Journal of Animal Research: v.13 n.05, p. 691-696. October 2023

DOI: 10.30954/2277-940X.05.2023.8

Clinico-Diagnostic Studies on Hepatic Disorders in Dogs

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Received: 27 July, 2023 **Revised:** 09 Sept., 2023 **Accepted:** 14 Sept., 2023

ABSTRACT

In the present study, 88 dogs were diagnosed with hepatic disorders based on clinical manifestations, haemato-biochemistry and diagnostic Imaging. All the cases exhibited clinical manifestations of inappetance and anorexia, vomition, anemia, diarrhea, pyrexia, lethargy, icterus, abdominal pain, emaciation, ascites, weight gain,weight loss, respiratory distress, limb edema, nervous signs, polyuria and polydipsia. Significantly decreased Hb and TEC with elevated TLC and neutrophil count were common hematological abnormalities. Similarly, elevated activity of ALT, AST, ALP, GGT, total bilirubin, direct bilirubin and globulin with decreased levels of total protein, albumin, glucose and serum electrolytes (sodium, potassium and chloride) were common biochemical findings recorded in dogs affected with hepatic disorders. Ground glass appearance, hepatomegaly and normal liver size were the common radiographic findings Based on ultrasonographic evaluation carried out on the suspected cases of hepatic disorders, revealed changes in size (normal reducedand enlarged), echogenecity, (hyper, hypo andmixed echogenicity), margins (sharp, rounded and irregular), portal and hepatic veins (Normal and inapparent), hypoechoic masses and anechoic fluid.

HIGHLIGHTS

- Hepatic disorders can be diagnosed by clinical signs, haemato-biochemistry and Diagnostic imaging.
- Diagnostic imaging technology is more sensitive and specific test.

Keywords: Hepaticdisorders, Dogs, Diagnosis, haemato-biochemistry

Liver plays a central role in a diverse array of processes including carbohydrate, lipid and protein metabolism; storage of vitamins, trace minerals, fat, glycogenand immune regulation. Liver is uniquely susceptible to damage as a consequence of its role as a filter for portal blood, metabolism of endogenous metabolites and xenobiotics (Cynthia, 2013). Symptoms, clinical signs and diagnostic results reflect impairments in these functions (Meyer and Rothuizen, 2013).

Hepatic disorders occur in a number of acute and chronic clinical conditions. 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 hepatobiliary dysfunctions. Common clinical manifestations include anorexia, vomition, ascites, jaundice, constipation or diarrhoea, polyurea and polydipsia, weight loss and coagulation abnormalities (Centre, 2015).

As the liver is physiologically and anatomically diverse, there is no single test that adequately identifies hepatic disease or its underlying cause. For this reason, a battery of tests must be used to diagnose the hepatobiliary affections (Kumar *et al*., 2012).

MATERIALS AND METHODS

Dogs presented to Veterinary Hospital, Bhoiguda with

How to cite this article: Lakshmi, K. and Padmaja, K. (2023). Clinico-Diagnostic Studies on Hepatic Disorders in Dogs. *J. Anim. Res.,* **13**(05): 691-696.

Source of Support: None; **Conflict of Interest:** None

the clinical signs suggestive of hepaticdisorders were selected. These dogs were diagnosed to be affected with hepatic disorders based on clinical manifestations, haemato-biochemical, radiography and ultrasonographic evaluation.

Blood was collected from the peripheral (cephalic/ saphenous) veins of dogs suffering with hepatic disorders in dogs using sterile vaccutainers containing EDTA (ethylene diamine tetra aceticacid-2 mg/ml blood), as anticoagulants for estimation of hematological parameters. Similarly, blood was also collected into sterile clean vaccutainers containing clot activator for serum separation for estimation of biochemical parameters.

The dogs were subjected to lateral and ventral abdominal exposure to evaluate location, size and shape of liver by using Heliophos–D500 mA X-ray machine supplied by Seimens, India and the radiographs were analyzed for abnormality. Ultrasonography of abdomen was performed in real time B-mode using *IXOSvet* ultrasound machine supplied by Esoate PieMedicals, Netherlands with L10-5 MHz linear array or C5-2R13 microconvex array transducers in transverse and Saggital planes as per the standard protocol described by Nyland *et al*. (2002). Liver was examined fully in both transverse and longitudinal sections. Liver was evaluated for size, shape, echogenicity (decreased / increased / mixed).

RESULTS AND DISCUSSION

In the present study, Clinical Signs observed in 88 dogs affected with hepatic disorders were inappetence and anorexia recorded in 86 (97.72%), vomition in 82 (93.18%), anemia in 67 (77.14%), diarrhea in 56 (63.64%), pyrexia in 55 (62.50%), lethargy in 51 (57.95%), icterus in 41 (46.59%), abdominal pain in 38 (43.18%), emaciation in 37 (42.05%), ascites in 32 (36.36%), weight gain in 32 (36.36%), weight loss in 29 (32.95%), respiratory distress in 26 (29.55%), limb edema in 24 (27.27%), nervous signs in 19 (21.59%) polyuria and polydipsiain 15 (17.05%) dogs (Fig. 1- 4, Table 1). The present findings corroborate

Fig. 1: Yellow colored vomitus

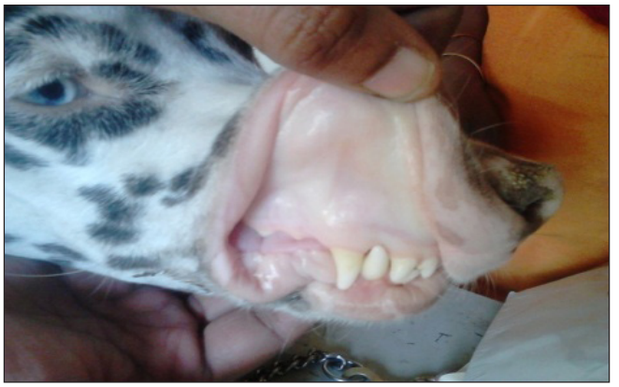

Fig. 2: Anemia- Pale buccal mucous membrane

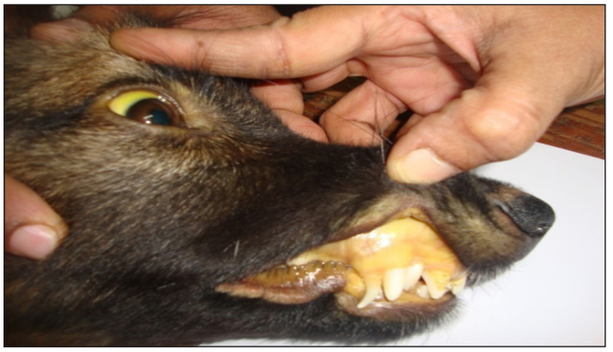

Fig. 3: Icterus: Yellowish discolouration of gums

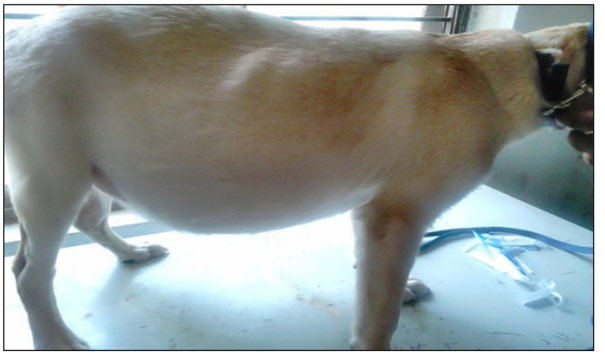

Fig. 4: Dog is showing ascites as pepple shape abdomen

with Tantary *et al.* (2014) and Maddison (2016) who reported clinical signs of hepatobiliary disease in dogs as inappetence, vomition, weight loss, abdominal distension, polydipsia, cutaneous lesions and fever.

Table 1: Clinical observations of hepatic disorders in dogs

Sl. No.	History and Clinical manifestations	No. of dogs	Percentage
1	Inappetence and Anorexia	86	97.72
2	Vomition	82	93.18
3	Anemia	67	77.14
4	Diarrhea and melena	56	63.64
5	Pyrexia	55	62.50
6	Lethargy	51	57.95
7	Icterus	41	46.59
8	Abdominal pain	38	43.18
9	Emaciation	37	42.05
10	Ascites	32	36.36
11	Weight gain	32	36.36
12	Weight loss	29	32.95
13	Respiratory distress	26	29.55
14	Limb edema	24	27.27
15	Nervous signs	19	21.59
16	Polyuria and polydipsia	15	17.05

The mean values of hemoglobin (g/dl), total erythrocyte count (x10^6/µL), total leucocyte count (x10^3/µL), packed cell volume (%), neutrophils (%), lymphocytes (%), monocytes (%), eosinophils (%) and basophils (%) recorded in hepatic disorders affected dogs were 9.06 ± 0.24, 4.64 ± 0.13, 23.73 ± 0.92, 38.81 ± 3.69, 80.04 ± 1.51, 26.61 ± 4.07,2.45 ± 0.88. There was a significant ($P<0.01$) decrease in the mean values of hemoglobin, total erythrocyte count values with a significant ($P<0.05$) increase in the mean values of total leucocyte count and neutrophils as compared to healthy control. Similar findings of reduced Hemoglobin, TEC in dogs affected with ascites of hepatic origin and hepatic disorders were reported earlier by Chaturvedi *et al. (*2013), Saravanan *et al.* (2014) and Bhadesiya *et al.* (2015). An increase in the mean values of total leucocyte count in the present study was characteristic of acute inflammatory conditions (Poldervaart *et al.,* 2009).

Table: 2: Mean haematological findings in healthy and hepatic disorders affected dogs

Sl. No.	Parameter	Healthy Control	Hepatic disorders
1	Hb (g/dl)	12.92 ± 0.44	9.06 ± 0.24**
2	TEC (X 10^6/µL)	7.19 ± 0.23	4.64 ± 0.13**
3	TLC(X 10^3/µL)	8.66 ± 1.65	23.73 ± 0.92*
4	PCV(%)	41.73 ± 1.34	38.81 ± 3.69
5	Neutrophils (%)	58.98 ± 2.70	80.04 ± 1.51*
6	Lymphocytes (%)	31.90 ± 0.75	26.61 ± 4.07
7	Monocytes (%)	2.18 ± 0.29	2.45 ± 0.88
8	Eosinophils (%)	2.50 ± 0.18	1.97 ± 0.10
9	Basophils (%)	0.48 ± 0.24	0.52 ± 0.12

The mean serum ALT(U/L), AST(U/L), ALP(U/L), GGT(U/L), Total protein (g/dl), serum albumin (g/dl) and serum globulin (g/dl), Glucose (mg/dl), Cholesterol (mg/dl), CK-Mb (U/L) BUN (mg/dl), Creatinine (mg/dl), Sodium (mEq/L), Potassium (mEq/L) and Chloride (mEq/L) concentration among dogs affected with hepatic disorders was 203.19 ± 19.16, 184.84 ± 22.32, 284.82 ± 18.39, 6.64 ± 0.51, 1.17 ± 0.04, 0.75 ± 0.05, 4.77 ± 0.10, 2.01 ± 0.03, 3.43 ± 0.01, 90.86 ± 1.39, 118.72 ± 17.25, 24.95 ± 0.46, 20.08 ± 0.69, 1.21 ± 3.03, 134.77 ± 1.23, 3.56 ± 0.08, 97.87 ± 0.85 and 97.87 ± 0.85 (Table 3). Serum concentrations of ALT and AST are the most commonly measured markers of hepatocellular leakage in dogs (Lidburg and Steiner, 2013). Elevation in the serum ALP levels along with GGT is seen with the administration of drugs like corticosteroids, anti convulsants, Phenobarbital etc. (Meyer, 2013). Hypoprotenemia could be due to the disruption in the hepatic protein metabolism, marked decline in diet intake, malabsorbtion and ongoing protein losing enteropathies like gastroenteritis, gastrointestinal ulcerations and chronic gastritis (Tantary *et al.,* 2014).

In the present study, 88 dogs with signs of abdominal distension and jaundice with elevated liver enzymes were subjected to plain abdominal radiographs which revealed ground glass appearance, hepatomegaly with the liver margins extending beyond the coastal arch and normal liver size and the presence of microhepatica was masked by the ground glass appearance due to ascitic fluid (Fig. 5-6).

These findings corroborate with the findings of Tantary *et al.* (2014), who stated that abdominal radiography of dogs

Table 3: Mean biochemical findings in healthy and hepatic disorders affected dogs

Sl. No.	Parameter	Healthy control	Hepatic disorders affected dogs
1	ALT (U/L)	32.80 ± 1.60	203.19 ± 19.16**
2	AST (U/L)	43.05 ± 1.22	184.84 ± 22.32**
3	ALP (U/L)	59.62 ± 2.08	284.82 ± 18.39**
4	GGT (U/L)	3.04 ± 0.15	6.64 ± 0.51*
5	Total Bilurubin (m g/dl)	0.45 ± 0.03	1.17 ± 0.04
6	Direct Bilurubin (mg/dl)	0.19 ± 0.02	0.75 ± 0.05
7	Total Protein (g/dl)	6.22 ± 0.03	4.77 ± 0.10**
8	Albumin (g/dl)	2.81 ± 0.07	2.01 ± 0.03**
9	Globulins(g/dl)	3.41 ± 0.07	3.43 ± 0.01*
10	Glucose (mg/dl)	108.24 ± 1.87	90.86 ± 1.39**
11	Cholesterol (mg/dl)	166.89 ± 2.28	118.72 ± 17.25
12	CK-Mb (U/L)	25.29 ± 0.61	24.95 ± 0.46
13	BUN (mg/dl)	15.26 ± 0.09	20.08 ± 0.69
14	Creatinine (mg/dl)	1.08 ± 0.07	1.21 ± 3.03
15	Sodium (mEq/L)	142.16 ± 0.38	134.77 ± 1.23
16	Potassium (mEq/L)	4.05 ± 0.35	3.56 ± 0.08
17	Chloride (mEq/L)	103.12 ± 0.35	97.87 ± 0.85

Significance at p ≥0.1.

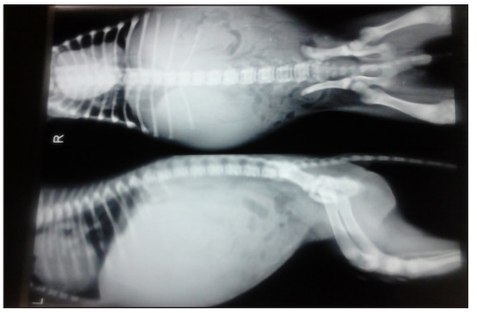

Fig. 5: Lateral and Ventro-dorsal view of Radiograph depicting Ground glass appearance of the abdomen

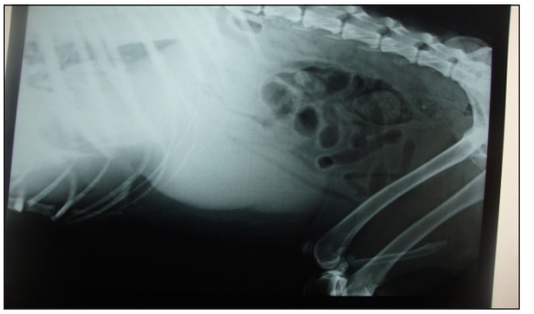

Fig. 6: Lateral view of Radiograph depicting Hepatomegaly

with hepatobiliary disorders could not provide any useful information except for diagnosing hepatomegaly.

In the present study, ultrasonography was performed on 88 dogs, 32 dogs showed diffuse parenchymal changes with ascites, 32 dogs showed diffuse parenchymal changes without ascites and 24 dogs showed focal parenchymal changes. Out of 32 dogs of diffuse parenchymal disorders with ascites, liver size was normal in 6 dogs (18.75%) and reduced in 26 (81.25%). The echogenic pattern revealed diffuse hyper echogenecity in 31 (96.88%) and mixed echogenecity in 1 (3.12%). The liver margins were rounded in 3 (9.38%) and irregular in 29 (90.62%). Ascites was represented by anechoic fluid was present in all (100%) and. Out of 32 dogs of diffuse parenchymal disorders without ascites, liver size was normal in 9 (28.12%) and enlarged in 23 (71.88%). The echogenic pattern revealed diffuse hyper, hypo and mixed echogenecity in 16 (50%), 13 (40.62%) and 3 (9.38%), respectively. The liver margins were sharp in 4 (12.50%) and rounded in 28 (87.50%). The echo texture

was coarse in 30 (93.75%) and heterogenous in 2 (6.25%). Out of 24 dogs of focal parenchymal disorders, liver size was normal in 14 (58.33%) and enlarged in 10 (41.67%). The echogenic pattern revealed isoechogenecity, diffuse hypoechogenecity and mixed echogenecity in 4 (16.67%), 16 (66.66%) and 4 (16.67%), respectively. The liver margins were sharp, rounded and irregular in 12 (50%), 9 (37.5%) and 3 (12.5%) dogs, respectively. The echo texture was coarse and heterogeneous in 15 (62.5%) and 9 (37.5%), respectively. Hypo echoic and hyper echoic masses were seen in 18 (75%) and 6 (25%) respectively. (Fig.7-9). These findings are in agreement with Chaudhary *et al.* (2008), who sated that liver was less echogenic than spleen, hyper echoic or iso echoic than right kidney with anechoic gall bladder. Ultrasonography was proven useful in evaluating the parenchymal structures of the liver in animals and therefore it can be an important adjunct to evaluate diffuse parenchymal disorders of the liver (Biller, 1992).

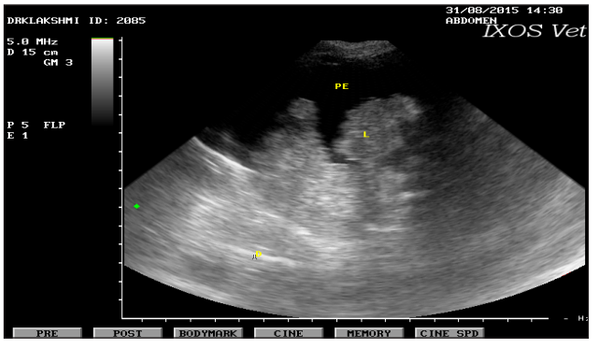

Fig. 7: Hyper echogenecity of hepatic Parenchyma with irregular liver margins as compared with spleen- DPD with ascites

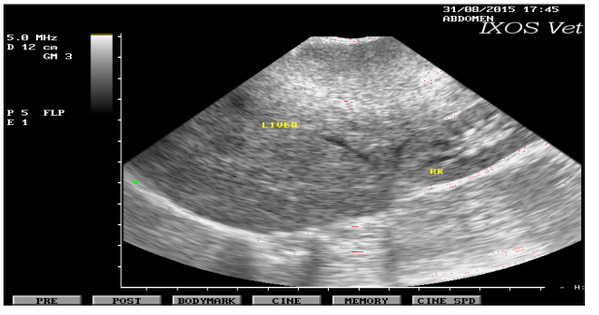

Fig. 8: Mixed echogenecity with hepatic parenchyma extending beyond rightkidney-suggestive of hepatomegaly. DPD without ascites

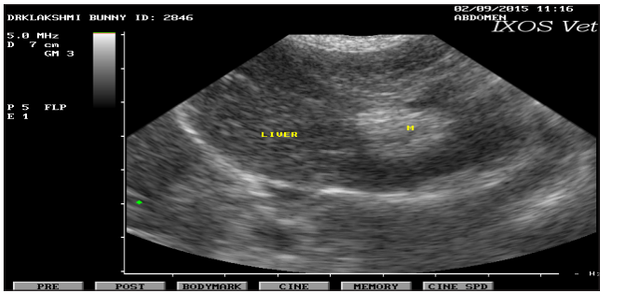

Fig. 9: Hyperechoic mass in the hepaticparenchyma- focal parenchymal disorders

CONCLUSION

From the present study, it may be concluded that clinical signs, haemato-biochemistry and ultrasonography plays an important role in diagnosing various hepatic disorders in dogs.

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