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Haemato-biochemical alterations in gastroenteritis affected dogs

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Abstract

The present study was conducted in the Department of Veterinary Medicine, Teaching Veterinary Clinical Complex and Instructional Dairy Farm, C.V.A. Sc., GBPUA & T, Pantnagar, U.S. Nagar (Uttarakhand, India). A total of 12 dogs were included in the study out of which 6 were suffering from gastro-enteritis whereas 6 healthy dogs were chosen to serve as healthy control. Hemogram of the dogs suffering from gastro-enteritis revealed significant ($P \leq 0.05$) reduction in Hb, PCV, TEC, TLC, neutrophils and MCHC when compared to healthy dogs. While MCV and lymphocyte count increased significantly ($P \leq 0.05$). Alterations in biochemical parameters included significant ($P \leq 0.05$) increase in serum ALP and AST concentrations and reduced serum albumin.

Keywords: Gastroenteritis, dog, blood, biochemical

Introduction

The rapidly increasing human population inhabits in most of areas on earth, with severe implications to the natural environment. A number of domesticated species have been introduced to all new habitats by the human beings, after they established in that place. Dog (*Canis familiaris*) has accompanied man all over the world since its domestication 15,000 years ago ^[1,2] and today it is the most abundant canid on earth with a great impact on the environment. The great abundance of free-ranging dogs is a rising concern to conservationists in many countries where dog predation takes toll on wildlife, hybridization with wild canids endangers rare species by disrupting their gene pool and dogs serve as reservoirs in the transmission of numerous diseases, creating a health hazard effecting both wildlife and human populations. Dogs serve people in many important ways; guarding property and domestic livestock, assisting the blind and other disabled people, performing search and rescue missions, acting as sled animals, detecting explosives and drugs etc. Clearly dogs are useful and important domestic animals and pets. Hence, it must be well protected from various infectious diseases. The diseases can be detected by examination of skin, blood analysis, urinary test, X-rays, etc. Out of the above mentioned tests blood is one of the important body fluids for assessment of the health status of animals. The evaluation of blood parameters is conducted in diagnosis of many diseases ^[2]. Hematological analysis is routinely done to determine the general level of health in animals, distinguishing them from diseased ones ^[3]. Blood tests are also used to determine the disease state, drug effectiveness and organ function in a variety of animals. Age, sex, breed and some environmental factors also affect the hematological parameters of clinically healthy dogs. Alterations in these parameters have been observed between tropical and temperate animals ^[2]. These variations have been thought due to the effect of climate, nutrition and sub clinical state of animals ^[4]. The present study determines the alterations in some hematological parameters in a naturally occurring gastroenteritis in dogs.

Materials and Methods

The present study was carried out at Teaching Veterinary Clinical Complex (TVCC) and Department of Veterinary Medicine, College of Veterinary and Animal Sciences, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, US Nagar, Uttarakhand, India. The dogs were selected on the basis of having principal complain of diarrhea and vomition for gastro-enteritis and having complained of polyuria, anuria, dysuria, anemia, halitosis. The dogs brought to TVCC for routine checkup and having up to date vaccination and deworming status and normal clinico-physiological parameters were taken as healthy

control. The animals were divided into two groups' viz. Group A (healthy dogs) and Group B (gastro-enteritis affected dogs) comprising six dogs in each group.

Under clinical examination, the conjunctiva, oral mucosa, heart rate, pulse, respiration and temperature were recorded. A detailed auscultation of all the four quarters was done. The size and shape of chest and abdominal cavity were also determined. Eight ml of blood samples from each dog were collected from cephalic vein/saphenous vein. Two ml of blood was transferred to a EDTA vial for hematology estimation and 6 ml blood was transferred to clot activator vial and serum was separated and kept in -20 degree centigrade for future study. Hematological studies were conducted to study the effect of indigestion on blood cellular profiles and it was compared with profile of apparently healthy normal buffaloes. Hematological parameters viz. hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), differential leukocyte count (DLC) and red cell indices viz. MCV, MCH and MCHC were studied as per standard laboratory procedures described by Young [15]

Biochemical parameters viz. Alanine amino transferase (ALT), aspartate amino transferase (AST), alkaline phosphatase (ALP), total bilirubin (TB), indirect bilirubin (IB), total serum proteins (TP), serum albumin, blood urea nitrogen (BUN), creatinine, serum calcium, serum phosphorus, serum potassium, serum sodium and serum chloride were determined using the non-haemolysed serum obtained from the blood samples using diagnostic kits from Erba diagnostics Mannheim, Germany.

The data was presented as Mean \pm standard error (SE). Paired t-test was used for comparing means using Students t-test. Graph pad Prism software was used for the analysis. The level of significance was set at $P < 0.05$.

Results and Discussion

Haemogram (Table 1) of the dogs suffering from gastro-enteritis revealed significant ($P \leq 0.05$) reduction in hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), neutrophils and MCHC when compared to healthy dogs. MCV and lymphocyte count increased significantly ($P \leq 0.05$) in dogs suffering from gastro-enteritis. Decreased levels of hemoglobin, total erythrocyte count and packed cell volume were also noticed by Lee *et al.* [8] and Ali *et al.* [1]. Observed decrease HB, PCV, TEC and MCHC in Group B might be due to anemia in hemorrhagic gastroenteritis [10], dehydration [11], mechanical obstruction and massive sloughing of intestinal epithelial cells [9] and damage of capillaries of villi in the intestine leading to hemorrhages [14]. Eosinopenia is frequently seen in acute infection and although it has never been verified, this finding has been attributed to endogenous release of cortisol [15]. Leucopenia in gastroenteritis can be attributed not only to the destruction of hematopoietic progenitor cells of various leukocyte types primarily in the bone marrow, but also in other lymphoproliferative organs such as the thymus, lymph nodes, and spleen. This is resulted in inadequate compensation for the massive demand for leukocytes (specifically neutrophils) in the inflamed gastrointestinal tract [6]. Neutropenia was observed in most of the infected dogs. The demand for WBC, particularly neutrophils, is high in the inflamed gastrointestinal tract, but due to hematopoietic cell destruction of leukocytes in lymphoproliferative organs like the bone marrow, there is an

inadequate supply of leukocytes leading to several other hematological changes [6].

Table 1: Haematological parameters of healthy, gastroenteritis disease in dogs [Mean \pm SE]

Parameters	group A (n=6)	Group B (n=6)
Hb (g/dl)	14.38 \pm 1.25	10.74 \pm 1.62*
PCV (%)	43.53 \pm 2.30	33.11 \pm 7.04*
TEC ($\times 10^6/\mu\text{l}$)	6.86 \pm 0.43	4.11 \pm 0.41*
MCV (fL)	63.71 \pm 5.83	77.69 \pm 7.87*
MCH (pg)	21.07 \pm 3.01	21.32 \pm 2.39
MCHC (g/dl)	33.62 \pm 2.82	27.73 \pm 2.21*
TLC ($\times 10^3/\mu\text{l}$)	17.41 \pm 0.96	9.76 \pm 2.33*
Neutrophils (%)	81.38 \pm 1.69	71.98 \pm 2.26*
Lymphocytes (%)	16.55 \pm 1.64	26.64 \pm 2.47*
Eosinophil (%)	1.01 \pm 0.36	1.15 \pm 0.42
Monocyte (%)	0.62 \pm 0.27	0.41 \pm 0.21

*= Significant ($P \leq 0.05$) difference as compared to control group within same row.

Biochemical analysis in present study (Table 2) revealed that there was significant ($P < 0.05$) increase of AST and ALP in Group B as compared to Group A. The Albumin level in case of Group B was significantly ($P < 0.05$) decreased as compared to Group A (Table 2). Other biochemical parameters did not show any significant ($P < 0.05$) alteration as compared to healthy dogs. These observations were in corroboration with the findings of Dharmadheeran *et al.* [5] and Shah *et al.* [13]. Decrease in Albumin and increase AST in gastroenteritis infected dogs might be due to involvement of liver and severe protein losing enteropathy due to intestinal villi damage or intestinal haemorrhage [7]. Increase in ALP might be due to hepatic hypoxia secondary to severe hypovolemia or the absorption of toxic substances due to loss of the gut barrier [13].

Table 2: Serum biochemical profile of Healthy, gastroenteritis disease affected dogs [Mean \pm SE]

Parameters	Group A (n=6)	Group B (n=6)
AST (IU/L)	58.28 \pm 3.97	83.33 \pm 5.31*
ALT (IU/L)	30.33 \pm 4.07	25.54 \pm 4.21
ALP (IU/L)	91.35 \pm 6.15	119.14 \pm 8.17*
TB (mg/dl)	0.27 \pm 0.17	0.23 \pm 0.16
IB (mg/dl)	0.12 \pm 0.08	0.18 \pm 0.12
TP (g/L)	6.67 \pm 0.19	5.83 \pm 0.68
Albumin (g/L)	3.55 \pm 0.47	2.05 \pm 0.48*
AG Ratio	1.13 \pm 0.24	0.66 \pm 0.22
BUN (mg/dl)	15.26 \pm 5.21	17.37 \pm 5.02
Creatinine (mg/dl)	0.83 \pm 0.36	1.06 \pm 0.47
Ca (mg/dl)	8.92 \pm 0.89	8.68 \pm 1.45
P (mg/dl)	4.87 \pm 0.33	5.13 \pm 2.37
Na (mEq/L)	142.66 \pm 9.33	140.92 \pm 7.40
K (mEq/L)	4.53 \pm 0.67	3.83 \pm 1.20
Cl (mEq/L)	115.54 \pm 6.52	109.89 \pm 8.65

*= Significant ($P \leq 0.05$) difference as compared to control group within same row.

Conclusion

In the dogs suffering from gastro-enteritis it was revealed there is reduction in hemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), neutrophils and MCHC whereas MCV and lymphocyte count increased significantly when compared to normal healthy dogs. All these alterations might be due to anemia, dehydration, sloughing of intestinal epithelial cells and damage to the intestinal villi. The results of the

biochemical analysis are suggestive of possible chances of liver involvement and intestinal haemorrhage in cases of gastro-enteritis in canines.

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