

Alterations in haematobiochemical parameters in crossbred cattle suffering from Babesiosis

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Bovine babesiosis is an important tick-borne disease affecting animals all over the world causing huge economic losses in subtropical and tropical territories. Projected economic losses to livestock due to babesiosis in India are estimated to be about 84.7 million US dollars (Narladkar, 2018). Disease is caused by an intraerythrocytic hemoprotozoan affecting animal erythrocytes and transmitted by blood-sucking ticks of the Ixodidae family. In India, bovine babesiosis is mainly caused by *Babesia bigemina* and *Babesia bovis* transmitted by *Boophilus microplus* tick. The crossbred cattle exhibited higher rate of susceptibility than zebu and buffaloes, which mainly act as carrier.

Clinically, disease has been characterized by anemia, fever, hemoglobinuria, and death (Mosqueda *et al.*, 2012). Presence of the protozoan inside red cells is considered as confirmative especially during acute stage of the disease (Singh *et al.*, 2000). Researchers in past have shown deleterious effect of parasite on the health of cattle leading to liver and kidney dysfunction (Hamoda *et al.*, 2014, Aziz *et al.*, 2020, Debbarma *et al.*, 2020). The extent of damage caused by parasite determines the severity of disease and prognosis. Therefore, the present study was undertaken with an aim to determine impact of parasite on liver and kidney functioning in animals suffering from clinical babesiosis by evaluating haematobiochemical parameters.

Blood and serum samples of 56 cross bred cattle were collected for determination of haematobiochemical alterations in cattle suffering from babesiosis. Blood samples were screened for babesiosis by examination of thin blood smears stained with Giemsa stain for 30 min. About 20 microscopic fields, per slide, were observed to view the parasite. The presence of single piroplasm was recorded as positive for particular parasite and correlated with clinical signs to determine clinically infected cattle and apparently healthy cattle.

Complete haematological examination was done using fully automated haematology cell counter (MS4s, Melet Schloesing Laboratories, France). The parameters measured were haemoglobin (Hb) in g/dl, total leucocyte count (TLC) in $10^3/\text{mm}^3$, differential leukocyte count (DLC lymphocytes (L) in %, monocytes (M) in %, neutrophils (N) in %, eosinophils (E) in % and basophils (B) in %. The serum samples were analyzed for estimation of biochemical test profile by using fully automated random access clinical chemistry analyzer (EM Destiny 200, Erba Diagnostics Mannheim GmbH-Germany). The serum biochemical parameters measured were aspartate aminotransferase in U/L, total protein in g/dl, albumin in g/dl, bilirubin direct (BID) in mg/dl, bilirubin total (BIT), blood urea nitrogen in mg/dl, creatinine in mg/dl, calcium (Ca) in mg/dl and phosphorus (P) in mg/dl. Independent t test was applied for determination of mean values and to compare positive sample values with negative samples values.

The mean values of haematological and biochemical parameters in nine cattle suffering from babesiosis and their comparison with 15 apparently healthy animals have been shown in Table no 1 and Table no 2. Severe anemia was recorded in cattle suffering from babesiosis with significantly lower ($P < 0.05$) mean values of Hb, TEC and PCV in infected animals. Results obtained in present study were in agreement with results of Abdel-Hamied *et al.* (2020) and Aziz *et al.* (2020) showing severe anaemia in animals suffering from babesiosis. This severe anaemia can be attributed to massive intravascular hemolysis associated with presence *Babesia* spp. inside RBCs (Callow and Pepper, 1974), production of auto-antibodies directed against circulating erythrocytes (Goes *et al.*, 2007) and increased phagocytosis of parasitized and even unaffected erythrocytes by activated macrophages (Court *et al.*, 2001).

Differential leukocyte count value showed significant decrease in neutrophil count and significant increase in lymphocyte count in infected animals as

Table 1. Haematological alterations in cross bred cattle suffering from babesiosis

Parameters	Infected cross bred cattle (n=9)	Non infected cross bred cattle (15)
Hb (g/dl)	5.06±0.716*	9.55±0.3075
TEC (10 ⁶ /dl)	2.58±0.32*	6.52±0.19
PCV (%)	18.5±2.58*	31.30±0.84
TLC (10 ³ /ml)	6.97± 1.55	5.54±0.46
Neutrophil (%)	48.86±9.04*	63.28±2.05
Lymphocyte (%)	46.06±9.31*	32.38±1.96
Basophil (%)	0.5±.3521	0.456±.2828
Eosinophil (%)	2.95±0.93	6.82±2.33
Monocyte (%)	5.02±1.0	4.20±0.35

*significant at P< 0.05

compared to apparently healthy animals. This finding was in accordance with the results of Tufani *et al.* (2015) and Abdel-Hamied *et al.* (2020). Reasons for increase in lymphocyte can be stimulation of phagocytic cells like lymphocytes and monocytes associated with RBCs breakdown for removal of the toxic remnants of damaged erythrocytes (Guglielmone *et al.*, 1996) and activation of body defense mechanisms for antibodies production against the protozoan in response to babesia infection (Court *et al.*, 2001). The significant reduction in neutrophils observed in present study may be attributed to neutrophilic sequestration in the spleen, haematopoietic precursor, cell damage, increased neutrophil adherence, or a combination of all (Akel and Mobarakai, 2017).

Significant elevated level of AST was found as compared to level observed in apparently healthy cattle. AST enzyme levels are the indicators of hepatic function and the rise in serum AST values may be due to alteration of liver function as a result of bovine babesiosis (Zulfiqar

et al., 2012). Mean values of urea and creatinine was found to be significantly increased (P<0.05) in cattle suffering from clinical babesiosis clearly indicating renal function impairment in infected cattle. This can be attributed to hypoxic and toxic renal tissue damage as a result of hypoxia, hemoglobinuria and increased catabolism of haemoglobin (Hamoda *et al.*, 2014). There were significant elevation in the serum bilirubin levels (direct and total bilirubin) that was attributed to the intense hemolysis and hepatic dysfunction in diseased animals (Schwint *et al.*, 2009). Significant reduction (P<0.05) in total protein values and non significant decrease in albumin was observed in cattle suffering from babesiosis suggests parasite deteriorates the liver and kidney function drastically. These results were consistent with the findings of Shinde *et al.* (2019) and Aziz *et al.* (2020). Therefore, it can be concluded that aggressive therapy should be initiated to combat parasitemia and limit the damage of parasite to vital organs.

Table 2. Biochemical Alterations in cross bred cattle suffering from babesiosis

Parameters	Infected cross bred cattle (n=9)	Non infected cross bred cattle(n=15)
AST (U/L)	140.93±26.10*	58.39±3.24
Phosphorous (mg%)	6.24±0.37	5.82±0.35
Total Bilirubin (mg%)	1.55±1.18	0.10±0.013
Direct Bilirubin (mg%)	0.49±0.27	0.149±0.007
Urea (mg%)	50.014±12.06*	9.87±1.72
Creatinine (mg%)	0.89±0.25*	0.35±0.17
Calcium (mg%)	9.00±0.56	11.94±0.34
Protein (g%)	5.75±0.46*	8.42±0.29
Albumin(g%)	2.32±0.26	2.43±0.11

*significant at P< 0.05

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