

## SHORT COMMUNICATION

# Studies on the Clinical Syndromes of Dogs Linked with *Babesia gibsoni*

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### ABSTRACT

Among the 24 PCR positive cases of *B. gibsoni* in dogs, 9 (37.5%) were associated with various clinical syndromes. According to the set criterion of various clinical syndromes 4/9 (44.44%) dogs showed hepatopathy, 2/9 (22.22%) showed acute kidney failure and pancreatitis and 1/9 (11.11%) was presented with acute respiratory distress syndromes. Remaining 2 cases of *Babesia gibsoni* did not show any clinical syndromes as per the set criteria. The mean values of serum biochemical parameters observed among 24 dogs were ALT 73.64±6.80 U/L, ALP 141.80±11.1 U/L, BUN 25.00±2.10 mg/dL, creatinine 0.90±0.08 mg/dL, amylase 639.10±49.10 U/L, and lipase 379.50±47.90 U/L. Among 9 babesiosis positive dogs with clinical syndromes, German Shepherds accounted for the largest number (4/9; 44.44%), followed by non-descript and Labradors each 2/9 (22.22%) and Dobermans 1/9 (11.11%).

**Key words:** Acute renal failure, Acute respiratory distress syndrome, Babesiosis, Hepatopathy, Pancreatitis.

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### INTRODUCTION

Canine babesiosis is prevalent throughout the world, with prevalence ranging from 3.3 to 55.0% (Singh *et al.*, 2014). As far as India is concerned the prevalence of both *B. gibsoni* and *B. canis* is 0.7 to 21.7% with the highest prevalence of 48.6% in Assam (Bhattacharjee and Sarmah, 2013). In uncomplicated babesiosis, clinical symptoms are primarily a result of haemolytic anaemia (Taboada and Merchant, 1991). Clinical syndromes observed in complex canine babesiosis cases encompass hepatopathy, acute kidney injury (AKI), a cerebral manifestation of babesiosis, acute respiratory distress syndrome (ARDS), elevated blood viscosity ("red biliary"), pancreatitis, muscle tissue breakdown (rhabdomyolysis), and myocardial dysfunction (Koster *et al.*, 2015). Hepatopathy, pancreatitis, acute renal failure and disseminated intravascular coagulation are the frequent complications found in canine babesiosis (Mathe *et al.*, 2006; Leica *et al.*, 2017). Hepatopathy in infected dogs results in elevated levels of ALT, AST, ALP and Bilirubin (Irwin and Hutchinson *et al.*, 1991). Acute renal failure in canine babesiosis is characterized by an increase in BUN and creatinine value (Mittal *et al.*, 2019). The clinical complex of pancreatitis will increase levels of pancreatic enzymes amylase and lipase. The aim of the present study was to investigate the clinical syndromes linked to *B. gibsoni* in dogs by analyzing serum samples biochemically.

### MATERIALS AND METHODS

The research was conducted at VCC, College of Veterinary Science in Shirwal, located in Satara District, Maharashtra

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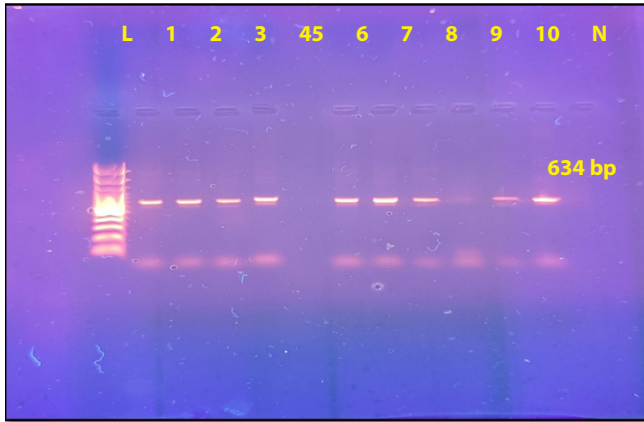
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(India). On identifying the characteristic clinical syndromes of canine babesiosis in dogs, a total of 24 cases of *B. gibsoni* were confirmed through PCR, targeting the *cox3* gene in serum samples. The criteria used for identifying the clinical syndromes of canine babesiosis were as followed by Mathe *et al.* (2006).

### PCR Assay for *Bgcox3* Gene

Wholegenomic DNA was extracted from 200 µL of whole blood by using HM HiPurA Blood Genomic DNA Miniprep

Purification Kit following the manufacturer’s instructions with slight modifications. The PCR assay was standardized using Bgcox3 gene-specific primers as per the method of Betgiri *et al.* (2019). Protocol involved Bgcox3 F: TTACATTAAGAAAA GTAATAAAG, Bgcox3 R: ATTATAACATATATAGAACATAA primers. This primer pair generated an amplicon size of 632 bp (Fig. 1). The PCR conditions included initial denaturation at 94°C for 2 min, annealing at 47°C for 45 sec and extension 72°C for 1 min.



**Fig. 1:** Bgcox3 PCR assay. Lane L: 100 bp DNA ladder RTU (MBT049 50LN), Lane N: Negative control, Lane: 1,2,3,4,5,6,7,9,10 shows positive samples, Lane: 8 shows negative sample.

**Serum Biochemistry**

Blood samples (n=24) were collected in vacutainers without anticoagulant and serum was obtained after centrifugation. The serum was subjected to biochemical analysis by using an ALTA semi-auto chemistry analyser (ADX-CHEM-220) and biochemical parameters like total bilirubin, total protein, albumin, alanine aminotransferase (ALT), alkaline phosphatase (ALP), BUN, creatinine, amylase and lipase were estimated.

**RESULTS AND DISCUSSION**

The criteria used to examine different clinical syndromes were based on the biochemical parameters of *B. gibsoni* infected dogs, such as ALP, BUN, ALT, creatinine, lipase, and amylase. Table 2 depicts the mean values and range of biochemical parameters of 24 dogs under the study.

**Hepatopathy**

In the present study the set criteria of hepatopathy (Mathe *et al.*, 2006) were reached or crossed by 4 dogs (44.44%, 4/9). In one case, hepatopathy was present along with acute renal failure with BUN 52 mg/dL and creatinine 1.5 mg/dL. Halder and Gupta (2022) found ALT 325 U/L, which was also more than the criteria set for hepatopathy and the findings of present study. Similar findings for hepatopathy in *B. gibsoni* were also found by Varshney *et al.* (2008) and Zygner *et al.* (2011). The mean ALT value in *B. gibsoni* found by Gonde *et al.* (2017) was 48.40 ± 9.01U/L which was less than the required criteria for hepatopathy, while Konto *et al.* (2014), and Chandra *et al.* (2018) reported a mild to moderate increase in ALT, AST, and ALP values. The liver is one of the first organs to suffer damage in babesiosis. Liver damage and dysfunction were frequently observed during the inflammatory stages linked to clinical babesiosis in dogs (Welzl *et al.*, 2001).

**Acute Renal Failure (ARF)**

Babesiosis rarely causes acute renal failure (ARF), which is usually manifested as anuria or oliguria even after receiving enough rehydration. In the present study, two dogs met or exceeded the acute renal failure criteria (22.22%, 2/9) and had creatinine and BUN values of 1.5 & 1.8 mg/dL and 52 & 35.5 mg/dL, respectively, indicating the presence of ARF. Praveen *et al.* (2021) found creatinine 2.1 mg/dL and BUN 41 mg/dL, while Halder and Gupta (2022) reported creatinine 1.84 mg/dL and BUN 34.2 mg/dL in canine babesiosis. Gonde *et al.* (2017) found mean creatinine 1.40±0.24 mg/dL and BUN 29.63±7.96 mg/dL, while Konto *et al.* (2014) found creatinine 1.0±0.13 mg/dL in canine babesiosis.

**Table. 1:** The criteria for identifying the clinical syndromes as per Mathe *et al.* (2006).

Syndrome/Complication	Criteria
Hepatopathy	At least 2 liver enzymes elevated (ALT > 60 U/L, ALP > 280 U/L) or a single enzyme above ALT 120 U/L, ALP 560 U/L.
Acute Renal Failure (ARF)	Creatinine > 1.5 mg/dL, BUN >30 mg/dL.
Pancreatitis	Both pancreatic enzymes elevated (amylase > 900 U/L, lipase > 800 U/L)
Acute respiratory distress syndrome (ARDS)	Clinical signs: dyspnoea, crepitating respiratory sounds, radiograph.

**Table. 2:** Average values of biochemical parameters of dogs under study (n=24)

Criteria	ALT (U/L)	ALP (U/L)	BUN (mg/dL)	Creatinine (mg/dL)	Amylase (U/L)	Lipase (U/L)
Mean±SE	73.64 ±6.80	141.80 ±11.1	25.00 ±2.10	0.90 ±0.08	639.10 ±49.10	379.50 ±47.90
Range	23.11 -160.00	53.00 -290.00	8.19 -55.00	0.22 -2.10	300.00 -1232.00	90.00 -995.00

ALT: Alanine transaminase; ALP: Alkaline phosphatase; BUN: Blood urea nitrogen.



## Pancreatitis

A recently reported symptom of babesiosis is pancreatitis (Mohr *et al.*, 2000). Mostly pancreatitis is seen with another concurrent organ failure. In this study total 2 pancreatitis cases (22.22%, 2/9) were found, in which one case was present along with acute renal failure with serum amylase and lipase values as 1232 and 995 U/L, respectively, and BUN and creatinine values 35.5 mg/dL and 1.8 mg/dL, respectively. Another pancreatitis case found in this study had amylase and lipase values of 1120 and 910 U/L, respectively. Mathe *et al.* (2006) reported pancreatitis in *B. gibsoni* with amylase 2950 U/L and lipase 1232 U/L. Mohr *et al.* (2000) also reported similar findings in pancreatitis with amylase > 3500 U/L and lipase > 850 U/L. Koster *et al.* (2015) and Masuda *et al.* (2019) found the lower incidence of pancreatitis in babesiosis with the serum lipase range (> 400 µg/dL), which is in contrast to the present finding.

## Acute Respiratory Distress Syndrome (ARDS)

Acute respiratory distress syndrome is a rare clinical complication in the cases of *babesia gibsoni* infection. In the present study, only one dog (11.11%, 1/9) was presented with respiratory distress. Dyspnoea and crepitating sounds were noticed on auscultation and radiography showed a diffuse and heavy interstitial/alveolar lung pattern. A similar finding of acute respiratory syndrome was also reported by Ahmad *et al.* (2007), Varshney *et al.* (2008) and Daste *et al.* (2013).

Table 3 summarizes the the distribution of clinical syndromes among different breeds. It indicates that 9/24 (37.5%) dogs had clinical syndromes, with German Shepherds accounting for the largest number (4/9; 44.44%), suggesting a breed predisposition to babesiosis, followed by Non-descript and Labradors each 2/9 (22.22%) and Dobermans 1/9 (11.11%).

**Table 3:** Description of the dogs showing the different clinical syndromes (n=24)

Breed	Dogs with clinical syndromes of babesiosis	Percentage
German Shepherds	4	44.44
Non-descript	2	22.22
Labrador	2	22.22
Doberman	1	11.11
Total	9	100.0

In conclusion, hepatopathy, acute renal failure, pancreatitis, and acute respiratory distress syndromes are clinical syndromes linked with *B. gibsoni* infection in dogs, hepatopathy being the most prevalent among them with 44.44% (4/9 cases) prevalence.

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