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Hematological and biochemical alterations in geriatric dogs: a short-interval clinical screening study†

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ABSTRACT: Geriatric dogs experience a progressive decline in overall organ function with advancing age, making routine health screening essential for the early detection of asymptomatic age-related disorders. This study aimed to evaluate the health status of geriatric dogs using comprehensive blood profile analysis. Blood samples were collected from six dogs aged 10 years that were intensively managed at the Veterinary Teaching Clinic, Study Program of Veterinary Paramedic, IPB University, Bogor, Indonesia. Hematological and serum biochemical examinations were performed, including the assessment of AST, ALT, total protein, albumin, globulin, A/G ratio, total bilirubin, ALP, cholesterol, GGT, BUN, creatinine, and glucose levels. Blood examinations were conducted twice at intervals of approximately four weeks. All geriatric dogs exhibited evidence of declining health status, characterized by alterations in several complete blood count parameters, including thrombocytopenia, leukocytosis, and mild lymphocytosis. In addition, changes in the biochemical profile were observed, notably elevated AST and BUN levels in several dogs. These findings highlight the importance of regular hematological and biochemical monitoring in geriatric dogs to support the early detection and clinical management of age-associated physiological deterioration.

Keywords:
canine, geriatric, hematology, blood biochemistry, short-interval clinical screening

■ INTRODUCTION

Aging is a physiological process involving molecular, cellular, and organ changes in living organisms that are linked to disease development. In companion animals, these changes reduce physiological reserves and increase susceptibility to chronic diseases (Pati *et al*. 2015). The AVMA considers dogs geriatric at seven years of age, varying by size and breed. Health screening in older dogs is essential for detecting asymptomatic age-related disorders. Routine screening provides baseline health data and reference values for monitoring and diagnosis (Davies 2012). Complete blood count and serum biochemical profiling are recommended annually or biannually to identify subclinical diseases in geriatric patients (Rizzi 2015).

Data on the hematological and biochemical profiles of geriatric dogs in veterinary teaching hospitals in developing countries are limited, particularly for monitoring physiological changes before disease onset. This study evaluated the health of geriatric dogs at the Veterinary Teaching Clinic of the Study Program of Veterinary Paramedic, IPB University through repeated blood tests. It provides baseline and longitudinal blood profile data from managed geriatric dogs, offering insights into early changes with aging and supporting evidence-based screening protocols in veterinary practices.

■ MATERIALS AND METHODS

Materials and Study Animals: The equipment used in this study included 3 mL syringes, EDTA blood collection tubes, plain blood collection tubes, a Biobase BK3200VET hematology analyzer, a centrifuge, a vortex mixer, a micropipette, and a photometer. The biological materials consisted of blood samples obtained from six 10-year-old dogs (two males and four females) that were intensively managed at the Veterinary Teaching Clinic, Study Program of Veterinary Paramedic, IPB University, Bogor, Indonesia.

Blood Sample Collection: Blood samples were collected from the cephalic (vena cephalica antibrachii) or saphenous veins using approximately 3 mL syringes. For complete blood count (CBC) analysis, 0.5 mL of blood was transferred into EDTA tubes, and the remaining volume (±2 mL) was placed into plain tubes for serum biochemical analysis.

Hematological and Biochemical Analyses: Blood samples in EDTA tubes were analyzed for CBC using a Biobase BK3200VET hematology analyzer, according to the manufacturer's instructions. Blood samples collected in plain tubes were processed for serum biochemical analyses using a photometer. The biochemical parameters evaluated

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included aspartate aminotransferase (AST), alanine aminotransferase (ALT), total protein, albumin, globulin, albumin-to-globulin (A/G) ratio, total bilirubin, alkaline phosphatase (ALP), cholesterol, gamma-glutamyl transferase (GGT), blood urea nitrogen (BUN), creatinine, and glucose levels.

■ RESULTS AND DISCUSSION

The complete blood count (CBC) results showed that one dog had a decreased white blood cell (WBC) count (leukopenia: <6.0 × 10⁹cells/L) in both examinations, while another dog showed leukopenia only in the second examination (Table S1). One dog had increased WBC (leukocytosis: >17.0 × 10⁹cells/L), while three dogs showed normal WBC values (6.0–17.0 × 10⁹cells/L). WBC variations may be influenced by stress, inflammatory responses, and diseases (Nelson & Couto 2014). Moruzi *et al.* (2023) reported leukocytosis is associated with infection and stress-induced corticosteroid release. Leukopenia may be linked to early infection or inflammatory conditions, commonly seen in cases of babesiosis and canine parvoviral enteritis.

Leukocytosis and leukopenia may involve changes in the lymphocyte levels. One dog with leukocytosis had lymphocytosis linked to leukemic conditions (Moruzi *et al*. 2023). Lymphocytosis was observed in five dogs during the examinations, which was associated with neutropenia. All dogs showed granulopenia, neutropenia, and lymphocytic. Terzungwe (2018) stated that neutropenia leads to lymphocytosis via hyperplasia of the bone marrow. At the IPB University Veterinary Teaching Clinic, lymphocytosis may indicate immune dysregulation in geriatric dogs. Lymphocytosis occurs during inflammatory processes, including Ehrlichia canis infection and thymoma-related neoplasia (Rout *et al*. 2020). Red blood cell analysis showed that one dog developed normocytic hypochromic anemia, while the others maintained normal values. Anemia in geriatric dogs may result from decreased erythropoiesis and splenomegaly (Smitha *et al*. 2024). Platelet analysis showed thrombocytopenia in all dogs during both periods. In geriatric patients, thrombocytopenia may be linked to infections, drugs, and myeloproliferative disorders (Jain *et al*. 2013).

Serum biochemical analysis revealed elevated aspartate aminotransferase (AST) levels in five dogs, without concurrent increases in alanine aminotransferase (ALT) levels (Table S2). This pattern may indicate age-related muscle decline rather than hepatic dysfunction. As reported by Bruno *et al*. (2022), AST elevation can occur in liver disorders, muscle diseases, or erythrocyte hemolysis. Elevated blood urea nitrogen (BUN) levels without concurrent increases in creatinine levels were observed in all study dogs. This finding may reflect age-associated renal changes, particularly a reduced glomerular filtration rate (GFR), as described by Rizzi (2015). Smitha *et al*. (2024) suggested that increased BUN without creatinine elevation may relate to dietary protein intake, gastrointestinal bleeding, medications, or dehydration. Elevated BUN levels may indicate an increased BUN-to-creatinine (U:C) ratio, which is associated with reduced renal filtration and dehydration (Hall *et al*. 2015).

■ CONCLUSION

Routine hematological and biochemical screening showed subclinical alterations in geriatric dogs, with changes in leukocyte profiles, thrombocytopenia, and increased AST and BUN levels, highlighting the importance of blood monitoring for the early detection of age-related decline.

■ ASSOCIATED CONTENT

Supporting Information

†The hematology and blood biochemistry were submitted in PDF form as supporting information.

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■ REFERENCES

Bruno F, de Souza Balbueno MC, Emídio TA, Rios N, Pereira FV, de Souza ML, de Paula Coelho C. 2022. Relationship between hematological and biochemical tests and senility in dogs. Research, Society and Development. 11(7):e12611729568.

Davies M. 2012. Geriatric screening in first opinion practice – results from 45 dogs. Journal of Small Animal Practice. 53(9):507–513.

Hall JA, Yerramilli M, Obare E, Yerramilli M, Melendez LD, Jewell DE. 2015. Relationship between lean body mass and serum renal biomarkers in healthy dogs. Journal of Veterinary Internal Medicine. 29 (3):808-814.

Jain S, Patel PR, Raval SK. 2013. Changes in haematological parameters in adult and geriatric dogs. Veterinary Practitioner. 14(2):230-231.

Moruzi RF, Morar D, Văduva C, Boboc MG, Dumitrescu E, Muselin F, Puvača N, Cristina RT. 2023. Leukogram patterns significance and prevalence for an accurate diagnosis in dogs. Journal of the Hellenic Veterinary Medical Society. 74(1):5193-5202.

Nelson R, Couto G. 2014. Small Animal Internal Medicine, 5th ed, Missouri, Elsevier.

Pati S, Panda SK, Acharya AP, Senapati S, Bahera M, Bahera SS. 2015. Evaluation of geriatric changes in dogs. Veterinary World. 8(3):273-278.

Rizzi T. 2015. Blood testing in the geriatric dogs. Veterinary Focus. 25 (1):31-37.

Rout ED, Moore AR, Burnett RC, Labadie JD, Hughes KL, Navin PA, Yoshimoto JA, Avery PR, Avery AC. 2020. Polyclonal B-cell lymphocytosis in English bulldogs. Journal of Veterinary Internal Medicine. 34(6):2622-2635.

Smitha JP, Dimri U, Kavitha K, Joshi V, Vinod VK, Anjali, Mondal DB, Singh G. 2024. Changes in haematological and biochemical parameters with ageing in dobermann pinscher dogs - a pilot study. Biological Forum – An International Journal. 16(5):150-153.

Terzungwe TM. 2018. Hematological parameters of dogs infected with canine parvovirus enteritis in Sumy Ukraine. World Journal of Innovative Research. 5(3):1-5.