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Hematobiochemical profiles and cardiac biomarker assessment in Labrador retriever dogs

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Abstract
This study aimed to establish baseline hematobiochemical and cardiac biomarker parameters in clinically healthy Labrador Retrievers and assess the influence of body weight on these indices. Sixteen adult Labrador Retrievers (2–6 years, both sexes) were categorized into two groups based on body weight: Group-I (<30 kg) and Group-II (>30 kg). Comprehensive evaluations including hematological, biochemical, and cardiac biomarker analyses were performed following confirmation of the dogs' health status. Hematological parameters including hemoglobin, packed cell volume, RBC, WBC and platelet counts, as well as biochemical parameters such as AST, ALT, total protein, albumin, BUN and creatinine were within normal ranges with no significant intergroup differences. Cardiac biomarker analysis revealed cTnI levels of 0.0056±0.0014 ng/mL in Group-I and 0.0081±0.0018 ng/mL in Group-II, while NT-proBNP levels were 1.9731±0.3085 pmol/L and 3.0789±0.8485 pmol/L, respectively. These differences were not statistically significant indicating stable cardiac health across varying body weights. This study provides valuable baseline data on hematobiochemical and cardiac biomarker parameters in Labrador Retrievers emphasizing the minimal impact of body weight on these indices and contributing to improved cardiac health assessment in this breed.

Keywords: Labrador retrievers, hematobiochemical parameters, cardiac biomarkers, body weight

Introduction

The Labrador Retriever, renowned for its friendly temperament, intelligence, and versatility has become one of the most popular dog breeds globally. This increased popularity has brought heightened attention to the breed's specific health requirements particularly concerning cardiovascular health. Cardiovascular diseases are a growing concern in veterinary practice mirroring their significance in human medicine. Early detection and accurate assessment of cardiac function are essential for managing such conditions in companion animals. Haematological evaluations play a pivotal role in assessing the physiological and pathological states of animals. Complete blood cell counts (CBC) are critical diagnostic tools providing essential information that facilitates accurate diagnosis or the creation of differential diagnosis lists (Dixon, 1997; DeNicola, 2011) [14, 15]. Establishing breed-specific reference ranges for haematological parameters is crucial as these values are influenced by factors such as lifestyle, gender, age and environmental conditions (Olayemi and Ighagbon, 2011; Connolly *et al.*, 2020) [18, 17]. In veterinary cardiology, the advent of cardiac biomarkers such as cardiac troponins (cTn) and brain natriuretic peptides (BNP) has revolutionized diagnostic capabilities. These biomarkers provide non-invasive insights into cardiac stress and injury offering a reliable indication of myocardial damage and disease severity (Noszczyk and Nowak, 2011) [1]. Combined with advanced diagnostic methods like echocardiography, these tools enable a comprehensive evaluation of cardiac function. This study aims to assess haematological and cardiac parameters including biomarkers in healthy Labrador Retrievers. By establishing reference ranges and examining the influence of body weight and other factors this research contributes to enhancing diagnostic precision and advancing Veterinary cardiac care.

Materials and Methods
Animals and Inclusion Criteria
This study included clinically healthy adult Labrador Retriever dogs, aged 2–6 years, with no history of clinical conditions such as coughing, breathlessness or exercise intolerance. All included dogs had a history of routine preventive healthcare including vaccinations and deworming. The age, sex and body weight of each dog were recorded prior to the study.

Clinico-physiological Examination
A comprehensive clinical examination was conducted on each dog to assess various physiological parameters including heart rate, pulse rate, rectal temperature, respiratory rate, breathing pattern, capillary refill time (CRT) and the color of visible mucous membranes.

Haemato-biochemical Examination
Blood Collection
Approximately 5 mL of blood was collected aseptically and of this, 1 mL was transferred into a K_3EDTA vacutainer for haematological analysis and the remaining 4 mL was transferred into a clot activator vacutainer for serum separation. The serum samples were stored at -20 °C until further biochemical analysis.

Haematological and Biochemical analysis
Haematological parameters *viz.* Haemoglobin (Hb, g/dL), Total Erythrocyte Count (TEC, x10^6/µL), Total Leukocyte Count (TLC, x10^3/µL), Packed Cell Volume (PCV, %), Platelet Count (x10^5/µL), Differential Leukocyte Count (DLC, %) were measured using a fully automatic blood cell counter (MEK-6420P, Nihon Kohden India).

Biochemical parameters *viz.* Alanine Aminotransferase (ALT, IU/L), Aspartate Aminotransferase (AST, IU/L), Serum Creatinine (mg/dL), Blood Urea Nitrogen (BUN, mg/dL), Total Protein (TP, g/dL), Albumin (g/dL) were assessed using a semi-automated biochemical analyzer (Microlab 300) with commercially available diagnostic kits.

Cardiac Biomarkers
The cardiac biomarkers N-terminal pro-brain natriuretic peptide (NT-proBNP) and cardiac Troponin I (cTnI) were quantitatively estimated using FINETEST Canine NT-proBNP and FINETEST Canine hs-cTnI ELISA kits. The analysis was performed using an ELISA reader (I Gene Labserve).

Equipment Used
- Fully automatic blood cell counter (MEK-6420P, Nihon Kohden India)
- Semi-automated biochemical analyzer (Microlab 300)
- ECG machine (BPL CARDIART 6208)
- ELISA reader (I Gene Labserve)

Results and Discussion
Haematological Analysis
All assessed parameters, including haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), platelet count and differential leukocyte counts (neutrophils, lymphocytes, monocytes, and eosinophils) were within normal physiological ranges without any statistically significant differences between Group I (<30 kg) and Group II (>30 kg) (Table 1) suggesting that body weight does not significantly influence these hematological parameters in healthy Labrador Retriever dogs.

Table 1: Mean ± S.E. of various haematological parameters in Labrador Retriever dogs

Sr. No.	Parameters	Group-I (n=8)	Group-II (n=8)	p values
1	Hb (g/dl)	14.675±0.83	15.463±0.39	0.41
2	PCV (%)	47.53±2.19	49.675±1.74	0.46
3	TEC (m/cmm)	7.6900±0.27	7.7038±0.31	0.93
4	TLC (cmm)	11612.50±736.65	12425.00±1445.78	0.62
5	Neutrophils (%)	67.88±3.01	64.38±2.24	0.37
6	Lymphocytes (%)	25.88±2.79	29.63±2.42	0.33
7	Eosinophils (%)	3.00±0.57	3.00±0.59	1.00
8	Monocyte (%)	3.25±0.42	3.00±0.78	0.78
9	Platelets (x 10^5/µL)	2.5975±0.15	2.6325±0.19	0.88

These findings align with previous studies, including those by Haritha *et al.* (2017) [2] and Ramteke *et al.* (2019) [2], which reported no significant differences in hematological parameters in healthy dogs between different breeds. Kara *et al.* (2024) [4] also found that gender differences did not significantly influence most haematological parameters. The normal haematological values in this study support the absence of anaemia, infection, or haematological abnormalities indicating that these factors are unlikely to affect cardiac function in the studied dogs.

Biochemical Analysis
The biochemical parameters assessed including AST, ALT, total protein, albumin, blood urea nitrogen (BUN) and creatinine showed no significant differences between the two groups (Table 2). All values were within the normal ranges reported by Kahn (2010) [5] and Kaneko *et al.* (2008) [6].

Table 2: Mean ± S.E. of various biochemical parameters in Labrador Retriever dogs

Sr. No.	Parameters	Group-I (n=8)	Group-II(n=8)	*p* values
1	AST(IU/L)	24.53±1.36	21.18±2.00	0.19
2	ALT (IU/L)	19.92±0.41	19.96±1.09	0.98
3	Total protein (g/dl)	8.33±0.15	8.0138±0.18	0.19
4	Albumin (g/dl)	3.36±0.08	3.39±0.68	0.77
5	BUN (mg/dl)	12.79±0.34	12.23±0.43	0.33
6	Creatinine (mg/dl)	0.98±0.08	1.18±0.07	0.08

These findings are consistent with studies by Haritha *et al.* (2017) [2] and Amaravathi *et al.* (2019) [7], which reported normal ALT, BUN, creatinine and total protein levels in healthy dogs and those with early cardiac diseases. In contrast, some studies, such as Martin *et al.* (2009) [8], have noted biochemical alterations including azotemia and elevated liver enzymes in dogs with advanced cardiac conditions.

The absence of significant differences in biochemical parameters in this study highlights the limited impact of body weight on routine biochemical markers in healthy Labrador Retrievers.

Cardiac Biomarkers

Table 3: Mean ± S.E. of cardiac biomarkers in Labrador Retriever dogs

Sr. No.	Parameters	Group-I (n=8)	Group-II(n=8)	*p* values
1	Cardiac troponin-I (ng/ml)	0.0056±0.0014	0.0081±0.0018	0.28
2	NT-proBNP (pmol/L)	1.9731±0.3085	3.0789±0.8485	0.75

The levels of cardiac troponin I (cTnI) and NT-proBNP, shown in Table 3 were within the normal range for all dogs with no significant differences between the groups. The mean cTnI levels in Group I (0.0056±0.0014 ng/mL) and Group II (0.0081±0.0018 ng/mL) were well below the diagnostic threshold of 0.5 ng/mL suggested by Pelander *et al.* (2002) [9]. Similarly, NT-proBNP levels in Group I (1.9731±0.3085 pmol/L) and Group II (3.0789±0.8485 pmol/L) were comparable to baseline levels reported by Ettinger (2012) [10].
Sleeper *et al.* (2001) [11] also documented that cTnI levels in healthy dogs are typically 0.0–0.04 ng/mL, similar to the findings in this study. Elevated levels of cTnI and NT-proBNP have been associated with cardiac stress and myocardial injury in diseased animals (Barathan *et al.*, 2018) [12]. However, the absence of significant differences and the low biomarker levels in this study indicate that all dogs were free from cardiac stress or injury. These findings can also serve as baseline data for Veterinary cardiology research in India.

Conflict of Interest
None declared.

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