



ISSN: 2456-2912

VET 2024; SP-9(3): 12-14

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www.veterinarypaper.com

Received: 19-02-2024

Accepted: 22-03-2024

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Haematological and serum biochemical profile of bovines infected with infectious bovine rhinotracheitis

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DOI: <https://doi.org/10.22271/veterinary.2024.v9.i3Sa.1369>

Abstract

Infectious Bovine Rhinotracheitis (IBR) has quite economic importance as it produces loss to the dairy industries due to the sudden decrease in milk production and causes other ailments in the bovines. As the disease affects multiple body systems like respiratory, nervous, gastrointestinal, reproductive and conjunctival systems, the present study was taken up to read certain clinical parameters in the cattle infected with Infectious Bovine Rhinotracheitis. A total of 273 animals suspected for IBR were screened by indirect ELISA out of which 72 animals were positive for the presence of IBR antibodies in the serum. The haematological parameters were compared with the reference values, there was a decrease in the number of white blood cells clearly indicating viral infection with a marked rise of the neutrophils and monocytes. The haemoglobin percentage and packed cell volume counts were lower in the infected animals. The biochemical profile showed a significant elevation of SGOT, SGPT, Glucose, creatinine and slight drop in phosphorous whereas the values of globulin increased and those of albumin decreased while the total protein, bilirubin and alkaline phosphatase remained the same with the values of healthy cattle.

Keywords: BoHV1, erythrocyte count, leucocyte count, PCV, SGOT, SGPT

Introduction

Infectious Bovine Rhinotracheitis also referred as Infectious Pustular Vaginitis is caused by a herpesvirus namely Bovine Herpes virus 1 (BoHV1). The virus causes the disease mainly in cattle causing enormous economic losses due to decrease in productivity (Markey *et al.* 2013) [9]. The disease is present all over the world and is characterised with clinical signs of respiratory and genital infections. Abortions were also reported in affected animals followed by respiratory distress. Horizontal transmission of the virus in and between the herds takes place by direct and indirect contact, aerosol route and via infected semen (Saravanajayam *et al.* 2015) [13], Gu and Kirkland 2008 [6], Rajendra *et al.* 2024) [11]. IBR exhibits latency in which the full viral genome is retained in the host cell with restricted or no expression of the viral particles. Thus, presence of latency factor poses a difficult task in the detection, diagnosis and control measures (Rajendra *et al.* 2024) [11]. Once the virus is out of latent phase, the shedding of the virus occurs thus contaminating the environment and affects the healthy animals (Radostits *et al.* 2000) [10]. The viral diseases causes significant changes in a few parameters both haematologically and biochemically. The haematological parameters often provide valuable information for the diagnosis, surveillance and prognosis and the future progression of a disease in the individual animal. Assessment of different enzymes and minerals which constitute to the biochemical parameters are essential in evaluating the status of organ functioning and also systemic diseases (Roland *et al.* 2014) [12]

Materials and Methods

The present study was undertaken in the bovines that were positive for Infectious Bovine Rhinotracheitis based on clinical signs and later confirmed by serological assay Indirect ELISA test. The study included a total of 273 samples (blood and serum) collected from cattle and buffaloes of different age groups suspected for IBR infection.

Ten ml of blood was collected from the external jugular vein under aseptic conditions using sterile syringes. A portion of the blood was transferred immediately to sterilized vial containing ethylene di-amine tetra acetic acid (EDTA) solution and other half was transferred to sterilized labelled test tubes for serum. The blood and serum samples were placed on ice and transported to laboratory. In the laboratory, the seropositive blood and serum samples were processed immediately for haematological parameters viz., Haemoglobin, total erythrocyte count, total leukocyte count and differential leukocyte count and packed cell volume using the Rayto semi-automatic Haematology analyser. The biochemical parameters such as serum glutamic-oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), Glucose, creatinine, calcium, phosphorous, globulin, albumin, total protein, bilirubin and alkaline phosphatase were analysed using the semi-automated biochemical analyser (Monash International Ltd.).

Statistical analysis

The statistical analysis of various haematological and biochemical parameters was carried out by student t- test using the software WEB AGRI STAT PACKAGE, ICAR

research complex, Goa.

Results

Out of the total 273 samples tested for Indirect ELISA, 72 samples were seropositive for IBR- antibodies. The seropositive blood and sera samples were further processed for various haematological and biochemical parameters. When the haematological parameters were compared with the normal reference values, the total leucocyte count differed significantly at 5% level of significance showing leucopenia. When the differential count was observed, there was slight neutrophilia and monocytosis. The total erythrocyte count, haemoglobin percent, packed cell volume were decreased significantly at 5 % level of significance. The serum biochemical profile showed a significant elevation of SGOT, SGPT, glucose, creatinine at 5% level while there was a significant drop in serum phosphorous levels. The values of albumin decreased and those of globulin increased at 5% level. There was no significant difference in the concentrations of total protein, bilirubin, calcium and alkaline phosphatase. The average haematological and serum biochemical values of seropositive animals were depicted in table 1.

Table 1: Average haematological and serum biochemical values of seropositive animals.

S.No	Parameter	Mean	Standard Deviation
1.	Haemoglobin (g/dl)	7.584*	1.558
2.	Packed Cell Volume (%)	27.976*	8.311
3.	Total Erythrocyte Count (x 10 ⁶ /L)	4.548*	1.332
4.	Total Leucocyte Count (10 ³ /L)	4.436*	1.834
5.	Neutrophil (%)	46.056*	7.952
6.	Globulin (g/dl)	3.618*	1.012
7.	Albumin (g/dl)	2.815*	0.510
8.	Total protein (g/dl)	6.351	1.176
9.	Bilirubin (mg /dl)	1.358	2.045
10.	ALP (U/L)	117.806	100.32
11.	Calcium (mg /dl)	10.283	1.652
12.	Phosphorus (mg /dl)	4.674*	1.671
13.	Glucose (mg /dl)	112.653*	77.971
14.	Creatinine (mg /dl)	2.314*	0.782
15.	SGOT (U/L)	169.111*	35.627
16.	SGPT (U/L)	44.764*	23.026

*Significant at 5% level of significance using student t-test

Discussion

India has the largest livestock population with a vast variety of cattle and buffalo breeds. The livestock population plays a major role in supporting the socio-economics and livelihood of the people. Bovine Herpes virus 1 infection causes an acute and contagious infection mainly affecting either the respiratory or the reproductive tracts. The incidence of BoHV-1 has been reported in many parts of India including Andhra Pradesh. An incidence of 40.22% was reported in Palnadu district of Andhra Pradesh (Kalavathi *et al.* 2024) [7]. Clinical signs tentatively could diagnose a disease but evaluating the haematological and serum biochemical parameters not only aid as a diagnostic tool but also enable to study the systemic analysis of the body and various conditions of the organs functioning. In the present study, there was a marked leucopaenia with relative neutrophilia and monocytosis. The decrease in the total leucocyte count is generally seen in viral infections. Neutrophilia and monocytosis were considered as potent phagocytic cells and thus plays a vital role in the destruction of the viruses. Chronic inflammations and stress shoots up the neutrophils and inflammatory neutrophilia is generally associated with

viraemia as suggested by Roland *et al.* 2014) [12]. Blood monocytes play a key role in the development of innate immune response during BoHV-1 infection, thus enhancing the monocyte production in the bone marrow in response to BoHV-1 infection stimuli in the host as reported by Grandoni *et al.* (2023) [5]. Cam *et al.* (2016) [3] reported the hematological findings in the cattle group of non vaccinated and antibodies positive for IBR. The neutrophils and monocytes were at the elevated level along with lymphopenia. The haematological values of bovines in the present study exhibited significantly lower haemoglobin, total erythrocyte count and PCV. The present study is in agreement with Kumar *et al.* (2015) [8] who opined that lower hemoglobin, haematocrit values in diseased buffaloes were probably as a result of anorexia due to prolonged fever and leading to poor body condition. Rajendra *et al.* (2024) [11] found that there was no significant difference in the hematological findings and all the values were in the reference range.

The serum biochemical tests in the present study found an increase in the SGOT, SGPT, glucose, creatinine and slight drop in phosphorous. The findings were in similar with the studies of Cam *et al.* (2016) [3] and they too determined higher

enzyme activities of SGOT, GGT, creatinine and total protein in non vaccinated and antibody positive cattle. The hypophosphatemia may be due to prolonged anorexia. Insulin causes phosphate to move into cells. Hypophosphatemia can occur with carbohydrate loading or intravenously administered glucose, which induces the secretion of insulin (Bohn 2022) [2]. The disturbances in the phosphorous mineral may be associated with the degeneration of mucous linings of the respiratory and genital systems associated with IBR infections (Fahmy *et al.* (2006) [4]. The values of globulin increased and those of albumin decreased while the total protein, bilirubin and alkaline phosphatase did not deviate from that of the healthy cattle. According to Allison *et al* (2022) [1], albumin is a negative APP, albumin synthesis is decreased during acute inflammation. Globulin concentrations are typically mildly increased due to increased positive APP synthesis. Because albumin and globulin concentrations change in different directions, total protein concentrations may be within the reference interval.

Conclusion

The study significantly stated the hematological and serum biochemical profile of the Infectious Bovine Rhinotracheitis infected cattle. Studying the haematology and serum profile helps in assessing the health status of the diseased animal and finally the prognosis of the case.

Conflict of Interest

Authors have no conflict of interest in this study.

Author's Contributions

SK and KKSL were involved in the design of the research. Collection of samples and processing was carried out by SK and KKSL. The laboratory tests and interpretation of the tests were carried out by SK and KKSL. SK, KKSL and GDK drafted and revised the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors are thankful to the Director, Animal Husbandry Department, Andhra Pradesh, Joint Director (AH), VBRI, Vijayawada and District Animal Husbandry Officer, Palnadu District for providing necessary facilities and infrastructure to carry out the work.

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