol. 20: 27-34.

Juyal, P.D., Kalra, I.S., Singhla, L.D. 1994. Prevalence of haemoprotozoans in domestic animals in Punjab. 6th National congress of Veterinary Parasitology.

Lakshmanan, B., John, L., Gomathinayagam, S. and Dhinakarraj, G. 2007. Molecular detection of *Ehrlichia canis* from blood of naturally infected dogs in India. Veterinarski Arhiv. 77: 307.

Lobetti, R.G. Diver, E and Pearson, J. 2002. Cardiac troponins in canine babesiosis. J. Vet. Internal Med. 16: pp. 63–68.

Lobetti, R.G.1998. Leukemoid response in two dogs with *Babesia canis* infection. J. South African Vet. Associ. 66: pp. 182–184

Mallapur, S.S. 2002. Studies of ehrlichiosis in dogs of Mumbai. M.V.Sc. thesis. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India.

Samaradni, D., Maske, D.K., Kolte, S.W., Shinde, P.N.2003. Ehrlichiosis in dogs in Nagpur. J Vet Parasitol. 17: 165-166.

Samradhni, D., Maske., D.K., Shobha, R. and Shinde, P.N. 2005. Bionomics and haemodynamics in blood protozoal infections in dogs from Nagpur [M.S.]. Indian J. Anim. Health. 44: 57-66.

Satish Kumar, K. and Srikala, D. 2015. Canine monocytic ehrlichiosis the newer perspectivesof its diagnosis and treatment. I.J.S.N. 6(4): 697-700.

Senthil Kumar, K., Vairamuthu, S., and Kathiresan, D. 2009. Prevalence of haemoprotozoans in canines in chennai city. Tamilnadu J. Veterinary & Animal Sciences. 5 (3): 104-108.

Soulsby, E.J.L. 1982. Helminths, Arthropod and Protozoa of Domesticated Animlas. 7th Edn., Bailliere Tindall, London, UK.

Sundar, N., Balachandar, C. and Senthilvelan, A. 2004. Incidence of *Babesia gibsoni* infection in dogs in Tamil Nadu. J.Vet. Parasitol.18: 69-70

The Merck Veterinary Manual. 2005.9th Edn., Merck &CO., INC Whitehouse Station. N.J.USA.

Table 1: Hematological Changes In Infected Dogs

Parameters	*B.gibsoni*	*E. canis*	P-value
HB	11.57±2.72	7.29±1.15	0.470
PCV	26.92±1.69	21.87±3.46	0.208
MCV	66.40±2.80	61.03±4.52	0.483
MCH	22.23±0.95	20.34±1.51	0.386
MCHC	32.52±0.81	33.33±0.00	0.644
TLC	15291.33±1593.79	15444.44±5066.50	0.971
TEC	4.01±0.19	3.48±0.47	0.261
N	73.00^{b}±1.20	61.11^{a}±4.31	0.001
L	21.34^{a}±1.28	32.56^{b}±5.01	0.003
M	3.24±0.33	3.33±0.47	0.905
E	1.49±0.28	2.78±0.72	0.065

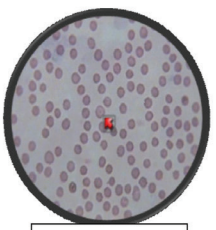

Fig. 1: B. gibsoni

Fig. 2: *E. canis*

Fig. 3: Tick Infested Dogs

Fig. 4: Epistaxis in *E. canis* infected dog

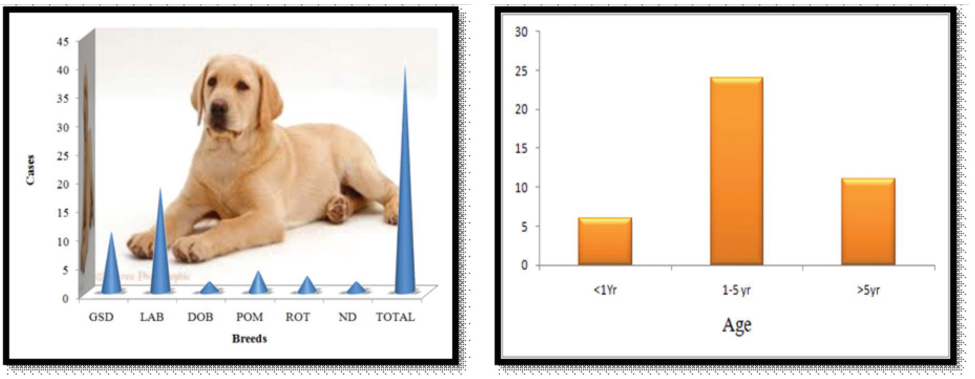

Fig. 5: Breed and Age susceptibility to *B. gibsoni*

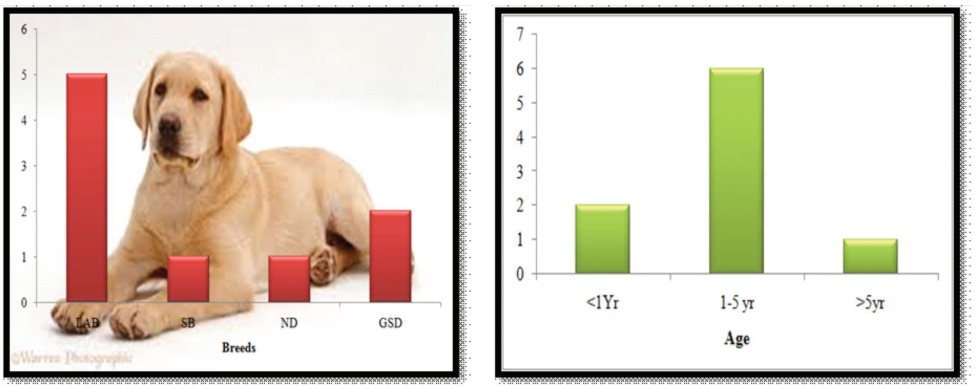

Fig. 6: Breed and Age susceptibility to *E. canis*