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Comparative study of different haematological and biochemical parameters in normal German Shepherd and Labrador dogs

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Abstract
Present study was conducted to evaluate the haematological and biochemical parameters in Labrador and German shepherd dogs. Total 16 healthy privately owned Labrador (n=8) or German shepherd dogs (n=8); 2-5 yrs. of age, weighing around 20 ± 5 kg, with body condition scores of 3 on a 1 to 5 scale residing in Akola city were selected. Blood sample (4 ml) was collected from each dog in plain vacutainer as well as in EDTA vials from cephalic or saphenous vein by using 21 gauze needles. After collection, blood in the plain vials was allowed to clot; serum was separated by centrifugation at 5000 g for 10 minutes and stored at -20 °C until further analysis of biochemical parameters. Haematological analysis was carried out within 20 minutes of blood collection. The mean haematological values recorded in German shepherd and Labrador dogs such as PCV, Haemoglobin, platelet count, total erythrocyte count, total leucocyte count, differential leukocyte count MCV, MCHC and MCH were in normal physiological limit and showed non-significant difference between the two breeds. The mean biochemical values recorded such as Total cholesterol, Triglyceride, Total protein and BUN concentration were in normal physiological limit. The Total cholesterol and Triglyceride concentration showed significant difference among the two breeds, whereas Total protein and BUN concentration showed non-significant difference between the two breeds. The present study revealed that the German shepherd and Labrador breeds of dogs showed the non-significant difference in haematological values and biochemical values except total cholesterol and triglyceride.

Keywords: Dog, haematological values, biochemical values, german shepherd labrador

1. Introduction
Dog is the most preferred domestic animal among all the pet animals (Toll and Reynolds, 2000; Shannon, 2015) [1, 2]. Since its domestication, the dog has been selectively bred over years for different traits, sensory abilities and physical ascribes (Wang, 2015) [3]. Dogs are used for herding, hunting, companionship and protection. Dogs are known as "Man's best friend" (Groves, 1999) [4] owing to their many important purposes in our society. The blood is an important medium in evaluating the health condition of animals. Both the pathological and physiological status of animals can be assessed by the measuring the biochemical and haematological analytes of the blood (Coles, 1986; Bush, 1991) [6, 7]. Factors such as age, sex, nutrition, breed and climate were known to alter biochemical and haematological parameters of clinically healthy dog (Coles, 1986; Awah and Nottidge, 1998) [8, 9]. Genetic backgrounds can influence the expected values of hematologic and serum biochemical analytes in domestic animal species. In dogs, various breed-related variations in hematologic and serum biochemical analytes which are apparently subclinical have been distinguished, including microcytosis in Shibas (Gookin et al., 1998) [10], thrombocytopenia in Cavalier King Charles Spaniels (Pedersen et al., 2002 and Smedile et al., 1997) [11, 12]; potential leukopenia in Belgian Tervurens (Greenfield et al., 1997) [13]; and higher serum chloride, sodium, creatinine, and bilirubin concentrations, and aspartate aminotransferase (AST) activity in Greyhounds compared with mixed breed dogs (Porter et al., 1971) [14]. These variations in clinical significance is often indistinct, other than to acknowledge them as likely incidental findings to escape potentially costly and invasive diagnostic evaluations. Serum biochemical profile is commonly used to screen dogs for disease and monitor clinical progression, breed-related differences in biochemical analytes may impact to make a clinical decision. Though lots of work has been done on establishing the base line values of haematological and biochemical

parameters of dogs (Oduye, 1978; Awah and Nottidge, 1998) [15, 16], earlier workers have either focused on the local dogs or different breeds of dogs together so it is difficult to ascertain the exclusive effect of breed on these parameters. Hence this study was carried out to investigate the effect of breed on some haematological and biochemical parameters of clinically healthy dogs.

2. Materials and Methods
The study dogs were chosen according to age, body condition and a complete medical record which included breeding history, vaccination records, clinical visits and clinical examination, if any. Total 16 healthy privately owned Labrador (n=8) or German shepherd dogs (n=8); 2-5 yrs. of age, weighing around 20 ± 5 kg, with body condition scores of 3 on a 1 to 5 scale residing in Akola city were selected. Vaccinations were current and all dogs were apparently healthy as assessed by history and physical examinations.

Blood sample (4 ml) was collected from each dog in plain vacutainer as well as in EDTA vials from cephalic or saphenous vein by using 21 gauze needles. After collection, blood in the plain vials were allowed to clot; serum was separated by centrifugation at 5000 g for 10 minutes and stored at -20°C until further analysis of biochemical parameters. Haematological analysis was carried out within 20 minutes of blood collection.

Haematological parameters studied were Haemoglobin (Hb, g/l), Platelet count (10^9/l), Total Leukocyte Count (TLC, $\times 10^3$/μl), Total Erythrocyte Count (TEC, $\times 10^6$/μl) Differential Leukocyte Count (DLC, 10^9/l) and different erythrocyte indices such as Mean Corpuscular Volume (MCV, fl), Mean Corpuscular Haemoglobin Concentration (MCHC,%) and Mean Corpuscular Haemoglobin (MCH, pg). Complete blood count (CBC) was performed by using automated hemoanalyzer. Separated serum samples were evaluated for

biochemical parameters which included total protein (mg/dl), BUN (), total cholesterol (mmol/l) and triglycerides (mmol/l). Biochemical analysis of serum sample was performed using a semi-automated biochemical analyzer (Autochem, 2011) using biochemical kits manufactured by Span Diagnostics Ltd., G.I.D.C. Sachin 394 230, Surat.

3. Results and Discussion
Total 16 clinically healthy, privately owned dogs of German shepherd and Labrador breed were selected from Akola city. All the values recorded in present study were in normal physiological range as described by Theresa et al., (2010) [17] for a normal and healthy dog.

3.1 Hematological parameters studied in German shepherd and Labrador dogs
Hematological parameters recorded in dogs of both the breeds are given in Table 1. The mean haematological values recorded in German shepherd dogs were as follows: PCV (46.60 ± 1.02%), Haemoglobin (15.90 ± 0.31 g/dl), platelet count (306.13 ± 25.82 10^9/l), total erythrocyte count (7.11 ± 0.21 $\times 10^6$/μl), total leucocyte count (12.63 ± 0.49 $\times 10^3$/μl), differential leukocyte count (monocyte: 5.00 ± 0.61%; lymphocyte: 22.00 ± 0.70%; eosinophil: 2.38 ± 0.64%; neutrophil: 70.63 ± 1.11%; basophil: 00%), MCV (66.07 ± 2.99 fl), MCHC (34.17 ± 0.60%) and MCH (22.49 ± 0.78 pg). Whereas in Labrador dogs, the haematological parameters recorded were as follows: PCV (46.58 ± 0.86%), Haemoglobin (15.91 ± 0.28 g/dl), platelet count (352.63 ± 23.46 $\times 10^9$/l), total erythrocyte count (6.99 ± 0.19 $\times 10^6$/μl), total leucocyte count (12.53 ± 0.46 $\times 10^3$/μl), differential leukocyte count (monocyte: 4.50 ± 0.60%; lymphocyte: 21.38 ± 0.61%; eosinophil: 2.50 ± 0.61%; neutrophil: 71.63 ± 1.11%; basophil: 00%), MCV (67.01 ± 2.12 fl), MCHC (34.16 ± 0.07%) and MCH (22.89 ± 0.75 pg).

Table 1: Different haematological parameters recorded in German shepherd and Labrador dogs

Breed	PCV (%)	Hb (g/dL)	PLT ($\times 10^9$/l)	TEC ($\times 10^6$/μl)	TLC ($\times 10^3$/μl)	MCV (fl)	MCH (pgs)	MCHC (%)	LYM (%)	MONO (%)	EOS (%)	NEU (%)	BASO (%)
German shepherd (GSD, n=8)	46.60 ± 1.02	15.90 ± 0.31	306.13 ± 25.82	7.11 ± 0.21	12.63 ± 0.49	66.07 ± 2.99	22.49 ± 0.78	34.17 ± 0.60	22.00 ± 0.70	5.00 ± 0.61	2.38 ± 0.64	70.63 ± 1.11	0.00 ± 00
Labrador (LR, n=8)	46.58 ± 0.86	15.91 ± 0.28	352.63 ± 23.46	6.99 ± 0.19	12.53± 0.46	67.01± 2.12	22.89 ± 0.75	34.16 ± 0.07	21.38 ± 0.61	4.50 ± 0.60	2.50 ± 0.61	71.63 ± 1.11	0.00 ± 00

(PCV-Packed cell volume, Hb- haemoglobin, PLT-platelet, TEC-total erythrocyte count, TLC-total leukocyte count, MCV-mean cell volume, MCH- mean cell haemoglobin, MCHC- mean cell haemoglobin concentration, LYM-lymphocyte, MONO- monocyte, EOS-eosinophil, NEU-neutrophils, BASO-basophil)

There was no significant difference recorded in all the haematological parameters between these two different breeds of dogs. The mean PCV observed in GSD as well as LR breed was in normal physiological range. The mean PCV% recorded in the present study is in close accordance with Suljevic et al. (2016) [18] who reported 44±4% PCV in Labrador dog and 47±5% PCV in GSD.

The mean haemoglobin count observed in both the breeds was in normal physiological range (12.0–18.0 g/dL) for fertile dogs (Theresa et al., 2010) [17]. The mean haemoglobin count recorded in both the breeds is in close accordance with Brenten et al., (2016) [19] who reported 15.1 g/dl mean haemoglobin count in Labrador dogs which is similar with the findings of the present study, similarly Ariyibi et al., (2002) [20] and Atata et al., (2018) [21] reported 13.3 ± 0.86 g/dl,

13.17±0.48 g/dl mean haemoglobin count, respectively which is in accordance with the present findings.

Mean platelet count recorded in the present study in both the breeds is in normal physiological limit as described by Theresa et al., 2010 [17] (200,000 – 500,000 /μL for normal healthy dogs). The mean platelet count recorded in both the breeds is in close agreement with Brenten et al., (2017) [19] who reported 309 $\times 10^3$/l platelet count in Labrador and miniature schnauzer (MS) dogs. Similar results were also observed by Suljevic et al., (2016) [18] who reported 336.85±109.9×10^3/l in German shepherd and Labrador dogs and Nielsen et al., (2009) [22] who reported 200-500 $\times 10^3$/l platelet count in bernese mountain dogs. The mean TEC recorded in the present study is in close accordance with Harper et al., (2003) [23] who reported 6.6×10^{12}/l TEC in

Labrador dogs. There was no significant difference observed in mean TEC between German shepherd and Labrador breeds of dog. The mean TLC recorded in the present study is in agreement with Suljevic *et al.,* (2016) [18] who found similar TLC of 11.58±3.35×10⁹/l in Labrador dogs and 10.87±2.62×10⁹/l in German shepherd dogs.

The MCV, MCH and MCHC values recorded in the present study are in close agreement with Suljevic *et al.,* (2016) [18], Brenten *et al.,* (2017) [19] and Harper *et al.,* (2003) [23] who reported similar findings of MCV, MCH and MCHC in German shepherd and Labrador breeds of dogs. Suljevic *et al.,* (2016) [18] reported 33.64±1.14 g/dL MCHC in Labrador breed, whereas 34.14±1.53 g/dL MCHC in German shepherd breed of dogs which is similar to the results of present findings.

The mean differential leukocyte count which included absolute number of neutrophils (NEU, 10⁹/l), eosinophils (EOS, 10⁹/l), basophils, monocytes and lymphocytes (LYM, 10⁹/l) recorded in the present study is in close accordance with Khan *et al.,*(2010) [24] who reported similar result of differential leukocyte count in dogs. All the results of differential leukocyte count were within normal physiological range.

3.2 Biochemical parameters studied in German shepherd and Labrador dogs

Biochemical parameters studied in the present study included total protein, total cholesterol, blood urea nitrogen and triglycerides. The results of biochemical parameters recorded in both the breeds are presented in Table 2. All the parameters were within normal physiological range as described by Kaneko *et al.,* (2008) [25] for normal healthy dogs.

Table 2: Different biochemical parameters recorded in German shepherd and Labrador dogs

Breed	Total protein (g/dL)	BUN (mg/dL)	Total cholesterol (mg/dL)	Triglycerides (mg/dL)
German shepherd (n=8)	6.35 ± 0.23	27.17 ± 0.50	167.20 ± 2.88	70.88 ± 3.87
Labrador (n=8)	6.47 ± 0.31	26.33 ± 0.42	200.33 ± 10.39	88.53 ± 6.12

In the present study, significant difference in the level of total cholesterol was observed between the German shepherd and Labrador dogs which were 167.20 ± 2.88 and 200.33 ± 10.39, respectively but within normal physiological limit. The similar findings of total cholesterol were also observed by Ikeuchi *et al.,* (1999) [26] who reported 131 ± 2.0 to 205 ± 2.2 mg/dL of total cholesterol in beagle dogs.

Similarly, significant difference was observed in the triglyceride level between the German shepherd (70.88 ± 3.87 mg/dL) and Labrador dogs (88.53 ± 6.12 mg/dL). Results of triglyceride level in both the breeds of dogs are in close accordance with Brenten *et al.,* (2017) [19] and Ikeuchi *et al.,* (1999) [26].

The mean total protein level recorded in German shepherd and Labrador dogs was 6.35 ± 0.23 g/dL and 6.47 ± 0.31 g/dL, respectively. There was no significant difference observed in total protein level when compared between these two breeds. The mean total protein level recorded in the present study is in close accordance with Sharkey *et al.,* (2009) [27] who reported 6-6.2 g/dL total protein in Golden retriever dogs. Similar findings were also reported by Choi *et al.,* (2011) [28] and Ikeuchi *et al.,* (1991) [26] who reported 5.61±0.28 g/dL total protein and 4.1±0.07-7.9±0.10 g/dL total protein in beagle dogs, respectively.

The mean BUN level recorded in the present study was 27.17 ± 0.50 mg/dL in German shepherd dogs whereas in Labrador dogs, it was 26.33 ± 0.42 mg/dL. No significant difference was noted in the mean BUN level between these two breeds. The findings of the present study are in accordance with Harper *et al.,* (2003) [23] who reported similar BUN values in healthy Labrador dogs and Nielsen *et al.,* (2009) [29] who reported similar BUN values in Bernese mountain dogs whereas Sharkey *et al.,* (2009) [27] reported lower BUN values in dogs than the present findings.

4. Conclusion
The present research findings revealed all the haematological parameters showed non-significant difference between German shepherd and Labrador, whereas significant difference was observed in total cholesterol and triglyceride concentration between both the breeds of dogs.

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