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Multidrug therapy and hematological profiling in 18 canine babesiosis cases: A clinical perspective

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Abstract
Background: Canine babesiosis is a significant vector-borne disease of dogs in India. Prompt diagnosis using peripheral blood smear and timely treatment are essential to prevent complications. This study evaluates 18 smear-confirmed cases of canine babesiosis treated with a clindamycin-doxycycline-metronidazole regimen, assessing their clinical, hematological, and therapeutic response.
Methods: Dogs with signs of babesiosis were evaluated through clinical examination and Giemsa-stained peripheral blood smear. Hematological and biochemical parameters were recorded before and after treatment. All dogs received triple-drug therapy and were monitored over 21 days.
Results: Pallor (88.9%), anemia (100%), lethargy (77.8%), and fever (83.3%) were predominant clinical signs. Hemoglobinuria was observed in only 2 dogs (11.1%). The therapy led to a 94.4% recovery rate and parasite clearance by Day 14 in 88.9% of dogs.
Conclusion: Clindamycin-doxycycline-metronidazole therapy is effective in treating canine babesiosis in settings where molecular diagnosis are unavailable. Blood smear remains a reliable diagnostic tool in routine clinical practice.

Keywords: Babesia, anemia, blood smear, clindamycin, doxycycline, metronidazole, thrombocytopenia

1. Introduction
Canine babesiosis is a globally important tick-borne hemoprotozoan disease, with *Babesia vogeli* and *Babesia gibsoni* being the most frequently implicated species in India (Yadav *et al*., 2021) [15]. Transmission predominantly occurs through the brown dog tick, *Rhipicephalus sanguineus* (Solano-Gallego & Baneth, 2011) [14], though vertical and bite-induced transmissions have also been reported in *B. gibsoni* infections (Birkenheuer *et al*., 2005) [2]. The disease ranges from subclinical to severe presentations, including life-threatening complications like organ dysfunction and disseminated intravascular coagulation (Jacobson, 2006; Matjila *et al*., 2008) [8, 11].
Although PCR is the gold standard for species-level detection, its application is limited in many clinical settings due to economic and infrastructural constraints (Singh *et al*., 2019) [13]. Thus, microscopic examination of Giemsa-stained peripheral blood smears remains a cornerstone for field diagnosis due to its affordability and accessibility (Irwin & Hutchinson, 1991; Salakij *et al*., 2012) [7, 12].
The commonly used drug, imidocarb dipropionate, though effective against *B. vogeli*, is often less effective against *B. gibsoni* and may not be available in remote settings (Greene, 2012) [4]. Furthermore, growing resistance and adverse effects such as pain and cholinergic signs post-injection necessitate alternative therapies (Boozer & Macintire, 2003) [3]. The combination of clindamycin, doxycycline, and metronidazole has shown promising results due to synergistic antimicrobial effects and intracellular penetration, particularly in *B. gibsoni* cases (Ikadai *et al*., 2007; Köster *et al*., 2015; Lin *et al*., 2012) [5, 9, 10].
This study aimed to clinically evaluate 18 cases of smear-confirmed canine babesiosis and assess the hematological alterations and therapeutic outcomes following triple-drug therapy using clindamycin, doxycycline, and metronidazole.

2. Materials and Methods

2.1. Study Population

Eighteen dogs of different breeds, ages, and sexes presented at the Teaching Veterinary Clinical Complex, C.V.Sc & A.H. Kumarganj , between [March 2025] and [may 2025] with signs suggestive of babesiosis were included. Inclusion criteria were based on clinical signs and confirmation of intra-erythrocytic Babesia forms via peripheral blood smear. Dogs with concurrent severe systemic illnesses, other vector-borne diseases, or coagulopathies were excluded to avoid confounding variables (Zygner & Gójska-Zygner, 2014) [16].

2.2. Clinical Examination and Diagnosis

Capillary blood from the ear tip was collected, and thin smears were stained with Giemsa and examined under oil immersion (1000×). Diagnosis was confirmed by the presence of pear-shaped or signet-ring intraerythrocytic Babesia organisms (Birkenheuer *et al*., 2003) [1]. Clinical evaluation included rectal temperature, mucous membrane assessment, lymph node palpation, and abdominal auscultation.

2.3. Laboratory Testing

- **Hematology:** Analyzed using automated hematology analyzer for complete blood count.
- **Biochemistry:** Liver and renal profiles including ALT, BUN, total protein, and creatinine were measured using a automated biochemical analyzer.

Dogs were re-evaluated on Days 7, 14, and 21 through both clinical examination and repeat smear tests.

2.4. Therapeutic Protocol

- **Clindamycin:** 25 mg/kg orally BID for 10 days
- **Doxycycline:** 10 mg/kg orally SID for 21 days
- **Metronidazole:** 15 mg/kg orally BID for 7-10 days
- **Supportive Therapy:** IV fluids, B-complex, hematinics, and silymarin

This protocol aligns with previous empirical and experimental studies demonstrating successful parasite clearance using this regimen (Ikadai *et al*., 2007; Boozer & Macintire, 2003; Lin *et al*., 2012) [5, 3, 10].

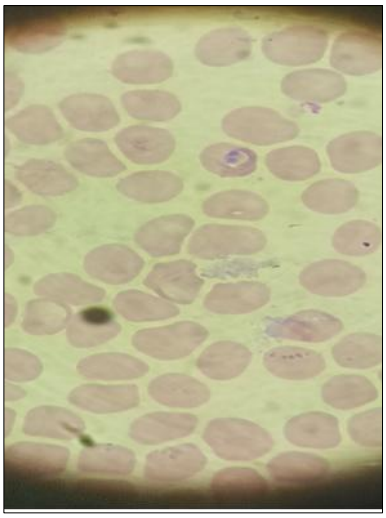

Fig 1: Blood smear showing Intra erythrocytic Piroplasm of *B. vogeli at 100X*

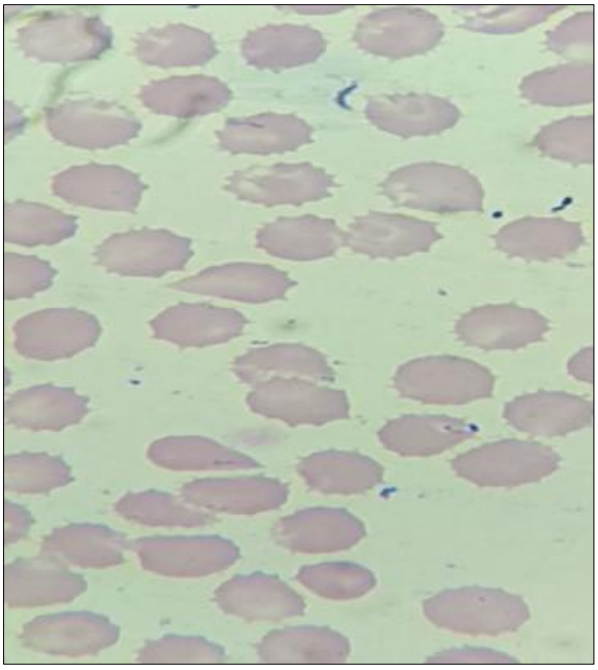

Fig 2: Blood smear showing Intra erythrocytic Piroplasm of *B. gibsoni at 100X*

Fig 3: Mucous membrane showing anemia

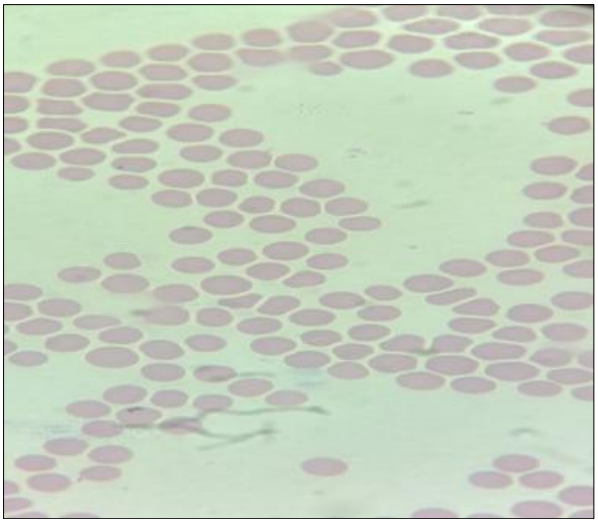

Fig 4: Blood smear after recovery

3. Results

3.1. Clinical Presentation

The most consistent clinical features included anemia (100%) and pallor (88.9%), with accompanying fever (83.3%), lethargy (77.8%), and anorexia (61.1%). Hemoglobinuria, though a classical sign of intravascular hemolysis, was observed only in two dogs (11.1%), likely due to early-stage detection or species differences in pathogenesis (Matjila *et al*., 2008) [11].

Clinical Signs	No. of Dogs	Percentage (%)
Fever	15	83.3%
Pallor	16	88.9%
Lethargy	14	77.8%
Hemoglobinuria	2	11.1%
Anorexia	11	61.1%
Icterus	5	27.8%

3.2. Hematological and Biochemical Findings

All dogs exhibited anemia with mean PCV of 16.4±3.1 and hemoglobin 7.2±1.4 g/dL. Thrombocytopenia was observed in 83.3% of cases. ALT elevation was mild and suggestive of hepatic stress, while variable protein levels indicated inflammatory responses.

Parameter	Mean ± SD
PCV (%)	16.4±3.1
Hemoglobin (g/dL)	7.2±1.4
Platelets (/µL)	75,000±19,000
ALT (IU/L)	124.3±28.6
BUN (mg/dL)	46.5±11.3
Total protein (g/dL)	5.1±0.7

3.3. Therapeutic Response

A total of 17 out of 18 dogs recovered (94.4%). Sixteen recovered dogs were smear-negative by Day 14, indicating a rapid parasitological response. One dog succumbed on Day 3 with pre-existing severe icterus and azotemia. No adverse effects from the drug combination were observed, corroborating previous safety reports (Köster *et al*., 2015) [9].

4. Discussion

This study confirms that pallor and anemia are key diagnostic markers in canine babesiosis, consistent with previous work by Jacobson (2006) [8], Boozer & Macintire (2003) [3], and Greene (2012) [4]. While hemoglobinuria and icterus are associated with severe hemolysis, their low incidence in our study suggests early intervention or infection with less virulent strains such as *B. vogeli*.

Peripheral blood smear, though less sensitive than PCR, remains practical and accessible, especially in rural and resource-limited veterinary centers (Irwin & Hutchinson, 1991; Salakij *et al*., 2012) [7, 12]. The triple-drug therapy used here shows high efficacy, likely due to the combined effects of protein synthesis inhibition (doxycycline), DNA damage (metronidazole), and antimicrobial synergy (clindamycin) (Ikadai *et al*., 2007; Lin *et al*., 2012) [5, 10].

Recovery rates in this study are comparable to those reported in similar clinical trials, with mortality restricted to dogs presenting with multi-organ compromise at admission (Zygner & Gójska-Zygner, 2014; Köster *et al*., 2015) [16, 9].

5. Conclusion

The clindamycin-doxycycline-metronidazole combination proved highly effective in smear-confirmed babesiosis, particularly where PCR and imidocarb were inaccessible. The blood smear remains an essential diagnostic tool, and early therapeutic intervention ensures favorable outcomes. This regimen may serve as a reliable treatment in primary veterinary setups across endemic regions.

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