



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2026; 11(5): 89-92

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www.veterinarypaper.com

Received: 11-02-2026

Accepted: 15-03-2026

Sahithi N

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

Vaikunta Rao V

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

Rajesh K

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

Raghunath M

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

A Nasreen

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

Corresponding Author:

Sahithi N

Department of Veterinary
Medicine, College of Veterinary
Science, Tirupati, Sri
Venkateswara Veterinary,
University, Andhra Pradesh,
India

Hematobiochemical findings of DCM in Labrador Retrievers

Sahithi N, Vaikunta Rao V, Rajesh K, Raghunath M and A Nasreen

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i5b.3245>

Abstract

Among 152 Labrador Retrievers presented with clinical signs of cardiac insufficiency, dilated cardiomyopathy (DCM) was diagnosed in 24 Labrador Retrievers. Hematological findings in DCM Labrador Retrievers revealed decreased Hemoglobin (Hb), Packed Cell Volume (PCV) and Total Erythrocyte Count (TEC), while leukogram showed significant neutrophilic leukocytosis. Serum biochemical profile showed elevated levels of Blood Urea Nitrogen (BUN), Alanine amino Transferase (ALT) and Aspartate amino Transferase (AST), decreased levels of serum total protein and albumin and normal levels of serum creatinine in Labrador Retrievers with DCM.

Keywords: Dilated cardiomyopathy, Labrador retrievers, haematological, serum biochemical

Introduction

The DCM is a progressive myocardial disease in Labrador Retrievers characterized by ventricular dilation, impaired systolic function and reduced myocardial contractility leading to CHF and increased risk of cardiac death (Freeman *et al.*, 2022) ^[4]. The most frequently reported signs of DCM in Labrador Retrievers include exercise intolerance, difficulty in breathing, rapid respiration and cough associated with left-sided heart failure, whereas right-sided heart failure in Labrador Retrievers may present with abdominal distension, jugular vein distension and pulsation along with additional signs such as cold extremities, weight loss, syncope, low intensity systolic murmur, weak femoral pulse and cyanosis. Thorough patient history, results of physical examination, electrocardiography and thoracic radiography provided a practical means of diagnosing DCM in Labrador Retrievers.

Materials and Methods

Haematology

Blood sample was collected from the cephalic or saphenous vein using disposable syringes and transferred into EDTA vials for whole blood analysis. Haemoglobin was measured as per Sahli's acid hematin method using a Sahli's haemoglobinometer and the readings were recorded in g/dL (Benjamin, 2007) ^[1]. Packed cell volume was determined using the microhematocrit technique following standard procedures and the results were expressed as a percentage (Benjamin, 2007) ^[1]. Erythrocyte counts were obtained following the procedure described by Weiss and Tvedten (2004) ^[19] and expressed as millions/ μ L. White blood cells were enumerated using a dilution method based on Benjamin (2007) ^[1], with values reported as thousands/ μ L. Blood smears were stained with Field's stain (Jain, 1986) ^[5] and the differential leukocyte count was conducted using the battlement technique. A total of 100 leukocytes were assessed and the percentages of individual cell types were documented according to Benjamin (2007) ^[1].

Serum Biochemistry

Blood sample was collected in clot-activator tubes for serum separation. After separation, serum was transferred and stored at -20°C until biochemical analysis was performed. The estimation of blood urea nitrogen (BUN), Serum Creatinine, Alanine transferase, Aspartate

transferase, Total protein and albumin was performed in semiautomatic analyser using ERBA diagnostic kits, following the instructions provided by the manufacturer.

Results

Hematology

The mean values of hematological parameters of control Labrador Retrievers and DCM Labrador Retrievers were presented in Table-I. The mean values of hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC) of control group were 12.73 ± 0.36 g%, 37.50 ± 1.99 %, 6.20 ± 0.50 millions/mm³, 9.70 ± 0.82 thousands/mm³ respectively. The DLC of control group was 66.37 ± 2.31 % Neutrophils, 30.87 ± 1.34 % Lymphocytes, 2.50 ± 0.42 % Monocytes and 0.87 ± 0.22 % Eosinophils.

The mean values of hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC) of DCM Labrador Retrievers (n=24) were 10.16 ± 0.38 g%, 31.33 ± 0.55 %, 4.54 ± 0.22 millions/mm³, 17.14 ± 0.46 thousands/mm³. The DLC of DCM Labrador retrievers was 76.00 ± 1.50 % Neutrophils, 21.16 ± 0.19 % Lymphocytes, 2.83 ± 0.26 % Monocytes and 0.91 ± 0.41 % Eosinophils.

The mean value of hemoglobin was significantly decreased ($P < 0.01$) in DCM Labrador Retrievers (11.16 ± 0.38 g%) when compared to healthy control (12.73 ± 0.36 g%). The mean value of packed cell volume (PCV) also significantly decreased ($P < 0.01$) in DCM Labrador Retrievers (32.33 ± 1.99 %) when compared to healthy Labrador Retrievers (37.50 ± 0.55 %). In the similar manner, there was a significant decrease ($P < 0.01$) in the mean total erythrocyte count of DCM Labrador Retrievers (4.54 ± 0.22 millions/mm³) when compared to apparently healthy Labrador Retrievers (6.20 ± 0.50 millions/mm³).

There was a significant increase ($P < 0.01$) in the mean total leukocyte count (17.14 ± 0.46 thousand/mm³) of DCM Labrador Retrievers when compared to apparently healthy control (9.70 ± 0.82 thousand/mm³). The mean value of neutrophils was significantly increased ($P < 0.01$) (76.00 ± 1.50 %) in DCM Labrador Retrievers when compared to apparently healthy control (66.37 ± 2.31 %). The mean value of lymphocytes was significantly decreased ($P < 0.01$) in DCM Labrador Retrievers (21.16 ± 0.19 %) when compared to apparently healthy control (30.87 ± 1.34 %). In the present study, there was no significant difference ($P > 0.05$) in the mean values of monocytes and eosinophils of Labrador Retrievers with DCM when compared to the control group.

Table 1: Mean $\pm$ SE of hematological parameters in Control Labrador Retrievers and DCM Labrador Retrievers

Parameter	Control	DCM (n=24)
Hb (gm%)	$12.73 \pm 0.36^*$	$10.16 \pm 0.38^*$
PCV (%)	$37.50 \pm 1.99^*$	$31.33 \pm 0.55^*$
TEC (106/cumm)	$6.20 \pm 0.50^*$	$4.54 \pm 0.22^*$
TLC (103/cumm)	$9.70 \pm 0.82^*$	$17.14 \pm 0.46^*$
N (%)	$66.37 \pm 2.31^*$	$76.00 \pm 1.50^*$
L (%)	$30.87 \pm 1.34^*$	$21.16 \pm 0.19^*$
M (%)	2.50 ± 0.42^{NS}	2.83 ± 0.26^{NS}
E (%)	0.87 ± 0.22^{NS}	0.91 ± 0.41^{NS}

Mean $\pm$ S.E followed by different superscript(s) differ significantly

*Significant only at $P < 0.01$

^{NS} Nonsignificant

Serum Biochemistry

The mean values of serum biochemical parameters of control Labrador Retrievers and DCM Labrador Retrievers were shown in Table-II.

The mean blood urea nitrogen (BUN), serum creatinine, serum ALT, serum AST, total protein and albumin of apparently healthy Labrador Retrievers were 27.87 ± 2.02 mg/dl, 1.43 ± 0.08 mg/dl, 72.75 ± 1.14 IU/L, 48.37 ± 5.80 IU/L, 6.15 ± 0.24 g/dl and 3.98 ± 0.05 g/dl respectively.

The mean values of blood urea nitrogen (BUN), serum creatinine, serum ALT, serum AST, total protein and albumin of DCM Labrador Retrievers were 47.79 ± 3.93 mg/dl, 1.70 ± 0.03 mg/dl, 129.67 ± 4.69 IU/L, 103.40 ± 5.43 IU/L, 4.59 ± 0.09 g/dl and 2.62 ± 0.04 g/dl respectively.

The mean values of blood urea nitrogen (BUN) of Labrador Retrievers with DCM (47.79 ± 3.93 mg/dl) were significantly increased ($P < 0.01$), while the mean values of serum creatinine of DCM Labrador Retrievers was not significantly increased ($P > 0.05$), when compared to apparently healthy control. The mean values of ALT, AST of Labrador Retrievers with DCM (129.67 ± 6.07 IU/L and 103.40 ± 5.43 IU/L) were significantly increased when compared to healthy control ($P < 0.01$). The mean values of total protein and albumin of Labrador Retrievers with DCM (4.59 ± 0.09 g/dl and 2.62 ± 0.04 g/dl) were significantly decreased when compared to healthy control ($P < 0.01$).

Table 2: Mean $\pm$ SE of Serum biochemical parameters in Control and DCM Labrador Retrievers

Parameter	Control	DCM (n=24)
Blood Urea Nitrogen (BUN) (mg/dl)	$27.87 \pm 2.02^*$	$47.79 \pm 3.93^*$
Serum Creatinine (mg/dl)	1.43 ± 0.08^{NS}	1.70 ± 0.03^{NS}
Serum ALT (IU/L)	$72.75 \pm 9.78^*$	$129.67 \pm 6.07^*$
Serum AST (IU/L)	$48.37 \pm 5.80^*$	$103.40 \pm 5.43^*$
Total Protein (g/dl)	$6.15 \pm 0.24^*$	$4.59 \pm 0.09^*$
Albumin (g/dl)	$3.98 \pm 0.05^*$	$2.62 \pm 0.04^*$

Mean $\pm$ S.E followed by different superscript(s) differ significantly

*Significant only at $P < 0.01$

^{NS} Non significant

Discussion

Hematology

The mean $\pm$ SE values of hematological parameters (Hb, PCV, TEC, TLC and DLC) in apparently healthy Labrador Retrievers were within normal range, as reported by Wess and Tvedten, (2004), Benjamin, (2007) [1] and Sree Sai Jyosthna *et al.* (2024) [15]. In the present study, the mean values of haemoglobin, packed cell volume and total erythrocyte counts were significantly decreased when compared to control group. The present findings were in agreement with previous authors (Vishnurav *et al.*, 2018; Mayani *et al.*, 2022 Sai krishna *et al.*, 2022 and Sree Sai Jyosthna *et al.*, 2024) [18, 10, 15]. While the mean values of total leukocyte count and neutrophils were significantly increased when compared to control group. The present findings were in accordance with earlier observations (Mayani *et al.*, 2022; Saikrishna *et al.*, 2022; Brloznik *et al.*, 2023 and Yadav *et al.*, 2023) [10, 12, 3, 20]. However, no significant difference was noticed in the mean values of monocytes and eosinophils between control and DCM Labrador Retrievers, which was in accordance with the findings of (Jeyaraja *et al.*, 2015; Vishnurav *et al.*, 2018 and Sree Sai Jyosthna *et al.*, 2024) [6, 18, 15]. The reason for the low haematocrit could be associated with the fluid retention that occurs in congestive heart failure and thus haemodilution (Martin *et al.*, 2010; Mayani *et al.*, 2022 and Sai krishna *et al.*, 2022) [9, 10, 1]. In the present study, presence of concurrent bacterial infection in the DCM Labrador Retrievers might be responsible for leukocytosis and neutrophilia (Mayani *et al.*, 2022; Sai krishna *et al.*, 2022; Brloznik *et al.*, 2023 and Yadav *et al.*, 2023) [10, 3, 20].

Serum Biochemistry

The mean + SE values for blood urea nitrogen (BUN), serum creatinine, serum ALT, serum AST, total protein and albumin in apparently healthy Labrador Retrievers were within the normal range, as suggested by (Kaneko *et al.*, 1997; Mayani *et al.*, 2022 and Sree Sai Jyosthna *et al.*, 2024) ^[7, 10, 15]. The present study revealed a significant elevation of BUN, ALT, AST values in DCM Labrador Retrievers. The present findings were in agreement with earlier observations (Bodh *et al.*, 2014; Saikrishna *et al.*, 2022; Mayani *et al.*, 2022; Sharma *et al.*, 2025; Sree Sai Jyosthna *et al.*, 2024 and Umesh *et al.*, 2024) ^[2, 12, 10, 13, 15, 17]. There was significant decrease in values of total protein and albumin in DCM Labrador Retrievers. The present findings were in agreement with (Rajamohan *et al.*, 2018) ^[11]. The elevation in concentration of serum creatinine was non-significant in DCM Labrador Retrievers in comparison to the control group, which was supported by the earlier observations (Singh, 2013; Sree Sai Jyosthna *et al.*, 2024 and Umesh *et al.*, 2024) ^[14, 15, 17]. The increase of BUN but not serum creatinine concentrations with higher stage of heart failure suggests a prerenal azotemia secondary to heart failure (Martin *et al.*, 2010 and Mayani *et al.*, 2022) ^[9, 10]. Prerenal azotemia is because of severe reduction in cardiac output (Miller, 2010 and Sree Sai Jyosthna *et al.*, 2024) ^[1, 15] or might be due to the adverse influence on renal function caused by progressive myocardial failure (Thomason *et al.*, 2014) ^[16]. Decreased levels of total protein and albumin in the present might be due to inappetence and hepatic enlargement (Lakshmi *et al.*, 2017) ^[8]. Hypoproteinemia and hypoalbuminemia in the affected dogs could be attributed to increased protein loss from the intestines due to bowel and pancreatic edema and poor absorption due to decreased splanchnic perfusion.

Summary

Hematology revealed decreased hemoglobin, packed cell volume and total erythrocyte count, while neutrophils and total leukocyte count was significantly increased. Serum biochemistry revealed normal levels of serum creatinine and elevated BUN, ALT, AST and decreased levels of total protein and albumin when compared to apparently healthy Labrador Retrievers.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article

Sahithi N, Rao VV, Rajesh K, Raghunath M, A Nasreen. Hematobiochemical findings of DCM in Labrador Retrievers. *International Journal of Veterinary Sciences and Animal Husbandry.* 2026;11(5):89-92.

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