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ORIGINAL RESEARCH

Haematological and biochemical analysis in canine enteritis

Abid Ali Bhat, Des Raj Wadhwa, Summer Preet Singh and Inderpal Singh

Department of Veterinary Medicine,
Dr. G.C. Negi College of Veterinary and Animal Sciences,
CSK HPKV – Palampur -176062, Himachal Pradesh, India.
Corresponding author: Abid Ali Bhat, email: abidalibhat786@gmail.com
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Abstract

Aim: The present investigation screened eighteen clinical cases of canine enteritis for haematological and biochemical analyses.

Materials and Methods: Eighteen dogs suffering from enteritis were selected and detailed clinical manifestations were noted. Hematological and biochemical parameters were estimated by using various kits. Blood was also collected from twelve healthy dogs for establishing control values and data obtained were subjected to statistical analysis.

Results: The affected dogs showed anorexia, diarrhoea, depression, varying degree of dehydration and tachycardia. There were significant changes in packed cell volume, neutrophils, lymphocytes and mean corpuscular haemoglobin concentration. Biochemical investigation revealed significant decrease in plasma glucose, total plasma protein, albumin and albumin:globulin ratio (A:G ratio). The level of potassium and chloride was markedly decreased. Significant increase in alanine aminotransferase (ALT) and blood urea nitrogen (BUN) was observed.

Conclusion: Packed Cell Volume (PCV) and Total Erythrocyte Count (TEC) remained almost similar between healthy dogs and dogs affected with diarrhoea. Mean Total Leukocyte Count (TLC) value was significantly higher as compared to the control group. Hypoglycemia, hypoproteinemia, hypokalemia, hypochloremia and increase in blood urea nitrogen was observed in dogs suffering from enteritis.

Key words: canine, enteritis, haematological-biochemical analyses.

Introduction

Among gastrointestinal disturbances, enteritis is the common disease which is encountered in all breeds and age group of canine population. Various factors like bacterial and viral infections, parasitic infestations, irritant drugs, dietary errors, ingestion of toxic materials etc. have been reported to be associated with canine enteritis [1]. It is characterized by anorexia, diarrhoea which may be haemorrrhagic and dehydration. Weight loss or stunting is seen in dogs that are more severely affected [2]. Irrespective of etiology, enteritis leads to electrolyte imbalance and dehydration.

Thus, the present study was undertaken to ascertain haematological and biochemical alterations in clinical cases of canine enteritis.

Materials and Methods

A total of 18 dogs of different breeds presented in the college veterinary clinics and suffering from enteritis were taken for the study. Detailed clinical manifestations and clinical parameters were recorded. About 1 ml blood was taken in sterile syringes containing disodium salt of ethylenediamine-tetra acetic acid (EDTA, 1mg/ml) and about 3-4 ml in sterile heparinized syringes aseptically from cephalic or recurrent tarsal vein, before any treatment was instituted. Samples with EDTA were used for haematological studies. Immediately after collection, plasma was separated from heparinized blood by centrifuging at 3000 rpm for 10 minutes. Haemoglobin (Hb), packed cell volume (PCV), total erythrocytic count (TEC) and total and differential leucocytic counts were determined using standard methods [3].

Biochemical and electrolytes estimations were carried out by using commercially available kits. Alanine aminotransferase (ALT), aspartate aminotransferase (AST), blood glucose, total protein, plasma albumin, blood urea nitrogen (BUN) and creatinine kits were procured from Agappe Diagnostics Ltd., Kerala, India. Sodium, potassium and chloride kits were procured from Reckon Diagnostics Pvt. Ltd, India. Globulin was estimated as per method given by manufacturer. Blood biochemical parameters were estimated on Microlab 300 Clinical Chemistry Analyser (Merck Limited, India).

Blood was also collected from twelve healthy dogs for establishing control values to compare the data. The animal care and the protocol for use of healthy dog as control were approved by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

Table-1. Clinical observations in dogs suffering from enteritis (Mean ± S.E.).

S.No.	Parameters	Control Group (n=12)	Enteritis Group (n=18)	Normal Values
1.	R.T. (^{0}F)	101.40 0.15	102.58 0.37*	99.5-101.5
2.	H.R. (per min.)	83.00 2.50	131.33 5.96**	70-90
3.	R.R. (per min.)	34.75 2.28	66.16 6.51**	15-35

* Significant at 5% level ($P<0.05$). * * Significant at 1% level ($P<0.01$).

Table-2. Clinical signs in dogs suffering from enteritis.

S. No.	Clinical Signs	Frequency
1.	Diarrhoea	
a)	Haemorrhagic	9 (50.00)
b)	Non-haemorrhagic	9 (50.00)
2.	Dehydration	
	Nil	4 (22.22)
	Mild (+)	9 (50.00)
	Moderate (++)	5 (27.77)
3.	Anorexia	12 (66.66)
4.	General depression	14 (77.77)

Table-3. Haemato-biochemical profile in canine enteritis (Mean ± S.E.).

Parameters	Control Group (n=12)	Enteritis Group (n=18)	Normal Values
Hb (g/dl)	13.29 ± 0.33	12.97 ± 0.78	12.0-18.0
PCV (%)	37.90 ± 1.01	38.37 ± 2.34	37-55
TEC (X 10^6/l)	5.90 ± 0.18	5.98 ± 0.29	5.5-8.5
TLC (X 10^3/l)	9.51 ± 0.70	12.14 ± 0.83*	6.0-16.0
DLC (%)			
Neutrophils	65.00 ± 1.71	70.16 ± 2.11	60-70
Lymphocytes	25.66 ± 1.54	20.83 ± 1.71	15-30
Monocytes	5.58 ± 0.31	4.83 ± 0.48	3-8
Eosinophils	3.25 ± 0.17	3.50 ± 0.32	2-10
Basophils	0.16 ± 0.11	0.11 ± 0.07	Rare
Glucose (mg/dl)	104.62 ± 2.19	87.34 ± 3.60**	60-125
Total plasma protein (g/dl)	7.01 ± 0.18	5.94 ± 0.31*	5.0-7.2
Albumin (g/dl)	3.62 ± 0.13	1.96 ± 0.16**	3.1-4.5
Globulin (g/dl)	3.36 ± 0.11	4.15 ± 0.30	2.8-4.5
A:G ratio	1.08 ± 0.04	0.56 ± 0.06**	-
Blood urea nitrogen (mg/dl)	10.92 ± 0.93	26.28 4.72*	7-25
Creatinine (mg/dl)	0.72 ± 0.06	0.96 ± 0.09	0.4-1.8
AST (IU/L)	26.42 ± 2.71	29.88 ± 2.21	5-55
ALT (IU/L)	23.50 ± 3.61	30.84 ± 2.72	5-60
Sodium (mmol/l)	146.47 ± 3.06	144.40 ± 3.61	142-150
Potassium (mmol/l)	3.69 ± 0.24	2.23 ± 0.15**	3.7-5.4
Chloride (mmol/l)	99.08 ± 1.81	80.33 ± 2.69**	105-115

* Significant at 5% level ($P<0.05$). * * Significant at 1% level ($P<0.01$).

Statistical analysis: The data obtained were subjected to statistical analysis by using GraphPad Software, (http://www.graphpad.com/quickcalcs/ttest2.cfm).

Results and Discussion

The common signs shown by dogs suffering from enteritis were diarrhoea, anorexia, depression, dehydration, tachycardia and tachypnoea (Table 1 & 2). Diarrhoea was haemorrhagic in 50 per cent of the affected dogs. Mean rectal temperature, heart rate and respiration rate was significantly ($P<0.01$ or $P<0.05$) increased in the affected dogs as compared to control group (Table-1). Inflammatory processes in the gastrointestinal system can result in fever, anorexia and weight loss [4]. These signs result from the release of certain mediators of inflammation. Interleukin-1, which is an important mediator of inflammation in many tissues including the gut tissue and is a polypeptide product of variety of cells, causes fever. While cachectin, a polypeptide derived from activated macrophages, along with interleukin is responsible for the fever and anorexia that accompanies inflammatory disease. Cachectin is induced by endotoxin and may be the prime mediator of endotoxic shock [5, 6].

In the affected dogs, tachycardia and tachypnoea were observed which might be due to effect of catecholamine and other compensatory mechanism of heart to maintain oxygen supply to tissues [7,8]. Higher respiration rates could be due to hypoxia, which causes increase in depth and rate of breathing. Severe metabolic acidosis in canines is often manifested in hyperventilation [8, 9].

In the present investigation, PCV and TEC remained almost similar between healthy dogs and dogs affected with diarrhoea. Several workers have reported significantly higher PCV in dogs with diarrhoea and the same was attributed to dehydration [10-12]. One possible explanation for unaltered PCV in dogs with gastrointestinal haemorrhage may be due to antagonistic mechanism of lowered PCV associated with intestinal bleeding, and elevated PCV in dehydration due to fluid loss [13-15]. Mean TLC value

was significantly ($P<0.05$) increased as compared to control group (Table 3). In the present study, there was non significant increase in neutrophils while lymphocytes were decreased non-significantly as compared to control group. This might be due to general reaction of immune system to bacterial infection and inflammatory processes in GIT [16]. Infact, interleukin-1 stimulates neutrophilia and also results in adherence of leukocytes [5].

Blood biochemical analysis showed significant ($P<0.01$ or $P<0.05$) decrease in values of plasma glucose, total protein, albumin and A:G ratio (Table 3). Hypoglycemia in the affected dogs may be due to inappetance/anorexia [17] complemented by mal-absorption from intestine [18]. In the present study, significant decrease in plasma albumin and non significant increase in globulin was observed in enteritis which might be due to marked decline in diet intake, malabsorption and ongoing protein losing enteropathy [19-21]. Inflammation also results in increased bowl permeability leading to fluid, electrolyte, protein and cell loss [5, 13]. Level of blood urea nitrogen was significantly ($P<0.05$) increased in enteritis group which corroborate to the observation of Jani et al. [10] in diarrhoeic dogs. Increased blood urea nitrogen reflects pre renal uremia probably due to reduced glomerulofiltration rate (GFR) and due to catabolic breakdown of tissues as a result of fever [17]. Alanine aminotransferase (ALT) and aspartate amino-transferase (AST) were found elevated non significantly as compared to control group. This increase may be due to reactive hepatopathy [16]. Potassium and chloride were decreased significantly ($P<0.01$) while sodium concentration was non significantly lower than control values (Table-3). Hypokalaemia might be due to loss of potassium in the diarrhoeic fluid along with sodium and bicarbonate [1]. Moreover, the colon conserves sodium but not potassium and is lost in excess leading to hypokalaemia [22]. Hypochloraemia might be due to loss of chloride ion in the secretion of intestinal fluid during diarrhoea. No appreciable changes were observed in the levels of chloride by Dhanapalan et al. [23] in cases of diarrhoeic dogs.

Conclusion

Packed cell volume and total erythrocyte count remained almost similar between healthy dogs and dogs affected with diarrhoea. Mean total leukocyte count value was significantly higher as compared to the control group. Hypoglycemia, hypoproteinemia, hypokalemia, hypochloremia and increase in blood urea nitrogen was observed in dogs suffering from enteritis.

Authors' contribution

DRW designed the study. AAB collected the samples. AAB, SPS and IS analysed the data. AAB and DRW drafted and revised the manuscript. All authors read and approved final manuscript.

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Competing interests

Authors declare that they have no competing interests.

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4. Biochemical and Haematological Study and Analysis. Whole biochemical serum analyses were all performed using the same device (Architect C16000, Abbott Diagnostics, Abbott Park, IL, USA). Levels of glucose (mg/dL), blood urine nitrogen (BUN) (mg/dL), creatinine (mg/dL), alanine aminotransferase (ALT) (U/L), aspartate aminotransferase (AST) (U/L), albumin (mg/dL), total protein (mg/dL), CRP (mg/L), uric acid (mg/dL), sodium (Na) (mEq/L), potassium.Â This study showed that significant differences in biochemical, haematological, and urine values are present between AMD and DRP patients and healthy individuals. These differences may be due to the varying pathophysiologies of the DRP and AMD diseases, also indicated by different serum values between the two groups.