



## Research article

### Evaluation of liver functions in anemic and healthy dogs

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#### Abstract

Most the Liver affections detected at a late stage for anemic K9 (police dogs) and they are very important to estimate liver functions to disclose diseases.

To study liver function in dogs chose forty five K9 dogs from Basrah and Maysan province- south of Iraq, the first group of thirty five dogs affected with anemia and second group of ten dogs appeared clinically normal served as control. The clinical findings and blood parameters directed for anemia detection then serum levels of liver functions were estimated.

The anemic dogs displayed pale mucous membranes, depression, dehydration, loss of appetite, lethargy, and weakness, moreover, tachycardia was evinced. The hematological parameters in anemic dogs revealed decreased in total RBCc, Hb and PCV, as well as reduction of MCV and MCHC in concerning microcytic hypochromic anemia ( $P<0.05$ ).

The differences of activity of liver functions between anemic and normal dogs were reported, in the anemic group was increased activity of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphates (ALP), and bilirubin levels with significant importance than normal group ( $P<0.05$ ). Other indicators included lowering levels of total protein and albumin in anemic dogs which were also significant ( $P<0.05$ ).

Anemic dogs showed changes in liver functions which are characterized by increased levels of ALT, AST, ALP, and bilirubin as well as decreased protein and albumin than normal, and associated signs of pale mucous membranes, depression, anorexia, and lethargy.

**Keywords:** Dogs, Hematology, Liver Function Parameters.

#### Introduction

The liver is one of the most important organs in the body of the dog and other animals (1). The liver performs an incredible number of functions to maintain health, including different enzymes, and chemicals are manufactured to evaluate its functional activities (2). The liver is responsible for the maintenance of normal blood glucose levels by providing the source as glycogen, the formation of some plasma proteins (fibrinogen, albumin, and globulin), formation and excretion of bile salts also the excretion of bile pigments, the formation of prothrombin and detoxification mechanism (3). The liver

plays a central role in a large number of processes, for example, in the metabolism of carbohydrates, lipids, and proteins, and the storage of vitamins, trace elements, and glycogen (4). Furthermore, the liver plays a significant role in immune regulation (5). Otherwise increases in the activities of the hepatocellular leakage enzymes, alanine aminotransferase (ALT) and aspartate aminotransferase (AST) occur with circulatory disturbances, hepatotoxicities, infectious diseases hepatitis, and neoplasia (6). More over chronic hepatic or gallbladder disease associated with,



increases in alkaline phosphates (ALP) production (7, 8).

**Aim of the study:** Study the liver function tests in anemic K9 dogs compare with clinically healthy dogs for different causes.

#### Materials and methods

**Experimental animals;** The present study includes 45 dogs (K9 from Basrah and Meysan). All dogs were checked clinically and accordingly, they were divided into 35 dogs clinically with anemia while 10 dogs that appear clinically healthy served as control.

**Blood samples;** Blood collected aseptically from the saphenous vein by 5 ml disposable syringe. Two milliliters of whole blood mixed with EDTA for hematological parameters and the remained blood used for serum collection by centrifugation 5 RPM (round per minutes) for 20 minutes, then kept in the fridge (9).

**Hematological tests:** included total erythrocytes count (**tRBCc**), hemoglobin concentration (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), and total leucocytes count as in (10).

**Biochemical tests; included** aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphates (ALP) U/L, total bilirubin, total protein, albumin (gm/dL), in serum by spectrophotometrically using available kits from Spectrum Company-Egypt.

**Statistical analysis:** SPSS Statistics version 15.0

#### Results:

The clinical examination of 45 K9 appeared ten dogs in normal condition, while the other 35 dogs showed signs of; pale mucous membrane, depression, dehydration, loss of appetite, lethargy, tachycardia and weakness as in table (1).

**Table (1): Clinical signs of anemic dogs**

Clinical signs	Sequence N=35	%
Pale mucous membrane	25	71.4
Depression	13	37.1
Dehydration	12	34.2
Loss of appetite	9	25.7
Lethargy	6	17.1
Tachycardia	5	14.2
Weakness	5	14.2

The vital signs of anemic dogs appeared high levels of respiratory rate ( $P < 0.05$ ), while the temperature and pulls rate increment appeared non-significant important ( $P > 0.05$ ), (table -2).

**Table (2): Vital signs of anemic and normal dogs**

Group	Temperature (C°)	Respiratory rate / Min.	Pulls rate/ Min.
Anemic (n=35)	39.03±0.6	35.9±2.64*	90.7±5.27
Normal (n=10)	38.5±0.44	20.0±3.8	87.9±6.93

\* = ( $P < 0.05$ ), no= mean (M) ± standard deviation (SD)

The blood parameters are showed in the table (3). The **total erythrocytes count**, hemoglobin, and packed cell volume in the anemic group were lower than normal dogs ( $P < 0.05$ ). As well as the mean corpuscle volume and mean corpuscle hemoglobin concentration in the anemic group were less than normal dogs ( $P < 0.05$ ).

**Table (3) blood parameters in anemic and normal dogs**

Group	tRBCc (x10 <sup>6</sup> /dL)	tWBCC (x10 <sup>3</sup> /dL)	Hb (g)	PCV (%)	MCV (fL)	MCHC (g/dL)
Anemic (n=35)	4.58±0.41*	13. 86±5.45	10.2±3. 41*	35.7±9.8 2*	61.7 ±16.78*	29.25 ±3.5*
Normal (n=10)	6.49±1.11	12.66±4. 26	15.51±1 .23	47.82±5. 95	74.67 ±4.45	32.44± 2.23

\*=(P &lt;0.05), no= M ±SD

The results of liver function tests were described in table (4). The aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase and bilirubin in the anemic group showed higher levels in serum than normal dogs, and that reversed for protein and albumin levels to be in low levels in anemic dogs than normal group.

**Table (4). Liver function tests in anemic and normal dogs**

Group	AST U/L	ALT U/L	ALP U/L	Bilurbin gm/dL	Protein gm/dL	Albumin gm/dL
Anemic (n=35)	76.68 ±52.32*	87.68 ±16.83*	169.31 ±34.91*	2.22 ±1.27*	26.82 ±9.75*	0.85 ±0.53*
Normal (n=10)	28.2 ±15.78	33.7 ±19.5	77.3 ±27.63	0.88 ±0.19	62.9 ±10.99	3.55 ±0.86

\*=(P &lt;0.05), no=M ±SD

## Discussion

The study of liver function tests in anemic dogs with the comparison of clinically healthy dogs showed that anemic dogs have signs included; pale mucous membrane, depression, dehydration, different stages of anorexia, lethargy, tachycardia, and weakness, such signs were also recorded following anemia in dogs by several authors (9,11, 12).

Anemic dogs appeared signs of; pale mucous membrane, lethargy, and weakness (13), whereas founded by (12, 14, 15), the lethargy and body weight loss associated with chronic anemia in dogs. Moreover, those anemic dogs might appear heated and depressed concerning the infectious cause of anemia as in hemoparasites (16, 17).

The increased respiratory rate of anemic dogs than the normal group (P<0.05), was due to oxygen demand, respectively decreased the number of erythrons, which was also explained by (17), as a compensatory mechanism through increased heart rate and respiratory rate following anemia.

The total RBC count, Hb and PCV of the anemic group were in low levels than

the normal group ( P<0.05), those results regarded to develop of anemia in dogs, and those clinical cases were approved by ( 18,19). Moreover, MCV and MCHC were lower than normal dogs (P<0.05), which could be interrelated to the microcytic and hypochromic type of anemia (20), type of anemia was founded when there are iron and copper deficiencies (19, 21,22).

Result of ALT in anemic dogs group, which was higher than normal group ( P<0.05), the increased activity of this enzyme in the dogs was documented due to alterations in the lipid membrane of the hepatocytes, that occurred secondary to injury, inflammations, or infection inside the liver ( 4, 23).

The level of AST in the group of anemic dogs was significantly increased than normal group of dogs (P<0.05), that AST was an intracellular enzyme in hepatocytes and increased its level following liver damage ( 9 ), such elevated level alone was non-significant for liver damage because the enzyme can increase following muscle problems and destruction of RBCs ( 7).



The ALP level in anemic dogs was higher than the normal group ( $P < 0.05$ ), authors explain that alkaline phosphatase is present within the liver (14), otherwise clarified that higher ALP activity can originate from diseases and non-diseased conditions states (9).

Bilirubin level in anemic dogs was higher than normal dogs ( $P < 0.05$ ), generally the increased bilirubin level was reported with diseases in the liver (8). Otherwise, elevated bilirubin levels may indicate intravascular leukocytes destruction as in immune-mediated hemolytic anemias or due to gallbladder obstruction (7).

Total protein and albumin levels in a group of anemic dogs were decreased when compared to normal dogs ( $P < 0.05$ ), which happened when a decreased function of hepatocytes will compromise the liver's ability to produce proteins (14).

Consequently the signs of pale mucous membranes, depression, anorexia and lethargy might also be associated with the liver problem as described by (3,10,16)

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