

## HAEMATOLOGICAL AND BIOCHEMICAL STUDIES IN DOGS WITH SOME DIGESTIVE PROBLEMS

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### ABSTRACT

Digestive problems in dogs are one of the most important causes of presentation to clinicians. Vomiting and diarrhea can cause severe mucosal damage which may alter the digestion and absorption of different nutrients. This study was to determine the hemato-biochemical condition, some macro-minerals and trace-elements status in dogs with vomiting, diarrhea and concurrent vomiting and diarrhea. Results showed significant increase in respiration, pulse and temperature. Hematological examination revealed significant decrease in RBCs count while significant increase in red cell indices and WBCs count. Differential leukocytic count showed significant increase in neutrophils and eosinophils in cases with diarrhea and concurrent vomiting with diarrhea while there was significant decrease in relative lymphocytes in cases with concurrent vomiting and diarrhea. Biochemical examination showed significant decrease in serum copper and zinc in all diseased groups while there was non-significant change in the serum levels of sodium, potassium and total serum iron.

#### **Key words:**

Hematology, Biochemistry, Vomiting, Diarrhea, Dogs.

### INTRODUCTION

Vomiting and diarrhea considered the most common problems which are encountered in all breeds and age group of canine population (**Bhat et al. 2013**). The main problem for the majority of gastrointestinal diseases was that of clinical signs that included vomiting and diarrhea that have either primary or secondary effect on gastrointestinal tract (**Batt 2009**). For these facts, vomiting and diarrhea are common complaints faced by canine medical practitioners daily (**Tams 2003**) as they considered as a common ways of discharging offending materials and toxins from the digestive system (**Burns 2012**). These major problems affect the water and electrolyte balance through increase both gastric and intestinal

permeability leading to their losses (**Henry et al. 1978**). The aim of this study was to determine the hemato-biochemical condition, some macro-minerals and trace-elements status in dogs with vomiting, diarrhea and concurrent vomiting and diarrhea.

## MATERIAL AND METHODS

A total number of 86 dogs of different breeds and sexes were included in the present study. This number included 20 apparently healthy dogs that admitted to the teaching veterinary hospital, department of medicine, faculty of veterinary medicine, Cairo University for annual vaccination and general health checkup while there were 66 diseased dogs suffered from vomiting (23 cases), diarrhea (22 cases) and concurrent vomiting and diarrhea (21 cases). Detailed full history and clinical signs were recorded and complete clinical examination was applied to all cases according to (**Rijnberk and Stokhof 2009**). From each dog, two blood samples were taken through cephalic vein, first one included 2ml blood with EDTA for estimation of hematological constituents included PCV, hemoglobin concentration, RBCs count, MCV, MCH, MCHC, WBCs count and differential leukocytic count according to (**Feldman et al. 2000**). Second blood sample included 6ml blood without anticoagulant and serum sample was separated and used for estimation of serum sodium (**Guder et al. 1982**), potassium (**Tietz 1976**). Also some trace-elements were evaluated included serum copper (**Abe et al. 1989**), zinc (**Johnsen and Eliasson, 1987**) and total serum iron according to (**Bauer 1984**) using specific test kits supplied by Spectrum diagnostics, MDSS, Germany. Fecal samples were taken and examined grossly and microscopically soon at time of admission for presence of adult worms, eggs or protozoa according to (**Zajak and Conboy, 2012**). All the data were subjected to statistical analysis using SPSS program version 16 according method described by (**Levesque 2007**). All the research procedures were approved by the department of internal medicine and infectious diseases, faculty of veterinary medicine, Cairo University, Egypt.

## RESULTS

Regarding physical examination (Table 1), all diseased groups showed high significant ( $P \leq 0.001$ ) increase in respiration, pulse rates and rectal temperature while pulse rate showed significant increase ( $P \leq 0.01$ ) in cases with diarrhea in comparison to control healthy group. Hematological examination in the present study was showed in (Table1). Toward hemoglobin concentration, results showed mild significant increase ( $P \leq 0.05$ ) in comparison to control

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group. RBCs count showed high significant ( $P \leq 0.001$ ) decrease in cases with diarrhea while there was moderate significant ( $P \leq 0.01$ ) and mild significant ( $P \leq 0.05$ ) decrease in cases suffered from concurrent vomiting and diarrhea and vomiting respectively. MCV showed moderate significant ( $P \leq 0.01$ ) increase in cases with vomiting and diarrhea while mild significance ( $P \leq 0.05$ ) was recorded for cases with concurrent vomiting and diarrhea. Regarding MCH, results showed high significant ( $P \leq 0.001$ ) increase in cases with vomiting and diarrhea while there was moderate significance for cases with concurrent vomiting and diarrhea.

**Table (1):** Clinico-hematobiochemical alterations in dogs suffered from some digestive problems compared with apparently healthy dogs.

	Parameter	Dogs suffered from vomiting	Dogs suffered from diarrhea	Dogs suffered from concurrent vomiting and diarrhea	Apparently healthy Dogs	
Clinical examination	Respiration (time/min)	59.3±2.12 <sup>a</sup>	42±0.96 <sup>a</sup>	52±1.64 <sup>a</sup>	36.6±0.67	
	Pulse (Pulse/min)	148±2.17 <sup>a</sup>	135±0.19 <sup>b</sup>	136±1.61 <sup>a</sup>	125±1.5	
	Rectal temperature (°C)	39.4±0.13 <sup>a</sup>	39.5±0.15 <sup>a</sup>	39.3±0.11 <sup>a</sup>	38.6±0.09	
Hematological parameters	PCV (%)	45.6±2.39	42.3±3.65	41±3.03	44±1.57	
	Hemoglobin (g/dl)	15.6±0.79 <sup>c</sup>	13.4±0.99	13.5±0.80	13.3±0.20	
	RBCs (×10 <sup>6</sup> /μl)	5.69±0.37 <sup>c</sup>	4.88±1.09 <sup>a</sup>	5.33±0.34 <sup>b</sup>	6.67±0.22	
	MCV (fl)	83.2±4.32 <sup>b</sup>	86.3±5.83 <sup>b</sup>	80.9±6.52 <sup>c</sup>	66.5±2.31	
	MCH (Pg)	28.5±1.53 <sup>a</sup>	27.3±1.53 <sup>a</sup>	26±1.70 <sup>b</sup>	20.3±0.62	
	MCHC (%)	34.8±1.17 <sup>c</sup>	33.1±1.87	34.1±1.74	30.8±0.68	
	Platelets	204±21.5	180±19.2	203±20.59	200.5±13.5	
	WBCs (×10 <sup>3</sup> /μl)	15.35±3.5 <sup>c</sup>	12.92±1.67 <sup>b</sup>	12.08±2.1 <sup>c</sup>	7.5±0.29	
	Neutrophils	Absolute	10740±2904	8971±120 <sup>b</sup>	9090±169 <sup>c</sup>	5026±110
		Relative	70.4±3.59	70.1±3.71	75.1±2.55 <sup>c</sup>	67.6±2.01
	Lymphocytes	Absolute	2999±524	3416±658	2420±544	2155±204
		Relative	22.3±2.08	25.4±3.62	20.6±2.59 <sup>c</sup>	27.9±2.1
	Monocytes	Absolute	441±77	260±39 <sup>b</sup>	246±51	136±14
		Relative	6.52±4.12	1.39±0.14	1.8±0.16	1.7±0.17
	Eosinophils	Absolute	382±140	279±45 <sup>b</sup>	338±86 <sup>c</sup>	149±2.2
Relative		2.29±0.27	2.3±0.25	2.1±0.22	1.9±0.14	
Basophils	Absolute	0.47±0.15 <sup>c</sup>	0.18±0.10	0.23±0.13	0.05±0.05	
	Relative	0.0±0.00	0.0±0.00	0.0±0.00	0.0±0.00	
Biochemical parameters	Sodium (mmol/l)	143±5.75	132.7±5.71	131.5±7.3	138.2±2.75	
	Potassium (mmol/l)	4.51±0.15	4.54±0.25	4.65±0.16	4.84±0.21	
	Copper (mmol/l)	11.3±0.39 <sup>c</sup>	10.8±1.23 <sup>c</sup>	11.1±0.72 <sup>b</sup>	14.8±1.16	
	Zinc (mmol/l)	17.3±1.32 <sup>c</sup>	12.1±1.38 <sup>a</sup>	15.5±1.44 <sup>b</sup>	22±1.82	
	Total iron (mmol/l)	18.3±1.42	15.9±2.87	17.7±1.33	17.9±2.38	

a: P≤0.001 b: P≤0.01 c: P≤0.05

Weak significance ( $P \leq 0.05$ ) was noticed for MCHC in cases with vomiting compared with control group. In terms of WBCs count, mild significant increase ( $P \leq 0.01$ ) was recorded for the cases with vomiting and concurrent vomiting and diarrhea while there was moderate significance ( $P \leq 0.01$ ) increase in cases with diarrhea. Regarding differential leukocytic count, results showed that there was mild significant ( $P \leq 0.05$ ) increase in the level of absolute and relative neutrophils, absolute eosinophils in cases with concurrent vomiting and diarrhea. The same level of significance ( $P \leq 0.05$ ) showed increase in the level of absolute basophils in cases with vomiting. Significant ( $P \leq 0.05$ ) decrease in the level of relative lymphocytes was recorded for cases with concurrent vomiting and diarrhea. Other parameters showed non-significant changes toward control healthy group. Concern the biochemical examination, results were showed in table one. Regarding serum copper level, results showed mild significant ( $P \leq 0.05$ ) decrease in cases with vomiting and diarrhea while there was moderate significant ( $P \leq 0.01$ ) decrease in cases with concurrent vomiting and diarrhea. Serum zinc level showed mild significant ( $P \leq 0.05$ ) decrease in cases with vomiting in comparison to healthy group while there was moderate significant ( $P \leq 0.01$ ) and high significant ( $P \leq 0.001$ ) decrease in cases with concurrent vomiting and diarrhea and the cases with diarrhea respectively. Regarding serum sodium, potassium and total iron levels, there was non-significant change in their levels when compared to control healthy group.

## DISCUSSION

The aim of the present study was to determine the hemato-biochemical condition, some macro-minerals and trace-elements status in dogs with various digestive problems included vomiting, diarrhea and concurrent vomiting and diarrhea. Regarding physical examination, results showed significant increase of respiration, pulse rates and rectal temperature in all diseased groups (Table 1). These findings were in accordance with (**Bhat *et al.* 2013**). Toward hematological examination, results in (Table 1) showed non-significant decrease of PCV in all diseased groups. Also, there was non-significant change in hemoglobin concentration in all diseased groups. Also, there was significant ( $P \leq 0.05$ ), ( $P \leq 0.001$ ) and ( $P \leq 0.01$ ) decrease in RBCs count in cases with vomiting, diarrhea and concurrent vomiting with diarrhea. These findings come in agreement with (**Zafar *et al.* 1999**) and (**Salem 2014**). Cases with vomiting showed mild significant increase ( $P \leq 0.05$ ) in hemoglobin concentration that disagreed with (**Salem 2014**) who recorded non-significant decrease for such cases. This may be attributed to

severe dehydration and hemconcentration. Regarding red cell indices, all diseased cases showed significant increase (Table 1). These findings were in consistence with **(Jain 1986)** as the type of anemia was macrocytic normochromic due to increased values of MCV, MCH and MCHC. Also, author reported that true hyperchromic state didn't exist so increase MCH and MCHC was designated as hypochromic or normochromic. Results showed significant increase in the levels of WBCs count in all diseased groups ( $P \leq 0.05$ ) for vomiting and concurrent vomiting with diarrhea and ( $P \leq 0.01$ ) for cases with diarrhea. This result agreed with **(Lideo et al. 2010)** and **(Bhat et al. 2013)** who recorded significant increase in cases with vomiting and diarrhea respectively. Regarding differential leukocytic count, results showed significant increase in levels of absolute and relative neutrophils in cases with diarrhea and concurrent vomiting and diarrhea (Table 1) while there was significant ( $P \leq 0.05$ ) decrease in the level of relative lymphocytes in cases with concurrent vomiting and diarrhea. These results come in accordance with **(Berghoff and Steiner, 2011)** as there was general reaction of immune system to bacterial infection and inflammatory process in gastrointestinal tract. Significant increase was recorded in the level of absolute eosinophils ( $P \leq 0.01$ ) in cases with diarrhea and ( $P \leq 0.05$ ) in cases with concurrent vomiting and diarrhea. This record agreed with **(Kwon et al. 2006)** as this elevation was due to parasitic infection with *Toxocara canis* in some cases with diarrhea and concurrent vomiting and diarrhea. Absolute level of basophils showed significant increase ( $P \leq 0.05$ ) in cases of vomiting (Table 1). This can be explained by the inflammatory process of gastric mucosa which leads to increase the level of basophils that release histamine. Concern biochemical examination in the present study, results showed that serum sodium and potassium had non-significant decrease with cases with diarrhea and concurrent vomiting and diarrhea which come in accordance with **(Bhat et al. 2013)** and **(Salem et al. 2015)** who recorded significant decrease in cases with diarrhea. Regarding serum copper level, results showed mild significant decrease ( $P \leq 0.05$ ) in cases with vomiting and diarrhea while there was moderate significant decrease ( $P \leq 0.01$ ) in cases with concurrent vomiting and diarrhea. Same findings were recorded by **(Panda et al. 2009)** and **(Salem et al. 2015)** who recorded significant decrease in dogs with severe enteritis. Serum zinc level had significant decrease ( $P \leq 0.05$ ), ( $P \leq 0.01$ ) and ( $P \leq 0.001$ ) in cases with vomiting, concurrent vomiting and diarrhea and diarrhea respectively. Same results were recorded by **(Sarma et al. 2012)** as there was excessive consumption of zinc to counterbalance reactive oxygen species over production. Also, damage of epithelium of

intestine shared in decrease absorption of zinc. In terms of total serum iron, results showed non-significant decrease in cases with diarrhea and concurrent vomiting and diarrhea. Similar results were recorded by (O' Dell and Sunde, 1997) and (Panda *et al.* 2009) as decreased level of copper shared in the impaired uptake of iron led to its loss.

### CONCLUSION

From the present study, it can be concluded that digestive problems in dogs included vomiting, diarrhea and concurrent vomiting with diarrhea had marked effect on clinico-hematobiochemical status. Significant anemia was recorded in all diseased groups. Also, significant rise in the level of WBCs due to inflammation of the GIT was recorded and reflected on differential leukocytic count. Significant decrease of serum copper and zinc was the major finding in trace-elements status evaluation.

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