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A Study on Prevalence and Clinico-pathological Findings Associated with Ascites in Dogs

Prerona Patowary[1], Arup Das[2], Utpal Barman[2], Mousumi Hazorika[2], Syed A. Arif[2], Aditya Baruah[3], Manoj Kr. Kalita[3]

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ABSTRACT

Canine ascites is a common illness with multiple aetiologies. However, the involvement of various etiological factors is making therapeutic management extremely difficult for the clinicians. The present study was conducted on dogs with distension of abdomen at Veterinary Clinical Complex, College of Veterinary Sciences, Assam Agricultural University, Khanapara, Assam, India, to study the prevalence of the disease with respect to primary organ involvement in the pathogenesis of ascites and hemato-biochemical changes. The blood samples from the dogs were collected for hemato-biochemical analysis. Routine blood smear, fecal smear examination, ultrasonography and echocardiography of all the ascetic dogs were carried out to find out the exact etiology of ascites. Out of the total 7788 dogs assessed throughout the period from August, 2022 to January, 2023, 32 dogs (0.41%) developed ascites. The highest prevalence of ascites 53.12% was recorded in the dogs of above 6 years of age and breed wise Labrador breed (34.37%) of dogs were most commonly affected. Most of the ascites cases were found to be largely due to liver diseases (34.37%); 31.25% were due to congestive heart failure, 21.87% due to infectious causes and 12.50% due to kidney disease. The hemato-biochemical analysis revealed anemia, mild leukocytosis, hypoproteinaemia, hypoalbuminemia, hyperbilirubinemia, increased alanine aminotransferase (ALT), aspertate aminotransferase(AST), lactate dehydrogenase(LDH), blood urea nitrogen (BUN) and creatinine level in the ascitic dogs.

Key words: Ascites, Dog, Hepatic cirrhosis, Hypoproteinemia, Ultrasonography.

Ascites is one of the most commonly found clinical problems in dogs. It refers to the buildup of excess fluid in the peritoneal cavity Rudloff (2005). This condition may be found in cases of hypoproteinemia, chronic hepatic failure, congestive heart failure, neoplasia, nephrotic syndrome, pancreatitis, infectious causes, malnutrition and heavy parasitism (Randhawa *et al*., 1988; Mamta *et al*., 2021). Based on the amount of fluid accumulated, ascites is technically graded into three (grades 1, 2 and 3 *i.e.* mild, moderate and severe respectively). Since, ascites is always a sign of disease; the investigation should be aimed at identifying the primary underlying problem. Also, management of cases of ascites in dogs is usually difficult because of lack of knowledge of the specific causes, which will dictate the appropriate therapeutic interventions to be applied. Therefore the aim of this study was to determine the prevalence and clinico-pathologic findings in cases of ascites in dogs.

The study was carried out during the period from August, 2022 to January, 2023 at Veterinary Clinical Complex, College of Veterinary Sciences, Assam Agricultural University, Khanapara, Assam, India. Dogs having signs of distended abdomen presented at VCC, Khanapara were taken under the study. The study was conducted as per the Institutional Animal Ethics Committee (IAEC) and Institutional Biosafety Committee (IBC) criteria during the entire study. Clinical signs and history of each dog was noted in relation to breed, age, sex *etc*. for epidemiological study. Ten apparently healthy dogs were kept to serve as healthy control. For hemato-biochemical analyses, approximately 5 ml of blood was taken from the cephalic or recurrent tarsal veins as per standard protocols. For the entire set of hematological tests, two ml of blood was drawn and placed in a dry vial containing 10% EDTA. Three ml of blood was transferred into serum vials taking all precautions to avoid hemolysis and serum was collected for biochemical tests (Meinkoth and Clinkenbeard, 2000). Hemoglobin (Hb), packed cell volume (PCV), total leucocytic count (TLC), total erythrocytic count (TEC) and platelet count were determined by using a fully automated hematological analyzer. Biochemical parameters like

[1]Goat Research Station, Assam Agricultural University, Burnihat-793 101, Assam, India.
[2]College of Veterinary Science, Assam Agricultural University, Khanapara-781 022, Assam, India.
[3]Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing-787 051, Assam, India.

Corresponding Author: Manoj Kr. Kalita, Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing-787 051, Assam, India. Email: manoj007.kalita@gmail.com

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alanine aminotrasferase (ALT), aspartate aminotransferase (AST), blood urea nitrogen (BUN), serum creatinine, albumin, total serum proteins (TSP), lactate dehydrogenase (LDH) and total bilirubin were determined using specific diagnostic kits in accordance with the manufacturer's recommendations. The biochemical parameters were analysed by using a Visible Spectro-105 spectro photometer. Routine blood and fecal smear examination, ultrasonography, echocardiography was also carried out for determining primary underlying causes. The statistical analysis was done using SPSS software version 20 and t-test was employed to determine the significant differences if any (Snedecor and Cochran, 1994).

Prevalence

Out of the total of 7,788 dogs presented in the VCC during the study period, 32 had ascites (0.41%).The prevalence of the present findings was in agreement with (Behera *et al*., 2017; Padhi *et al*., 2022) who reported that the prevalence of ascites in canines was 0.59% and 0.34% respectively. Out of 32 ascitic dogs 17 (53.12%) were males and 15 (46.87%) were females. The sex differences in the prevalence were not significant ($p<0.05$). The age distribution of the reported cases of ascites were as follows: below 1 year-2 cases (6.25%), 1 to 3 years-5 cases (15.62%), 4 to 6 years-8 (25%), 6 years and above-17 cases (53.12%). Age wise prevalence of ascites was significantly higher ($p<0.05$) in older dogs than in younger ones, this could be because older animals are more likely to have damage to or failure of their important organs (heart, liver and kidney) than younger ones (Dixit, 2012; Behera *et al*., 2017). Out of the 32 dogs that had ascites, eleven (34.37%) were Labrador retriever, six (18.75%) were Alsatians, seven (21.87%) were german spitz, four (12.5%) were golden retriever, two (6.25%) were pug, while two were mongrel (6.25%). Breed wise prevalence of ascites in Labrador retriever was found significantly higher in the current study which might suggests higher preference of dog owner for keeping Labrador breed in Guwahati (Behera *et al*., 2017; Kumar *et al*., 2022). The 32 ascites cases were classified into four causative types- liver damage (LD), congestive heart failure (CHF), Kidney Damage (KD) and infectious causes. Out of the 32 cases, eleven dogs (34.37%) had LD, ten dogs (31.25%) had CHF, four dogs (12.50%) had KD and seven dogs (21.87%) had infectious origin. The further categorization of the infectious cases showed that two had hookworm infestation while five had babesiosis. In the present study maximum cases of liver disease and congestive heart failure in dogs was found to be common etiological of ascitic and it is agreement with (Behera *et al*., 2017; Remzi *et al*., 2018) who reported that most of the ascites cases largely due to hepatic diseases (36.2%) among 58 ascitic dogs, whereas (Ihedioha *et al*., 2013; Padhi *et al*., 2022) indicated that the majority of ascites cases were primarily caused by congestive heart failure and cirrhotic liver disease.

Hematology

Hematological parameters revealed a significant ($P<0.05$) decrease in Hb, PCV, RBCs and platelets count in ascitic dogs. Non significant increase in TLC was observed as compared to healthy dogs (Table 1). Hematological examination revealed anaemia in ascetic dogs and it was concurrence with Gupta *et al.* (2020). Kidney and liver being the prime organ, involved in the production of erythropoietin and other factors required for erythropoiesis and so the dysfunction of liver and kidney may lead to anaemia. Hemo-protozoal infection and GI parasitism may be another contributing factor for decreased level of RBCs, platelets and Hb, thus results in anemia. Washabau (2010) observed severe leukocytosis in dogs with granulomatous hepatitis, hepatic cirrhosis and hepatic abscess.

Serum biochemical profile

Serum biochemical analysis revealed a significant increase ($P<0.05$) in ALT, AST, LDH, BUN, creatinine, total bilirubin and significant ($P<0.05$) decrease in total protein and albumin level in ascitic dogs (Table 1). Serum biochemistry of present investigation revealed a significant increase ($P<0.05$) in ALT, AST, LDH, BUN, creatinine, total bilirubin and significant ($P<0.05$) decrease in total protein and albumin level in ascitic dogs. An increased ALT level might be caused by hepatocellular necrosis and inflammation with injured hepatocytes, multi-organ dysfunction and heart diseases resulting in leakage of enzymes from hepatic cells in the blood. Increased serum AST, creatinine and LDH activity recorded for ascetic dogs with CHF is thought to be due to cardiac muscle damage (Stockham *et al*., 2008; Patowary *et al*., 2022) while the elevated serum AST activity recorded for dogs with kidney diseases may be attributed to hypoxia associated with the anaemia reported in these dogs (Stockham *et al*., 2008). AST and LDH may also be

Table 1: Haemato-biochemical parameters between healthy control and ascitic dogs (Mean ± SE).

Parameter	Healthy control (n=10)	Ascitic dog (n=32)
Hb (g/dl)	12.70±1.60	9.84±0.08*
PCV (%)	38.50±4.41	28.37±0.68*
TEC (10^6/mm^3)	6.36±0.95	3.73±0.10*
TLC (10^3/mm^3)	13.10±0.38	17.57±0.8
Platelets(10^5/mm^3)	2.25±0.47	1.93± 0.35
ALT (U/L)	26.88±0.71	93.47±12.29*
AST (U/L)	18.99±0.34	89.18±11.15*
LDH (U/L)	145.49±1.14	224.32±16.78*
BUN (mg/dl)	23.21±0.89	55.29±3.26*
Creatinine (mg/dl)	1.19±0.03	2.17±0.15*
Total bilirubin (mg/dl)	0.22±0.01	0.63±0.08*
Total protein (gm/dl)	7.09±0.03	5.15±0.10*
Albumin (gm/dl)	3.24±0.12	2.02±0.03*

(*significant at $p<0.05$).

attributed to the hepato cellular damage. Renal ischemia due to low cardiac output and decreased glomerular filtration rate commonly associated with kidney and heart disease is believed to be responsible for the significantly elevated serum levels of BUN and creatinine recorded in ascetic dogs with kidney damage and CHF (Ihedioha *et al*., 2013; Patowary *et al*., 2022). An increased total bilirubin *i.e*., hyperbilirubinemia in ascites could be due to a disruption in the imbalance between bilirubin synthesis, metabolism and excretion in hepatic disorder and babesiosis. There was a decrease in total serum protein and albumin values in all the ascitic dogs, which might be due to reduced protein synthesizing ability of the liver as most of the hepatocytes had been replaced by fibrous tissue in liver disease. It is presumed that dogs with kidney diseases had hypoproteinemia due to protein loss in urine that occurs in kidney disease (Stockham *et al.* 2008; Coles, 1986). Hypoprotenemia and hypoalbuminemia in the affected dogs could also be attributed to hepatic congestion caused by right sided heart failure and increased protein loss from the intestines due to intestinal edema and poor absorption due to deceased splanchnic perfusion that occur in dogs with cardiac insufficiency (Moser, 1989; Ettinger, 2000).

Ultrasonography

USG examination of dogs with hepatic dysfunction revealed cirrhotic liver, hyperechoic hepatic parenchyma, gall bladder stone, cholecystitis (Fig 1, 2, 3). Dogs with renal disorder showed renal degeneration with loss of cortico-medullary junction (Fig 4). Dogs with cardiac dysfunction showed presence of hepatic congestion, hepatomegaly (Fig 5, 6). In all the cases there was presence of sufficient

Fig 3: USG of gall bladder revealed cholecystitis in ascitic dogs.

Fig 1: USG of abdomen revealed hepatic cirrhosis and presence of ascitic fluid inside the cirrhotic liver lobes.

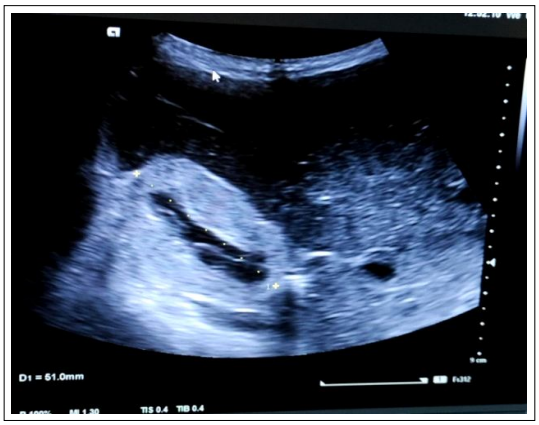

Fig 4: USG of kidney-renal degeneration with no well distinct cortico medullary junction.

Fig 2: Presence of stone in gall bladder, *i.e.* cholelithiasis.

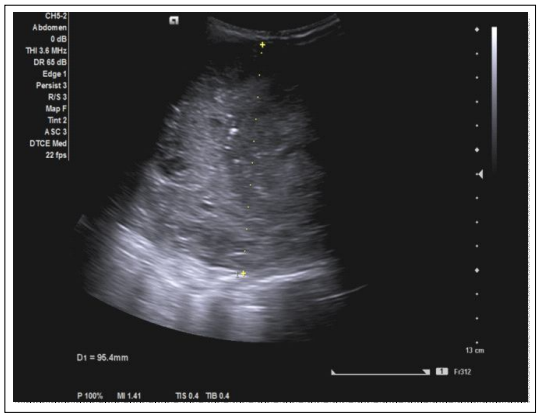

Fig 5: Hepatic enlargement found in dogs with CHF.

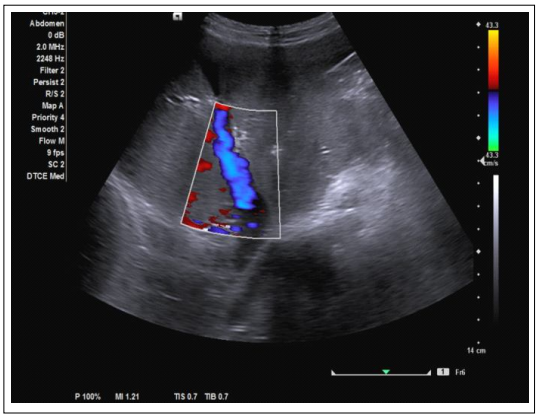

Fig 6: Color doppler imaging of liver showing hepatic congestion in dogs with CHF.

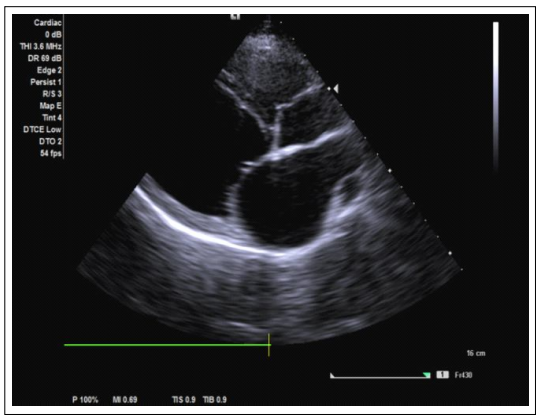

Fig 7: Echocardiographic image at right parasternal long axis view is showing dilated cardiac chambers with decreased wall thickness.

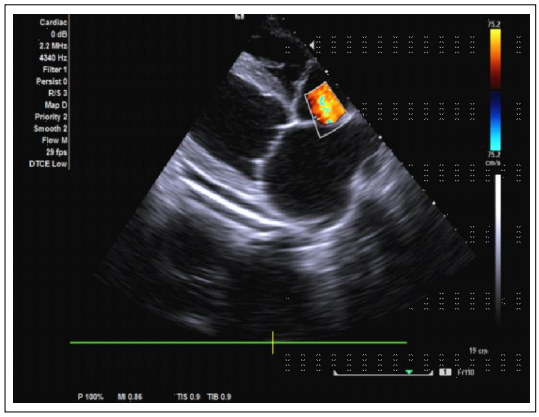

Fig 8: Tricuspid valve regurgitation along with pericardial effusion seen in ascitic dogs due to CHF.

free anechoic fluid in peritoneal cavity of the dogs. USG examination revealed that ascites was observed in this study due to hepatic, renal and cardiac dysfunction. Ultrasonography was found to be a suitable diagnosis technique to detect ascitis cases in dog. USG examination revealed that ascites was observed in this study due to hepatic, renal and cardiac dysfunction. A similar result also observed by (Vijaykumar *et al*., 2011; Phom *et al*., 2019).

Echocardiography

Echocardiographic examination of the ascitic dogs associated with cardiac disorder revealed dilated cardiomyopathy, pericardial effusion, tricuspid and mitral valve regurgitation (Fig 7,8). Echocardiography revealed severe dilatation of right ventricle and atrium with right ventricular hypo contractility leads to right heart systolic ejection failure. Echocardiography is useful to detect the ascites of cardiac origin. It also helps in detecting severe dilatation of right ventricle and atrium with right ventricular hypo contractility leads to right heart systolic ejection failure. Ascites results in CHF may be due to damage of liver parenchyma as a result of increased venous pressure in the liver caused by right sided heart failure. A similar finding was mentioned by (Phom *et al*., 2019; Patowary *et al*., 2022).

Blood smear examination

Routine blood smear examination of the entire ascitic dog revealed presence of *Babesia gibsoni* organism in five animals. Babesia forms small agglutinates in the capillaries of the organs leading to blocking of the capillaries as reported by (Schefters, 2019), which leads to increase pressure and thereby perfusion of fluid leading to peritoneal effusion.

Fecal examination

Fecal examination by direct smear method revealed presence of *Ancylostoma caninum* ova in two dogs. Rao *et al*. (2021) observed anaemia and protein loss occurs in dogs associated with Ancylostomiasis leads to ascitis.

CONCLUSION

The present investigation concluded that the prevalence of ascites was reported as 0.41% in the dog population. The highest prevalence of ascites 53.12% was recorded in the dogs of above 6 years age and breed wise Labrador breed (34.37%) of dogs were most commonly affected. Most of the ascites cases were largely due to liver disease (34.37%); 31.25% were due to congestive heart failure, 21.87% due to infectious causes and 12.50% due to kidney disease. The findings of hemato-biochemical abnormalities along with USG, echocardiography, fecal and blood smear examination associated with the different causative types shall be of help to clinicians in the diagnosis of the causative forms of ascites and thus enable them to choose appropriate therapeutic interventions and management procedures.

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Conflict of interest

There is no conflict of interest among the authors.

REFERENCES

Behera, M., Panda, S., Nath, I., Panda, M.R., Kundu, A.K., Gupta, A.R. and Behera, S.S. (2017). Incidence of canine ascites in and around Bhubaneswar, Odisha, India. International Journal of Science, Environment and Technology. 6(6): 3382-3392.

Coles, E. (1986). Veterinary Clinical Pathology. 4th edn. WB Saunders Company Philadelphia. London, Toronto, Mexico, Riodejenario, Sydney, Tokyo and Hong Kong. pp: 136-70.

Dixit, A. (2012). Studies on diagnosis of canine ascites with special references to therapeutic approach in hepatic dysfunction. PhD Thesis. Jawaharlal Nehru Krishi Vishwa Vidyalaya Jabalpur.

Ettinger, S.J. (2000). Dietary Modifications in Cardiac Disease. In: Textbook of Veterinary Internal Medicine, [Ettinger, S.E. and Feldman, F.C., (eds)]: 5th edn, W.B. Saunders Co., Philadelphia, pp: 262-269.

Gupta, P., Bhardwaj, H.R., Gupta, A.K., Dwivedi, D.K., Sharma, A., Kumar, A. and Chakraborty, D. (2020). Clinical study on comparative evaluation of diagnostic modalities in the diagnosis of hepatic affections in dogs. Journal of Animal Research. 10(5): 717-724. doi: 10.30954/2277-940X.05.2020.7.

Ihedioha, J.I., Anosa, V.O. and Esievo, K.A.N. (2013). Prevalence of and clinicopathologic findings associated with ascites in dogs in Enugu State, Nigeria. Comparative Clinical Pathology. 22: 185-193.

Kumar, R., Gupta, D.K., Gajbhiye, S., Kumar, S., Ramteke, M., Pankaj, D.K. and Rathi. R. (2022). Evaluation of ascetic fluid in dogs. The Pharma Innovation Journal. 11(7): 1201-1204.

Mamta, M., Akash, Purohit, S. and Pandey, R.P. (2021). Electrocardiographic evaluation of cardiac rhythm: A comparative study of apparently healthy german shepherd dogs versus dogs with cardiac affections. Indian Journal of Animal Research. 55(8): 917-923. doi: 10.18805/ijar.B-4148.

Meinkoth, J.M. and Clinkenbeard, K.D. (2000). Normal Hematology of the Dog. Schalm's Veterinary Hematology, 5th edn, [(eds). Fieldman, R.W., Zinkl, J.G. and Jain, N.C.] Wolters Kluwer Company. Philadelphia. Pp: 1057-1063.

Moser, E. (1989). Dietary management of congestive heart failure. Veterinary Medicine. 84: 518-524.

Padhi, P., Patra R.C., Senapati, S.K., Panda S., Das, D.P. and Sangram, B. (2022). Prevalence, clinicpathological changes and therapeutic management of ascites in dogs. The Pharma Innovation Journal. 11(11): 742-746.

Patowary, P., Phukan, A., Baishya, B., Barman, U., Das, A. and Tamuly, S. (2022). Evaluation of hematological and serum biochemical alterations in dogs affected with congestive heart failure. Indian Journal of Animal Research. 56(8): 941-944. doi: 10.18805/IJAR.B-4883.

Phom, O.K., Sarma, K., Arya, R.S., Behera, S.K., Konwar, B. Saikia, B. (2019). Ascites and hepato-renal syndrome in cirrhosis in dogs. Journal of Entomology and Zoology Studies. 7(5): 313-321.

Randhawa, S.S., Dhaliwal, P.S., Kirti, S. and Singh, K.B. (1988). A case study on ascites of hepatic origin in a dog. Indian Journal of Animal Health. 58(1): 135-138.

Rao, N., Sadhu, D.B., Shah, A.I., Parmar, J.J. and Patel, D.M. (2021). Ascites associated with ancylostomiasis in dogs. Indian Journal of Veterinary Science and Biotechnology. 17(2): 110-112.

Remzi, G., Lora, K., Alper, B., Kutay, Y., Taner, B., Mehmet, E. and Abdülkadir, U. (2018). Hepatorenal arterial resistive and pulsatility indexes in dogs with ascites. Indian Journal of Animal Research. 54(3): 359-362. doi: 10.18805/ijar.B-960.

Rudloff, E. (2005). Text Book of Veterinary Internal Medicine-Disease of the Dog and Cat, 6th edn. Elsevier, Saunders, Publication. Pp: 345-387.

Schefters, T. (2019). Mechanisms involved in the persistence of *Babesia canis* infection in dogs. Pathogens. 8: 94. https://doi.org/10.3390/pathogens8030094.

Snedecor, G.W. and Cochran, W.G. (1994). In: Statistical Methods 8th Edn. (Oxford and IBH Publishing Company, New Delhi, India.

Stockham, S. and Scott, M.A. (2008). Fundamentals of Veterinary Clinical Pathology, 2nd edn. Blackwell, Iowa. Pp: 253-272.

Vijayakumar, H., Pandey, N.N., Gurav, A., Mishra, K.K., Mondal, D.B. (2011). Diagnostic evaluation of ultrasonography in canine hepatobiliary and urinary disorders. Indian Journal of Animal Science. 81(2): 162-167.

Washabau, R. (2010). Laboratory tests for liver disease. Veterinary Focus. 20(3): 32-37.