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Short Communication

Haemato-biochemical alteration and therapeutic management of canine babesiosis

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Abstract

Canine babesiosis is one of the most common, globally existent, fast-spreading tick-borne haemoprotozoan disease caused by different species of *Babesia*. The present study discusses the clinico, haemato-biochemical changes and its therapeutic management in dogs infected with babesiosis. A 3.5 years old female Spitz having 10 kg body weight was presented to the TVCC, WBUAFS, Kolkata- 37, West Bengal with a history of ectoparasitic infestation, inappetence for 5 days. Clinical examination revealed that, there were 103.4°F body temperature, tachycardia and increased respiratory rate. Closed clinical observation showed pale mucous membrane, severe dehydration, depression and swelling of lymph nodes. A peripheral blood smear and whole blood sample were sent to the laboratory for confirmatory diagnosis. The presence of pyriform-shaped organism, *Babesia gibsoni* on microscopical examination and correlation with haemato-biochemical alteration confirmed the case as canine babesiosis associated with acute renal failure (ARF). Therapeutic management of acute renal failure was initiated along with specific treatment for canine babesiosis with triple drug therapy consisting of doxycycline @5 mg/kg b. wt., clindamycin @25 mg/kg b.wt. and metronidazole @15 mg/kg b. wt. orally twice daily for 14 consecutive days. Tick remover, injection ivermectin @0.2 mg/kg subcutaneously at weekly interval and for correction of anaemia haematinic syrup (Sharkoferrol) @5 mL daily orally were given. After two weeks of treatment, blood smear and blood sample were sent for re-examination. The report showed negative for any haemoprotozoa and the haemato-biochemical report also improved than earlier.

Key words: ARF, Babesia, Haemato-biochemical changes, Therapeutic management

Highlights

- The presence of pyriform-shaped organism i.e. *Babesia gibsoni* in the erythrocytes of the infected dog on microscopical examination of thin blood smear and clinico, haemato-biochemical alteration confirmed the present case as canine babesiosis associated with acute renal failure (ARF).
- Treatment of canine babesiosis involves the therapeutic management of acute renal failure besides specific treatment for removal of haemoprotozoa by using triple drug therapy along with prevention of ectoparasitic infestation and correction of anaemia.
- After two weeks of treatment, the dog appeared normal in health, and blood smear and blood sample were sent for examination again. The report of blood smear examination showed negative for any haemoprotozoa and the haemato-biochemical report also improved than earlier.

Canine babesiosis is one of the most common globally reported clinically significant, fast spreading, life-threatening, tick-borne haemoprotozoan disease of dogs and wild canids caused by apicomplexan intra-erythrocytic parasite of genus *Babesia* (Laha *et al*., 2014; deMarco *et al*., 2017; Halder and Gupta, 2021). There are various species of *Babesia* i.e. *B. canis*, *B. vogeli*, *B. microti*, *B. rossi* and *B. gibsoni*, but in India, the disease canine babesiosis mainly occurs due to two forms, *Babesia gibsoni* (small form) and *Babesia canis* (large form) and is transmitted by a tick *Rhipicephalus sanguineus* (brown dog tick) (Sharma *et al*., 2019). The clinical signs appear as a result of haemolysis due to the

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presence of the pear or signet ring-shaped organism within the erythrocytes. But some species of *Babesia* may also trigger immune-mediated component to anaemia along with severe inflammatory reaction resulting to morbidity and mortality in animals. In India, *B. gibsoni* infection is higher than *B. canis* in dogs (Laha *et al*., 2014). Laboratory diagnosis i.e. direct microscopical examination of the peripheral blood smear is routinely used most simple and rapid diagnostic method. Correlation of haematological and biochemical changes with blood smear examination would be helpful for the early diagnosis of canine babesiosis in field condition.

A 3.5 years old female Spitz weighing 10 kg body weight was presented at the TVCC, Belgachia, WBUAFS, Kolkata (West Bengal) with a history of ectoparasitic infestation, inappetence for 5 days, severe dehydration, pale mucous membrane, depression/lethargy and swelling of lymph node [Fig. 1]. On clinical examination, the dog revealed 103.4°F body temperature, increased respiratory rate and tachycardia.

Based on history and clinical signs, recent case was suspected of haemoprotozoan infection. For confirmatory diagnosis, blood was collected from the ear vein to see a thin blood smear slide in Giemsa staining under 100X microscopical examination. Whole blood was collected from the cephalic vein in sterile vials under aseptic conditions for haemato-biochemical study. Haematological parameters (haemoglobin, packed cell volume, total erythrocyte count, total leucocyte count, differential leucocyte count and platelet count) were evaluated at the laboratory of the Physiology Department, WBUAFS and serum samples were subjected to biochemical parameters like blood urea nitrogen, creatinine, total protein, albumin and globulin by using Ebra Chem. 5x model machine (Transitia Biomedical Limited).

Microscopic examination of a thin blood smear revealed the presence of pyriform-shaped organisms in the erythrocytes of the infected dog (Fig. 2), and the disease was confirmed as canine babesiosis (*B. gibsoni*). There was an alteration in haemato-biochemical profiles. Haemoglobin, PCV, TEC and platelet counts were reduced compared to the normal and healthy dog, indicating severe anaemia and thrombo-cytopenia. In this case, the haematological findings of canine babesiosis were in agreement with the findings of Furlanello *et al*. (2005) and Niwetpathomwat *et al*. (2006). Here anaemia results from increased osmotic fragility of erythrocytes, increased erythrophagocytic activity of macrophages, immune-mediated cleavage and thrombocytopenia due to the destruction of immune-mediated platelets (Makinde and Bobade, 1994; Onishi and Suzuki, 1994; Murase *et al*., 1996; Willard and Tvedten, 2004).

Serum biochemical parameters revealed elevation of BUN, creatinine and ALT along with decrease in the total protein and serum albumin levels due to liver damage in the affected dog. The present findings were in agreement with Salem and Farag (2014). Increased BUN and creatinine might have resulted in canine babesiosis due to acute renal failure. Disproportionate rise in serum urea concentration has been related to catabolism of lysed erythrocytes, and elevation of ALT values in affected animals may be due to attributed to hepatic hypoxia in babesiosis (Aysul *et al*., 2013). The haematological and biochemical parameters are depicted in Table 1.

The treatment of babesiosis involves the removal of parasites from the body, correction of anaemia along with supportive treatment (Halder and Gupta, 2021). In the case of *B. gibsoni,* diaminazine aceturate is not so satisfactory as the drug cannot remove the parasite completely. In this case, therapeutic management of acute renal failure (ARF) was followed through fluid replacement by intravenous infusion of ringers lactate (RL) @10 mL/kg b.wt., frusemide @2 mg/kg b.wt. i.v., ondansetron @0.5 mg/kg b.wt. i.v. and H2 blocker pantoprazole @1 mg/kg b. wt. i.v. for 5 consecutive days.

For specific treatment of canine babesiosis triple drug therapy was given consisting of doxycycline @5 mg/kg b.wt., clindamycin

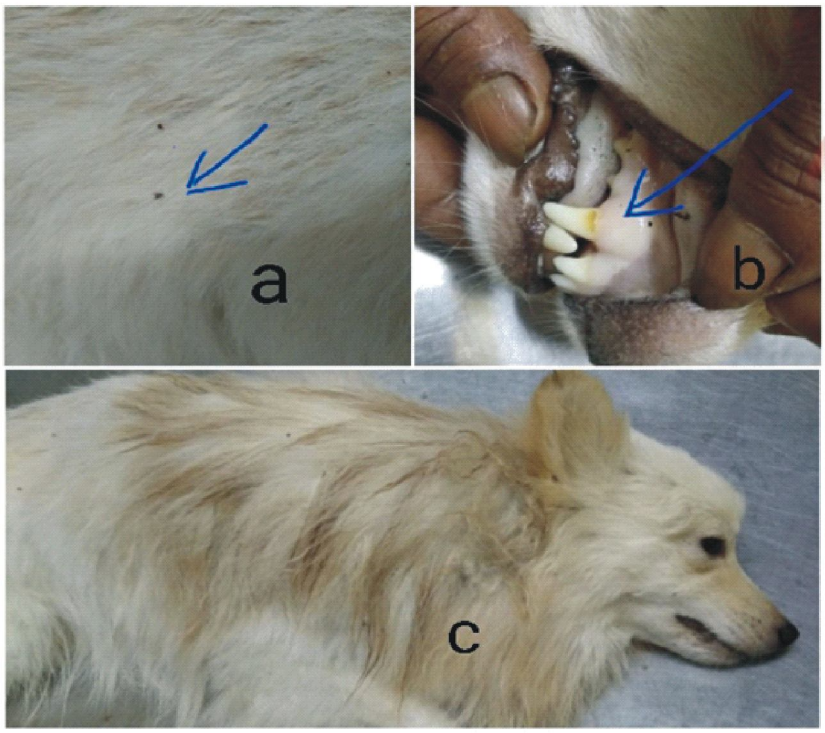

Fig. 1. Clinical signs of dog with babesiosis were a. Ectoparasitic infestation, b. Pale oral mucous membrane (gum), c. Severe depression

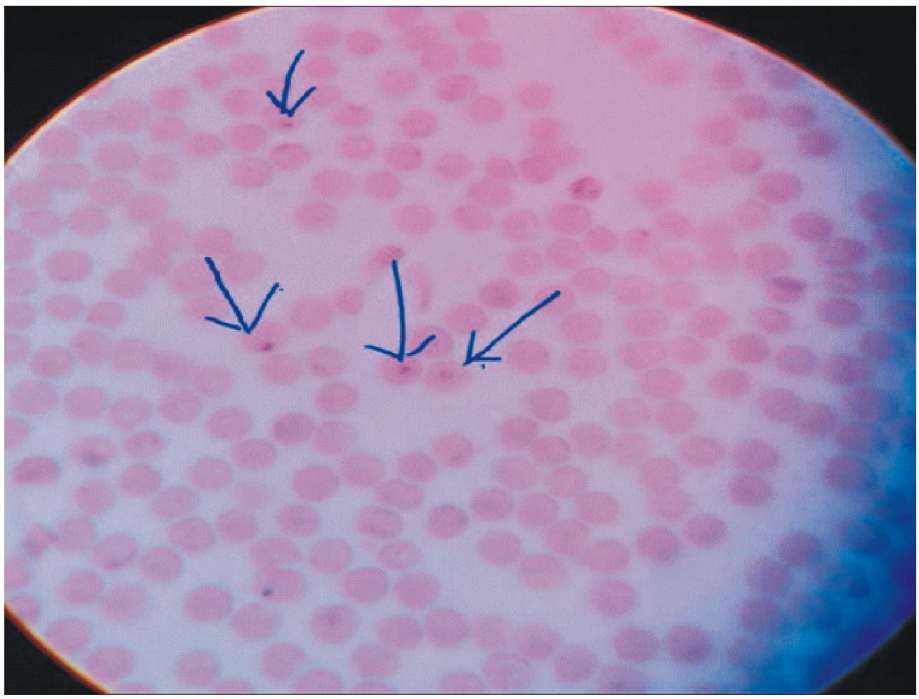

Fig. 2. Microscopic examination of dog blood smear showed pear shaped organism of *Babesia gibsoni* (Small form) present in the erythrocyte under 100X

Table 1. Haematological and biochemical parameters in Babesia infected dog compared to healthy dog

Haematological parameters	Babesia infected dog	Apparently healthy dog
Haemoglobin (gm/dL)	7.8	13
TEC ($\times 10^6$/μL)	4.2	6-8
TLC ($\times 10^3$/μL)	10.6	9-13
Neutrophil (%)	85	65-70
Eosinophil (%)	02	2-5
Besophil (%)	00	0-1
Lymphocyte (%)	12	20-25
Monocyte (%)	01	2-6
PCV (%)	27	38-43
MCHC (%)	21.15	30-35
MCV (fL)	55.60	59-69
MCH (pg)	12.42	20-24
Platelets ($\times 10^3$/μL)	234	150-500
BUN (mg/dL)	34.2	7-25
Creatinine (mg/dL)	11.84	0.5-1.5
ALT (IU/L)	325	10-80
Total protein (g/dL)	3.93	4.5-7.5

Normal haematological parameters in healthy dog (Swenson, 1993)

@25 mg/kg b.wt. and metronidazole @15 mg/kg b.wt. orally twice daily for 2 consecutive weeks along with haematinic syrup (Sharkoferrol) @5 mL orally to correct the anaemia, and injection ivermectin @0.2 mg/kg b. wt. was given subcutaneously at weekly interval to prevent the ectoparasitic infestation. As it is a tick-borne disease, preventive measure for tick control is an important factor, and this combination helps to boost the innate immunity called Marshall protocol (Nandhini *et al*., 2016). After two weeks of treatment, the dog appeared normal in health, and a blood smear and blood sample were sent for examination again. The report of blood smear examination showed a negative result for haemoprotozoa and the haemato-biochemical report also improved than earlier.

The present case study concluded that the most significant manifestations in canine babesiosis are anaemia and thrombocytopenia with biochemical complications. Triple drug therapy consisting of doxycycline, clindamycin and metronidazole along with supportive therapy for haemato-biochemical complications is found to be 100% effective for curing the disease canine babesiosis.

Conflict of interest: Authors have no conflict of interest in this study.

Author's contribution: BH: Case treated, manuscript written; ARG: Edited and corrected the manuscript and supervised the experiments.

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