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Hemato -biochemical changes in a *Babesia gibsoni* infected German Shepherd dog with Hemoglobinuria -A case report

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Abstract

A German Shepherd four years old dog admitted in a private clinic, in Paralakhemundi, Gajapati district, Odisha state, India with the clinical sign of hemoglobinuria. Blood smear examination revealed *Babesia gibsoni* infection. The hematological studies revealed decreased levels in hemoglobin, total leucocyte count, platelet count (PLT), hematocrit value (HCT) and the RBC count, followed by neutrophilia and lymphopenia. The biochemical studies showed, elevated bilirubin, AST, ALT, alkaline phosphatase, CGT, total protein, globulin and A/G ratio. The serum creatinine level remained normal. The dog suffered with hemoglobinuria for 3 days and was treated with imidocarb immediately but without success and it was attributed to severe toxicity due to accumulation of heme in the kidney parenchyma and the development of glomerulonephritis by immune -mediated proteinuria.

Keywords: Acute kidney failure-*B.gibsoni*-hemoglobinuria

Introduction

During 19th century, Dr. Victor Babes found out this Babesia organisms in the erythrocytes of cattle and sheep with hemoglobinuria (Uilenberg 2006). Now it is occurring globally (Boozer and Macintire, 2003; Solano-Gallego 2011). The ticks transmit the parasites in all animals including canines.

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The commonly reported organisms are *Babesia canis* and *Babesia gibsoni* in canines (Taboda and Merchant 1991). Babesia gibsoni causes a chronic disease with progressive anemia that is not treated with regular babesiacides. (Phillip carter and Peter Rolls 2025)

Case report

A 4 years old German shepherd male dog reported with the clinical signs of fever, anorexia, pale mucus membrane of the eyes and hemoglobinuria. (Fig.2) The owner of the animal reported the prevalence of hemoglobinuria for 3 days.

Observation studies on Haemato-biochemical values.

Blood smear revealed the *B.gibsoni* organisms in the infected erythrocytes by Giemsa staining (Fig1). The hematological studies revealed low level hemoglobin (6.8 g/dl with reference range value of 11.90-18.90), PLT (130/10^3 ul with reference range of 200.00-600.00), lymphocytes (10% against the reference range of 12-30), and high-level TLC (53.1/10^3 ul as against the reference value of 6-17), and neutrophil (85% values as against the reference value of 60-70). Absolute cell counts revealed high level neutrophils (45.13/10^3 ul as against the reference value of 3-11)., lymphocytes (5.31/10^3 ul as against the reference value of 1-4.8), monocytes (1.59/10^3 ul as against the reference value of 0.1-1.4), followed by low level HCT (19.2 % as against the reference value of 35-57), RBC values (2.8/ 10^6 ul as against the reference value of 4.95-7.87).The biochemical studies showed high level total bilirubin, AST, ALT,

alkaline phosphatase (ALP), gamma glutamyl transferase (CGT), total protein, and A/G ratio. (Table1).

Discussion

Clinical studies

The dog brought to the clinic with hemoglobinuria. (Fig.2), anorexia, fever and pale mucus membrane of the eyes. Phillip Carter and Peter Rolls (2025) reported acute babesiosis runs a course of 1week or less. The first clinical signs are lethargy, weakness, depression and fever i.e. 106°C, later accompanied by inappetence, anemia, jaundice, weight loss; hemoglobinemia, and hemoglobinuria in the final stages. Irwin (2005) observed fever, anorexia, depression, hemoglobinuria, vomiting, dehydration, icterus, pale mucus membrane, splenomegaly and dyspnea. In this case study the dog experienced acute infection and it was severe with poor prognosis. The clinical signs were severe and acute which coincide with the observation of the above authors.

Studies on Haemato-biochemical values

Babesiosis develops a mechanism of antibody mediated cytotoxic destruction of circulating erythrocytes. Auto antibodies act against the components of the infected and uninfected erythrocytes, which causes intravascular and extravascular hemolysis leading to anemia and hemoglobinemia. (Pedersen,1999; Irwin,2005). Brockus and Andreasen (2003) reported low level of hemoglobin concentration due to extravascular hemolysis. In this study the hemoglobin value reduced to low level, which coincides with the finding of the above authors. Total leucocyte count (TLC) was elevated which is consistent with the findings of Welzl *et al.* (2001), who suggested a systemic inflammatory reaction leads to multiorgan dysfunction. Rafaj *et al.* (2013) reported leucopenia which could be due to the platelet ability to combine with endothelial cells and the secondary capture action ends in leucopenia. The neutrophils and lymphocytes ratio altered indicating complicated babesiosis with systemic inflammation (Omobowale *et al* 2017). Boozer and Macintire (2002) reported thrombocytopenia due to platelet sequestration in the spleen or immune mediated platelet destruction and intravascular coagulation. Makinde and Bobade, (1994) speculated anemia in babesiosis dogs due to increased osmotic fragility of the erythrocytes and thrombocytopenia due to immune mediated platelets destruction. In these studies, the hematocrit (HCT) values and the platelets (PLT) values were at lower levels, which indicated anemia.

The RBC count was lower in these studies. Schoeman (2009) reported that the bone marrow takes 3-5 days to respond to the RBC damage and hence the blood picture could reflect regenerative anemia. Solano-Gallego *et al.* (2016) reported anemia, neutropenia, leukocytosis, azotemia, elevated ALT and ALP in the *B.gibsoni* cases. Shah *et al* 2011; Bilwal *et al* (2017) reported elevated ALP and GGT due to liver damage. Irizarry-Rovira *et al.* (2001) reported elevated ALP could be due to cholestasis and an increase in endogenous glucocorticoids were due to illness. In this case study, both ALP and GGT were elevated that indicated the liver and bile duct damage. Thankachan *et al* (2020) reported significant variations in A:G ratio, albumin, ALT and GGT with severe organ impairments in complicated canine babesiosis. In this study elevated A:G ratio, AST, ALT, GGT and total protein were observed. (Table.1) Yeruham *et al* (2003) reported elevated bilirubin in Babesiosis due to hepatic dysfunction. Leise Witz, *et al* (2023) reported the presence of bilirubinuria due to extra vascular hemolysis in *B.gibsoni* infection

in dogs and these observations coincides with the elevated total bilirubin observed in this part of the study. Ullal *et al* (2018) reported proteinuria as a result of glomerular nephritis. In this study total protein elevation could be attributed to the action of immune -mediated glomerular injury.

Gonde *et al.* (2016) reported, hemoglobinuria due to systemic inflammatory response which ends in multiorgan dysfunction. Chan (2025) reported anemia, thrombocytopenia, monocytosis, eosinopenia, prolonged thromboplastin time, hyperglobulinemia, elevated alkaline phosphatase, gamma-glutamyl transferase, total bilirubin and proteinuria in *B.gibsoni* infected dogs. In severe babesiosis with anemia the infected dog experienced reduced glomerular filtration rate (GRE) which could be the reason for the kidney injury (Lobetti *et al* 1996). Deuel *et al* (2016) reported that the hemoglobinuria-related acute kidney injury due to intrarenal oxidative reactions triggered by a heme toxicity response which was observed in this dog also. Observation of the present study indicated the vulnerability of German shepherd breed for babesiosis infection which was also reported by Shah *et al* 2011; Birkenheuer *et al* (2005).

Conclusions

A case on the occurrence of severe hemoglobinuria in a German Shepherd dog revealed the prevalence of *B.gibsoni* infection with altered haemato-biochemical parameters. The death of the dog occurred within 4 days after hemoglobinuria symptoms in the absence of immediate treatment and it was attributed to severe toxicity due to accumulation of heme in the kidney parenchyma and the development of glomerulonephritis by immune-mediated proteinuria.

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Table. 1 Liver and kidney function tests

Bilirubin -total	**0.65**	**mg/dl**	**0.00-0.40**	**High**
AST	293.4	u/l	9.00-49.00	High
ALT	60.6	u/l	8.00-57.00	High
ALP	234.6	u/l	10.00-100.00	High
CGT	13.00	u/l	0.00-10.00	High
Total protein	9.9	g/dl	5.50-7.50	High
A/G ratio	0.43		0.50-2.20	High

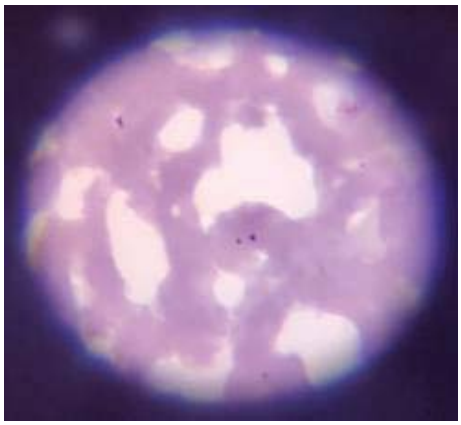

Fig 1. Blood smear with *Babesia gibsoni*

Fig.2 Hemoglobinuria