



Diagnosis and Therapeutic Management of Canine Babesiosis Infection in Nagaland, India- A Case Report

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10.18805/IJAR.B-5660

ABSTRACT

Background: A 4-month-old, non-descriptive male dog was presented to the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Jalukie, Nagaland, with progressive weight loss, reduced appetite, lethargy and emaciation. Examination revealed tick infestation, icterus, enlarged lymph nodes and bilirubinuria. The dog was neither vaccinated nor dewormed.

Methods: Peripheral blood was collected for parasitological, hematological and biochemical analyses. Two milliliters of whole blood were drawn from the cephalic vein into EDTA and clot activator vacutainers, respectively. Ticks were also collected for morphological identification.

Result: Blood smears confirmed *Babesia gibsoni* infection. Hematology showed anemia with mild neutrophilia, while biochemistry revealed hyperaspartatemia, hypoalbuminemia and hyperbilirubinemia. Tick morphology under a 45x stereomicroscope, identified *Rhipicephalus sanguineus*. Treatment included Diminazene aceturate, Doxycycline and supportive therapy.

Key words: *Babesia gibsoni*, Diminazene aceturate, Doxycycline.

INTRODUCTION

Canine babesiosis, a globally distributed hemoprotozoan disease of domestic and wild canids (Irwin, 2010), was first described by Victor Babes in the 19th century and identified in dogs in Italy in 1895 (Anand *et al.*, 2015; Uilenberg, 2006; Amici, 2001), belongs to genus *Babesia* under the phylum *Apicomplexa*. These intraerythrocytic parasites cause a malaria-like infection of major veterinary importance in dogs, cattle and horses and are recognized as emerging zoonotic pathogens (Bhojne *et al.*, 2013).

Dogs acquire infection through sporozoites transmitted by infected tick saliva during feeding. Once in circulation, the sporozoites invade erythrocytes, multiply asexually and release merozoites upon red cell rupture, continuing the infection cycle. *Babesia canis* and *Babesia gibsoni* are the two principal species infecting dogs. The larger *B. canis* (4-5 µm) appears as paired pear-shaped merozoites, whereas *B. gibsoni* (1.0-2.5 µm) presents as smaller ring or pyriform forms (Singh *et al.*, 2023; Conrad *et al.*, 1991). The *B. canis* group includes three antigenically distinct subspecies: *B. canis canis*, *B. canis vogeli* and *B. canis rossi*. Of these, *B. canis rossi* prevalent in southern Africa is the most virulent (Matjila *et al.*, 2008). while *B. canis canis* and *B. canis vogeli* occur in Europe, Asia, the Mediterranean, the Americas, Australia, Japan and South Africa (Matjila *et al.*, 2004). *B. gibsoni* is primarily reported from the Middle East, Europe, Japan and the USA, where it causes an acute form of the disease (Conrad *et al.*, 1991).

Transmission mainly occurs through ixodid ticks, particularly *Rhipicephalus sanguineus*. The clinical manifestations depend on the infecting species and host factors such as age, immune status and concurrent

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How to cite this article: Kuotsu, K., Ozukum, S., Begam, R., Varte, L., Lalsangpuii, Lalawmpuii, H., Devi, N.B., Chutia, T., Singh, C.V. and Das, G. (2025). Diagnosis and Therapeutic Management of Canine Babesiosis Infection in Nagaland, India- A Case Report. *Indian Journal of Animal Research*. 1-6. doi: 10.18805/IJAR.B-5660.

Submitted: 28-07-2025 **Accepted:** 02-09-2025 **Online:** 24-11-2025

infections (Irwin, 2009). Common signs include fever, icterus, depression, severe weight loss, hemoglobinuria, splenomegaly and multi-organ dysfunction affecting the liver, kidneys or brain. Prognosis worsens with the number of organs affected (Matijatko *et al.*, 2010). Both subclinical and subacute infections occur (Irwin, 2009; Eichenberger *et al.*, 2016). Clinicopathological findings often reveal ascites, hypoglycemia, thrombocytopenia, azotemia and elevated liver enzymes (Irwin, 2010).

Diagnosis relies on stained blood smears examination (Cacciò *et al.*, 2002), while serological assays like IFAT and ELISA (Yamane *et al.*, 1993; Adachi *et al.*, 1994) and molecular tools such as PCR have enhanced detection sensitivity (Birkenheuer *et al.*, 2003; Jefferies *et al.*, 2003).

In India, *B. canis vogeli* has been reported, while *B. gibsoni* was first recorded in 1910 (Patton, 1910). Subsequent sporadic cases have been confirmed mainly by microscopy (Mitra *et al.*, 1987; Sundar *et al.*, 2004; Harikrishnan *et al.*, 2005; Sabu, 2005; Varshney *et al.*, 2009; Karunakaran *et al.*, 2011; Tresamol *et al.*, 2013).

Although *B. gibsoni* transmission is attributed to *Haemaphysalis longicornis* and *R. sanguineus* (Solano-Gallego and Baneth, 2011), *H. longicornis* is considered the predominant vector in India (Shaw *et al.*, 2001). Molecular characterization of *Babesia* isolates from northern and northeastern India has shown that ITS-1 and 18S rRNA genes are reliable markers for detection and differentiation of *B. gibsoni* and other atypical *Babesia* species (Mandal *et al.*, 2014).

Case history and observations

A 4-month-old, non-descriptive male dog weighing about 5 kg was presented to the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Jalukie, Nagaland, with a history of progressive weight loss, inappetence, lethargy, weakness and emaciation. The owner also reported persistent tick infestation. The dog had not been vaccinated or dewormed.

On clinical examination, rectal temperature, respiratory rate and heart rate were within normal limits. However, the

mucous membranes of the conjunctiva and oral cavity were icteric and the urine appeared dark yellow (Fig 1a, b, c). Bilirubinuria and enlargement of the mandibular and popliteal lymph nodes were noted.

Peripheral blood was collected for parasitological examination. Two milliliters of whole blood were drawn from the cephalic vein into an EDTA vacutainer for hematological analysis and another 2 ml were collected in a clot activator vacutainer for serum biochemistry. The samples were processed immediately for laboratory evaluation.

RESULTS AND DISCUSSION

Parasitological examination of peripheral blood smears revealed the presence of annular and signet ring-shaped piroplasms, measuring approximately 1.2-2.0 μ m in diameter within erythrocytes, confirming infection with *Babesia gibsoni* (Fig 2). Morphological examination of ticks under a 45 $\times$ stereomicroscope demonstrated features consistent with *Rhipicephalus sanguineus*, including a sub-hexagonal basis capitulum, scutum, bifid coxae of the first pair, palpi, hypostome, chelicerae, genital pore, festoons at the posterior end, adanal shields, anus and a comma-shaped spiracular plate-findings concordant with the descriptions of Wu *et al.* (2024) (Fig 3, Fig 4, Fig 5, Fig 6, Fig 7).

Hematological analysis on day 1 revealed marked reductions in total erythrocyte count, hemoglobin concentration and packed cell volume, accompanied by neutrophilia, while other hematologic indices remained within normal limits (Table 1). Serum biochemical analysis showed elevated aspartate transaminase (AST) activity (hyperaspartatemia), increased bilirubin concentration (hyperbilirubinemia) and decreased albumin levels (hypoalbuminemia), whereas creatinine and alanine transaminase (ALT) values were within reference ranges (Table 2) (Latimer, 2011; Kaneko *et al.*, 2008). By day 15, total erythrocyte count, hemoglobin concentration and packed cell volume showed mild improvement and other hematologic parameters returned to normal limits (Table 1).

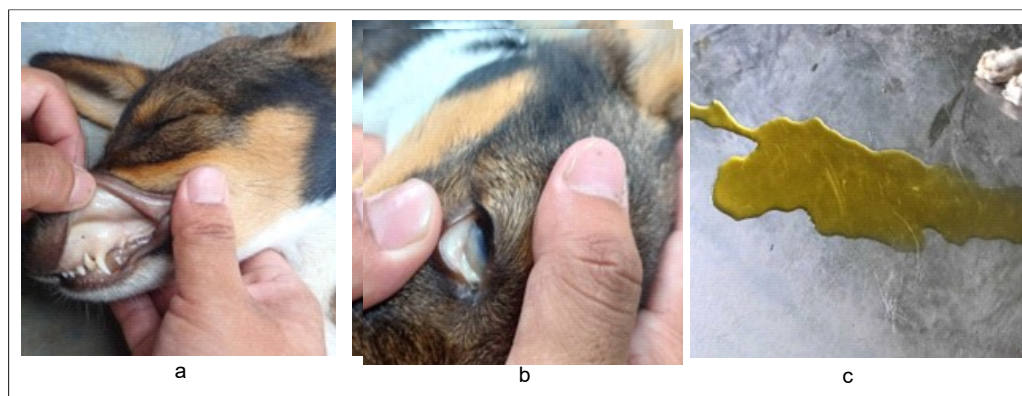


Fig 1a, b, c: Clinical observation displaying Icterus in the oral and conjunctival mucous membranes, accompanied by yellowish urine.

Treatment

Initial therapy consisted of oxytetracycline (10 mg/kg, IM) and Trivibet (1 ml/10 kg, IM). Following confirmation of *Babesia gibsoni* infection, the regimen was modified to diminazene aceturate (3.5 mg/kg, IM) and doxycycline (10 mg/kg, PO,

OD) for 21 days. Due to severe anemia (PCV <20%; Hb <3 g/dL), a whole-blood transfusion was administered after evaluation of donor hematological parameters (Fig 8a, b, c; Table 3). Avilin (0.5 ml, IM) was administered prior to transfusion to stabilize the recipient (Fig 9a,b).

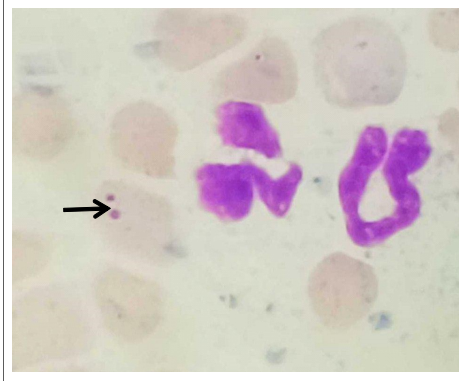


Fig 2: Giemsa-stained blood smear revealing the presence of *Babesia gibsoni* organisms within erythrocytes, characterized by their signet, rod, or cocci shapes, as indicated by the arrow.

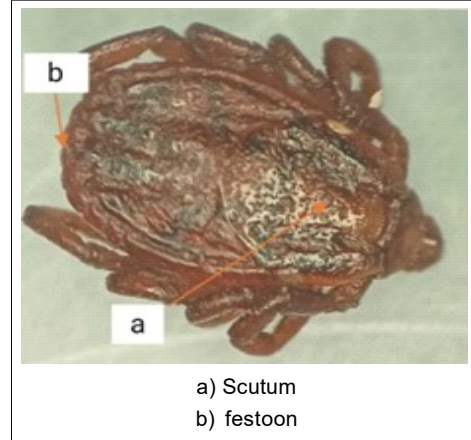


Fig 5: Female (Dorsal view).

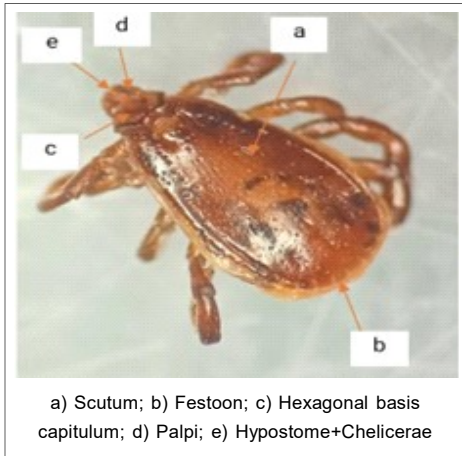


Fig 3: Male (Dorsal view).

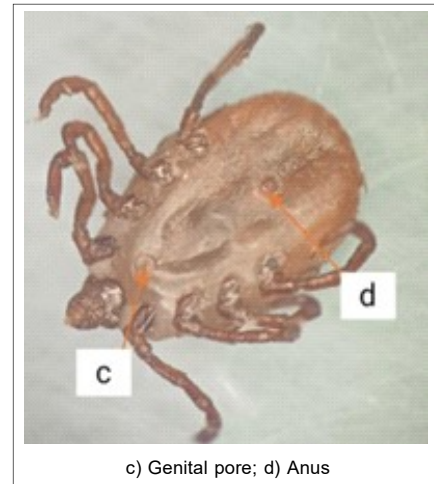


Fig 6: Female (Ventral view).

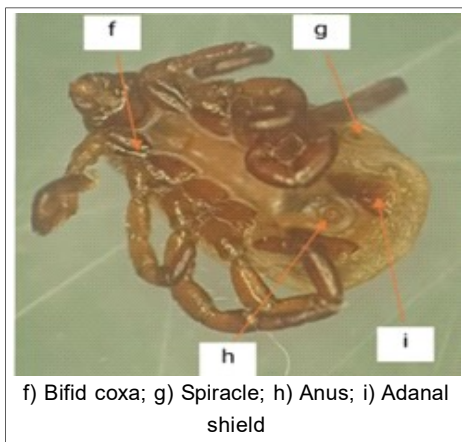


Fig 4: Male (Ventral view).

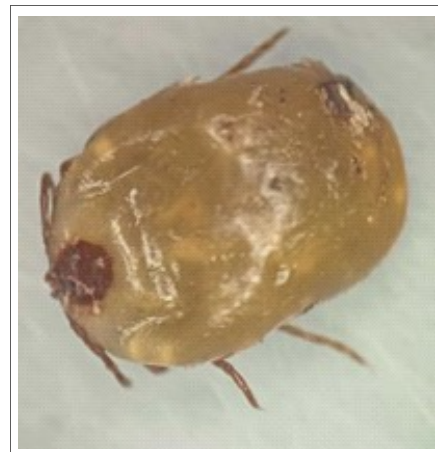


Fig 7: Engorged Female tick.

Ectoparasite control was achieved using a topical spot-on formulation containing Fipronil 9.8% w/v and (S)-Methoprene 8.8% w/v, with reapplication advised every two months. Supportive therapy included oral hematinics (Syrup Iroshine, 1 tsp BID for 28 days) and a liver tonic (Syrup Hepamust, 1 tsp BID for 28 days) to promote hematopoiesis and hepatic recovery.

The prognosis for canine babesiosis caused by *Babesia gibsoni* is generally favorable when diagnosed early and treated promptly. However, untreated cases may progress to severe, life-threatening stages. Effective management requires an integrated approach combining specific antiprotozoal therapy with supportive measures aimed at restoring tissue oxygenation, correcting anemia and maintaining fluid-electrolyte balance. Whole-blood transfusion is warranted in severely anemic patients to restore oxygen-carrying capacity.

Current chemotherapeutic agents seldom achieve complete parasite clearance at standard dosages; their primary objective is to reduce mortality and clinical severity (Birkenheuer *et al.*, 1999). The Atovaquone-Azithromycin

combination has shown promising efficacy against *B. gibsoni*, but Atovaquone remains costly and unavailable in India. Furthermore, resistant strains of *B. gibsoni* have been reported (Wulansari *et al.*, 2003).

Various chemotherapeutic agents and combinations including Imidocarb dipropionate, Diminazene aceturate, Atovaquone with Azithromycin, Buparvaquone with Azithromycin and antibiotics such as Doxycycline, Clindamycin and Metronidazole have demonstrated efficacy (Irwin, 2009; Solano-Gallego and Baneth, 2011; Iguchi *et al.*, 2015; Checa *et al.*, 2017; Baneth, 2018). Diminazene aceturate and Imidocarb dipropionate remain among the most widely used agents globally, while Oxytetracycline serves as an adjunct to reduce disease severity (Karunakaran *et al.*, 2011). Diminazene aceturate is frequently administered at slightly higher-than-recommended doses of 3.5 mg/kg body weight (Dakshinkar and Bhojne, 2002). A combined regimen of Doxycycline, Clindamycin and Metronidazole with Diminazene aceturate has also shown high efficacy with minimal adverse reactions (Lin and Huang, 2010).

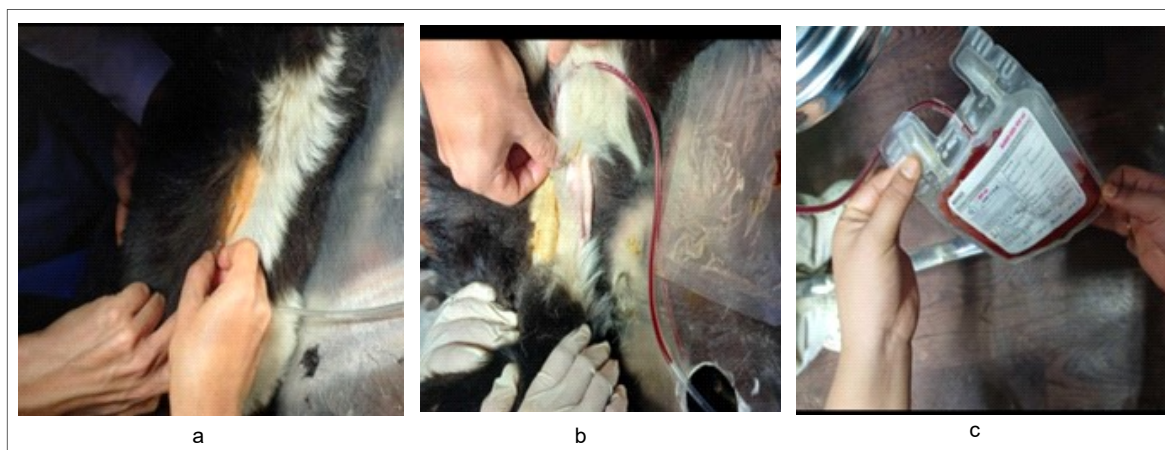


Fig 8a, b, c: Collection of blood from the donor into a blood bag.



Fig 9: Administration of blood transfusion to the recipient dog.

Table 1: Hematological changes in dog on day 1 and day 15 (Pre and post therapy).

Blood parameters	Values		Reference standard
	Day 1	Day 15	
Hb (g%)	2	6.7	12-18
TEC (million/cmm)	0.83	2.62	5.5-8.5
TLC (thousand/cmm)	9.37	15.84	6-17
Neutrophils (%)	87.3	70	50-80
Lymphocyte (%)	12.2	15	8-38
PCV (%)	5.7	17.5	37-55

Table 2: Biochemical parameters of dog affected with canine babesiosis.

Parameters	Test value	Reference range
Bilirubin-total (mg/dl)	1.52	0-0.3
Albumin (g/dl)	1.14	2.3-3.1
Creatinine (u/dl)	0.58	0.5-1.7
SGPT (ALT) (U/L)	80	10-109
SGOT (AST) (U/L)	53.6	13-15

Table 3: Hematological parameters of the donor dog.

Parameters	Values	References
Hb (g%)	12.8	12-18
TEC (million/cmm)	5.25	5.5-8.5
TLC (thous and/cmm)	12.46	6-17
Neutrophils (%)	50	50-80
Lyphocyte (%)	25	8-38
PCV (%)	35.3	37-55

In the present case, treatment with Diminazene aceturate and Doxycycline resulted in marked clinical improvement. Follow-up after 15 days revealed Giemsa-stained peripheral blood smears negative for *B. gibsoni* and notable improvement in hematological parameters (Table 1). Complete clinical recovery was observed by day 28 and the owner was advised to continue hematinic supplementation for one additional month.

Canine babesiosis remains a growing concern in regions with expanding tick populations, particularly *Rhipicephalus sanguineus*. The warm, humid climate of Jalukie favors tick proliferation and predisposes dogs to concurrent infections such as ehrlichiosis. Poor grooming and increasing urbanization further contribute to disease transmission. Early recognition of clinical signs such as fever, emaciation and anemia is critical for timely intervention, as chronic untreated cases often prove fatal. This case highlights that the combination of Diminazene aceturate (3.5 mg/kg, IM) and Doxycycline (10 mg/kg, PO for 15 days) effectively reduced parasitemia and resolved anemia, inappetence and fever without adverse reactions. Hence, this therapeutic regimen may be considered a practical, safe and well-tolerated approach for managing *B. gibsoni* infection in dogs.

CONCLUSION

In conclusion, this case report illustrates that the combination of Diminazene aceturate and Doxycycline effectively reduced parasitemia in the affected dog, leading to the resolution of clinical signs such as anemia, inappetence, and fever, with no reported adverse effects. Thus, in this study, it can be concluded that the combined therapy of Diminazene Aceturate at the dose rate of 3.5 mg/kg via injection and Doxycycline at the dose rate of 10 mg/kg orally for 15 days was an effective treatment against *B. gibsoni* in dogs exhibiting no notable adverse reactions.

ACKNOWLEDGEMENT

The authors acknowledge the Dean, College of Veterinary Science and Animal Husbandry, Jalukie, Nagaland, for support and facilities in the Veterinary Clinical Complex.

Conflict of interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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