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Haematobiochemical alterations in hepatic diseases in dogs

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Abstract

The present study was carried out in Veterinary Clinical Complex, College of Veterinary Science, Tirupati over a period of one year from January 2019 to December 2019. The canine clinical cases suspected for hepatic diseases were screened with specially designed data sheet. These clinical cases were subjected to clinical examination, ultrasound scan, radiography and haemato-biochemical examination. Out of 10,921 cases we have selected 52 clinical cases, from which the whole blood and serum were collected and sent to Veterinary Diagnostic Laboratory. Haemogram, leukogram and serum biochemical profile were performed as per the standard methods. Hematological studies revealed moderate to severe anemia, decrease in PCV, leucocytosis, neutrophilia and thrombocytopenia. Elevation of ALT, AST, globulin, BUN, creatinine and decreased total protein and albumin were observed in serum biochemical profile.

Keywords: Biochemical profile, haemogram, hepatic diseases, leukogram

Introduction

Liver is the largest parenchymal gland and the most important vital organ of the body with vast reserve of function. Hepatic diseases are one of the top five causes of non-accidental deaths in dogs ^[1]. Liver provides a myriad of biochemical, synthetic, excretory and regulatory functions important to intermediary body metabolism ^[2]. Hepatic diseases occur in a number of acute and chronic clinical conditions and variety of adverse influences can damage the liver either reversibly or irreversibly ^[3]. Drug-induced hepatotoxicity, infectious diseases, congenital or neoplastic diseases, metabolic disorders, degenerative processes, vascular injury, auto-immune diseases and even blunt trauma may result in hepatic diseases ^[4]. The common diagnostic approach to hepatic disorders includes clinical examination, laboratory estimations of blood and urine, liver function tests, imaging techniques like radiography, ultrasonography, nuclear scintigraphy, computed tomography and magnetic resonance imaging. The present study describes the haemato-biochemical alterations in hepatic diseases.

Materials and methods

The present study was conducted on the dogs presented in the Veterinary Clinical Complex, College of Veterinary Science, Tirupati between January 2019 and December 2019. Dogs with no clinical condition brought to the clinics for routine clinical examination in the age group of 3-7 years irrespective of sex and breed were chosen to act as control (n=10). All the animals were found clinically healthy, active and had normal appetite, defecation, urination and normal clinical parameters, haematology and biochemical profiles were obtained from this group. Out of 10,921 canine clinical cases suspected for various hepatic diseases were screened with specially designed hepatic data sheet. All the suggestive clinical cases were subjected for thorough clinical examination, ultrasonography and radiography. From 52 confirmed clinical cases for hepatic diseases, blood and serum were subjected for haemato-biochemical analysis. Haemogram and biochemical analysis were performed as per the standard methods at Veterinary Diagnostic Laboratory, Veterinary Clinical Complex. The results were analysed statistically by performing T- test using statistical analysis tool pack, SPSS software version 20.

Results and Discussion

In the present study haematology examination of the dogs with hepatic diseases revealed a significant ($P<0.05$) decrease in haemoglobin may be attributed to increased degradation of erythrocytes due to increased transit time through spleen because of reduced portal blood flow, impaired bone marrow responses, decreased erythrocyte survival time, decreased nutrient uptake due to inappetance or anorexia and reduced availability of micronutrients from liver for the synthesis of haemoglobin was reported earlier^[5, 6]. There was a significant ($P<0.05$) decrease in the mean values of packed cell volume in the present study might be due to the dehydration seen in the dogs affected with various hepatobiliary disorders and it was accordance with other studies^[7] whereas there was significant ($P<0.05$) increase in total leukocyte count as compared with healthy control dogs and the similar findings of leucocytosis were reported by authors^[7-10] in a dog affected with hepatic disorders. While there was a significant ($P<0.05$) increase in the mean values of neutrophils and significant ($P<0.05$) decrease in lymphocytes levels, the later may be due to sever rise in neutrophils. Neutrophilic leucocytosis was a characteristic feature of ongoing acute inflammatory conditions as reported by Poldervaart *et al.*^[11]. Mean platelet count was significantly ($P<0.05$) decreased in dogs with hepatic disease as compared with control group (Table 1). Several mechanisms have been suggested for thrombocytopenia in patients with liver disease, including increased platelet sequestration in the spleen as a result of congestive splenomegaly; reduced production of thrombopoietin by the liver; increased platelet breakdown due to auto-antibodies, and increased consumption resulting from low-grade disseminated intravascular coagulopathy (DIC) reported by Prins *et al.*^[12].

Table 1: Mean values of haematology parameters

Parameter	Control Group	Dogs with hepatic diseases
Haemoglobin (gm%)	13.77 ± 0.55	8.43 ± 0.49*
PCV (%)	40.12 ± 1.75	25.22 ± 4.24*
TLC (thousands/ µl)	11.84 ± 1.02	25.08 ± 4.92*
Neutrophils (%)	69.13 ± 3.05	84.9 ± 1.8*
Lymphocytes (%)	29.25 ± 2.14	13.72 ± 1.8*
Platelet count (lakhs/µl)	3.42 ± 0.47	0.88 ± 0.29*

* Significant ($P<0.05$), T- test

Table 2: Mean values of biochemical parameters

S. No	Parameter	Control (10dogs)	Dogs with hepatic diseases (52 dogs)
1	ALT (IU/L)	17.70± 4.96	326.28 ± 19.53*
2	AST (IU/L)	22.26± 4.78	166.19 ± 30.75*
3	Total protein (g/dl)	8.57± 0.21	5.27 ± 0.57*
4	Albumin (g/dl)	3.62± 0.25	1.35 ± 0.19*
5	Globulin (g/dl)	4.94± 0.32	3.72 ± 0.3*
6	A/G ratio	0.77 ± 0.09	0.47 ± 0.09
7	BUN (mg/dl)	13.60± 1.74	70.73 ± 14.13*
8	Creatinine (mg/dl)	1.45± 0.14	3.52 ± 0.3*

* Significant ($P<0.05$), T- test

Biochemical profile in this study revealed a significant ($P<0.05$) increase in the mean values of ALT and AST which may be due to altered hepatocellular membrane permeability, hepatocellular necrosis and inflammation with degree proportional to number of injured hepatocytes^[13]. This is in accordance with other studies^[7, 8, 10]. There were a significant

($P<0.05$) decrease in the mean value of total protein and albumin. Hypoproteinemia is the most common finding in chronic disorders like cirrhosis and portosystemic vascular abnormalities stated by Tennant^[14] because liver is the main site for synthesis and degradation of the proteins. A low serum albumin concentration due to liver disease indicates a diffuse and chronic hepatopathies^[15] and the same nature of the disease were observed in this study. The findings of the present study are in agreement with the findings of Elhiblu *et al.*^[10], Lathamani and Nalinikumar^[16] and Lakshmi *et al.*^[7] who all reported the significant decrease in the total serum protein concentration in dogs with various hepatic disorders. A significantly ($P<0.01$) elevated levels of mean globulin were recorded in the present study could be due to increased synthesis of gamma globulin fraction associated with enhanced systemic immune reactivity against portal antigens or secondary to antibody production. The present findings are in agreement with Jacobson and Swan^[17]. The mean values of A/G ratio were decreased non-significantly which might be due to short period of duration of disease or short insult to hepatic protein synthesis^[18]. While there is a significant increase in the mean values of BUN and creatinine in this study as compared to control group (Table 2) and similar findings were reported by Elhiblu *et al.*^[10] and Sampaio *et al.*^[19]. Renal dysfunction has been reported as a frequent complication in patients with end-stage liver disease. Hence, the increased in BUN and creatinine values could be attributed to impaired kidneys function associated with liver cirrhosis due to the decreased capacity of the liver to detoxify the harmful products.

Conclusion

In this study dogs with hepatic diseases revealed significant decrease in the levels of haemoglobin, PCV, platelet count and increase in leukocytes and neutrophils than the control group. Total protein and albumin were significantly lower whereas ALT, AST, globulin, BUN and creatinine were significantly higher than the control group. Hence it is suggested that haematobiochemical alterations may be used as a diagnostic tool for hepatic diseases in dogs.

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