Indian J Anim Health (2023), 62(1): 88-94
DOI: https://doi.org/10.36062/ijah.2022.10522

Research Article

Prevalence, clinical manifestations and etiology of canine hepatic dysfunction in and around Pantnagar

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Abstract

The present investigation reports the clinical prevalence, common clinical manifestations and etiology of canine hepatic dysfunction in and around Pantnagar. Hematobiochemical, radiographical, urine analysis, faecal analysis and ultrasonographical examination were performed for diagnosis of hepatic dysfunction in dogs presented with clinical signs such as icterus, ascites, vomition, diarrhoea, fever, anorexia, anaemia, weight loss, polydipsia, polyuria, yellow urine and nervous disorder. Overall prevalence of hepatic dysfunction in dogs was found to be 3.36% in and around Pantnagar. The mean age in dogs diagnosed with hepatic dysfunction was 5.12±0.96 years. In terms of age, the maximum incidence was seen in dogs with age between 4-6 years, and Mongrel breed of dogs had maximum incidences of hepatic dysfunction. Dogs with hepatic dysfunction manifested a variety of clinical signs. Etiology of hepatic dysfunction in most of the dogs was generally due to multiple or unknown causes.

Keywords: Age, Dogs, Hepatic dysfunction, Incidences, Prevalence

Highlights

- The present investigation was done to study the clinical prevalence and common clinical manifestations associated with dogs affected with hepatic dysfunction.
- Hematobiochemical, radiographical, urine analysis, faecal analysis and ultrasonographical examination were performed for diagnosis of hepatic dysfunction in dogs presented with clinical signs such as icterus, ascites, vomition, diarrhoea, fever, anorexia, anaemia, weight loss, polydipsia, polyuria, yellow urine and nervous disorder between the study period of September 2021 to April 2022.
- Overall prevalence of hepatic dysfunction in dogs was found to be 3.36% in and around Pantnagar.
- Etiology of hepatic dysfunction in dogs is generally due to multiple causes or is usually unknown.

INTRODUCTION

Dogs have various roles in human society, such as hunting scouts, beasts of burden, protectors, sentinels and companions (Smith and Emery, 2020). But this close relationship with humans as well as other factors such as increasing global warming and environmental pollution have led to the emergence of various diseases in dogs, many of which are hepatic in origin and affect dogs by affecting various metabolic processes such as digestion, homeostasis and even the balance of the nervous system. The liver has an important role in carbohydrate metabolism, converting glucose into glycogen, and has an active role in the storage, re-absorption and release of glucose (DeWolf *et al*., 1987; Aspinall and Cappello, 2009). The liver also plays an

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important role in protein metabolism; it deaminates amino acids and converts them into carbohydrates and lipids (Bermingham *et al*., 2010). Many proteins such as albumin, fibrinogen, globulin and clotting factor (V, VII, IX, X, XI, XII) are synthesised in the liver (Ziccardi *et al*., 1991). In animals, hepatic dysfunction can be acute or chronic. Acute hepatitis encompasses a wide range of disorders marked by acute inflammation of the hepatic parenchyma or hepatocyte damage, both of which result in increased liver function indices (Ryder and Beckingham, 2001). Chronic hepatitis refers to a long-term disease process in which the liver parenchyma is constantly destroyed and replaced with fibrous tissue, which often leads to liver cirrhosis and death (Kanemoto *et al*., 2017). Various causes are responsible for hepatic dysfunction in dogs, and many of them are idiopathic in nature (Watson, 2004; Van *et al*., 2012). Other causes include various bacteria, fungi, protozoa, virus, drugs and toxins (McCord and Webb, 2011).

These causative agents structurally, metabolically or hormonally alter normal liver activity and produces a wide range of clinical signs among dogs, such as depression, weakness, nervous signs, jaundice, anorexia, vomiting, change in spleen size, diarrhoea, emaciation, dark brown urine, pyrexia, polydipsia, polyuria, epigastric pain, ascites, coma, change in liver size, dark or light-coloured stools, haemorrhage, and urticaria (Kozat and Sepehrizadeh, 2017). It was estimated that hepatic disease had a prevalence of 3.01% in dogs. Hepatic dysfunction in dogs can be diagnosed by techniques such as hematobiochemical techniques, urine, coproscopical analysis, abdominal radiography (Varshney and Hoque, 2002), ultrasonography (Patel *et al*., 2022) and also with the help of histological (Doi *et al*., 1991) and histochemical evaluation of liver tissue (Banerjee, 2003).

The incidence of hepatic dysfunction in dogs is reported in all age groups, and a study of prevalence helps in predicting the scenario of a particular region regarding this ailment, thereby helping in diagnosis. The prevalence of hepatic dysfunction in dogs was studied in Bangalore, Indore and Nagpur by various researchers (Pradeep *et al*., 2017; Kumbhkar *et al*., 2018; Sameeksha *et al*., 2021). There is no documented research work regarding the prevalence of hepatic dysfunction in and around Pantnagar. Keeping in view the importance of hepatic dysfunction in dogs, the present study was undertaken with the objective to study the clinical prevalence, common clinical manifestations and etiology associated with dogs affected by hepatic dysfunction in and around Pantnagar.

MATERIALS AND METHODS

The present research work was done at the Department of Veterinary Medicine and Dr. I. P. Singh Veterinary Clinical Complex and Trauma Centre, College of Veterinary and Animal Sciences, G. B. P. U. A. & T., Pantnagar, U. S. Nagar (Uttarakhand) during the period of September 2021 to April 2022, where dogs presented with various clinical signs such as icterus, ascites, vomiting, diarrhoea, fever, anorexia, anaemia, weight loss, polydipsia, polyuria, yellow urine and fits mainly indicating gastrointestinal and nervous disorders were screened for liver dysfunction. These dogs were subjected to hematobiochemical, radiographical, urine analysis, faecal analysis and ultrasonographical examination for the diagnosis of hepatic dysfunction, and the prevalence of hepatic dysfunction in and around Pantnagar was also studied during the study period.

Haematological analysis was done with the help of methods given by Jain (1986). Biochemical analysis was done with the help of commercially available kits manufactured by Erba Diagnostics using a Lasany International Limited LI-2700 spectrophotometer. Radiography was performed using Allengers HF X-ray machine in both lateral and ventro dorsal position of dog and ultrasonography was performed with the help of 5D-6000-CD VET machine having millihertz transducer (3.5 MHz) for scanning abdominal organs. Urine

analysis was done to evaluate physical, chemical and microscopic characteristics of the urine. Chemical examination of urine was done with the help of dipstick strips, and microscopic examination was done under high and low power of microscope. Analysis of faecal samples for evaluation of eggs, larvae, oocysts and cysts of various parasites was commonly performed with the help of microscopic examination as given by Soulsby (1982).

RESULTS

Prevalence: A total of 1398 dogs were presented to Dr. I. P. Singh Veterinary Clinical Complex and Trauma Centre, Pantnagar, during the present study. Among them, 762 dogs were found to be showing varied symptoms of gastrointestinal and nervous disorders. Out of these 762 cases, 47 dogs belonging to various ages, breeds and sex were found affected with hepatic dysfunction. Dogs with canine hepatic dysfunction showed a prevalence of 3.36% out of the total number of dogs presented during the study period and a prevalence of 6.21% among cases of gastrointestinal and nervous disorders. The dogs in the present study with signs of hepatic impairment ranged in age from 4.5 months to 11 years, with a mean age of 5.12±0.96 years. Similarly, Strombeck and Gribble (1978) reported a mean age of 5.32 years in dogs with hepatic dysfunction. In terms of age, maximum incidence 12 (25.56%) was seen in dogs with a 4-6 years age group, followed by >8 years age group 10 (21.27%), 1-2 years age group 8 (17.02%), 6-8 years age group 7 (14.89%), 2-4 years age group 6 (12.76%) and <1 year age group 4 (8.51%), respectively (Table 1).

Sex-wise prevalence showed a higher number of females (61.17%) affected with hepatic dysfunction than males (38.83%). Breed-wise prevalence documented a greater number of cases in Mongrel breed 15 (31.91%) followed by Labrador retriever 10 (21.17%), German shepherd 9 (19.14%), Doberman pinscher 4 (8.51%), Pomeranian 3 (6.38%), Rottweiler 2 (4.25%), Pug 2 (4.25%), Pitbull and Himalayan sheep dog 1 (2.12%), respectively (Table 2).

Clinical signs: Clinical manifestations in dogs presented with hepatic dysfunction mainly included pyrexia 22 (46.80%), anorexia 21 (51.06%), vomition 27 (57.44%), emaciation 15 (31.91%), polydipsia 24 (51.06%) polyuria 20 (42.56%), dullness 35 (74.46%), ascites 10 (21.27%), oedema of hind limbs 4 (8.5%), diarrhoea 14 (33.33%), respiratory distress 4 (8.5%), hepatodynia 4 (8.5%), subcutaneous haemorrhages 3 (6.39%), icterus 7 (14.89%), corneal opacity 3 (6.39%), unkempt hair coat 16 (34.04%) and nervous signs 6 (12.76%) (Table 3).

Etiology: In the present study, out of 47 cases presented, the etiology in 15 (31.91%) were

Table 1. Age-wise prevalence of dogs affected with hepatic dysfunction (n= 47)

Age of affected dogs (Year)	No. of dogs affected (n= 47)	Percentage of dogs affected (%)
< 1	4	8.51
1-2	8	17.02
2-4	6	12.76
4-6	12	25.56
6-8	7	14.89
>8	10	21.27
Total	47	100

Table 2. Breed and sex-wise prevalence of dogs with hepatic dysfunction (n= 47)

Sl. No.	Breed	No. of dogs affected (n=47)	Sex wise distribution	
			Male (%)	Female (%)
1.	Labrador retriever	10 (21.27%)	2 (20.00%)	8 (80.00%)
2.	Pomeranian	3 (6.38%)	1 (33.33%)	2 (66.67%)
3.	Pug	2 (4.25%)	0	2 (100%)
4.	Himalayan sheepdog	1 (2.12%)	0	1 (100%)
5.	Doberman pinscher	4 (8.51%)	2 (50.00%)	2 (50.00%)
6.	Mongrel	15 (31.91%)	8 (53.33%)	7 (46.67)
7.	Rottweiler	2 (4.25%)	1 (50.00%)	1 (50.00%)
8.	Pitbull	1 (2.12%)	0	1 (100%)
9.	German shepherd	9 (19.14%)	4 (44.44%)	5 (33.34%)

Table 3. Clinical manifestation of dogs with hepatic dysfunction (n= 47)

Clinical sign	Findings	Total (n= 47)
Temperature	Normal	19 (40.42%)
	Pyrexia	22 (46.80%)
	Subnormal temperature	6 (12.76%)
Appetite	Normal appetite	2 (4.25%)
	Reduced appetite	20 (42.55%)
	Anorexia	25 (53.19%)
Vomition	Frothy	5 (10.63%)
	Yellow	19 (40.42%)
	Hematemesis	3 (6.38%)
	No vomition	20 (42.56%)
Ascites	Present	10 (21.27%)
	Absent	37 (78.72%)
Oedema	Hind legs	4 (8.5%)
Body condition	Emaciated	15 (31.91%)
	Normal	32 (68.08%)
Water intake	Polydipsia	24 (51.06%)
	Normal	13 (27.66%)
	Reduced	10 (21.27%)
Bowel movement problems	Diarrhoea	14 (33.33%)
	Constipation	6 (12.76%)
Respiratory distress	Dyspnoea	2 (4.26%)
Hepatodynia	Severe abdominal pain (position of relief)	4 (8.5%)
Skin bruises	Subcutaneous haemorrhages	3 (6.39%)
Corneal opacity	Blue eye syndrome	3 (6.39%)
Hair coat	Unkempt hair coat	16 (34.04%)
Icterus	Yellow mucous membrane	7 (14.89%)
Nervous manifestations	Nervous disorder	6 (12.76%)

Cont. Table 3.

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Clinical sign	Findings	Total (n= 47)
General activity	Dull/ lethargic	35 (74.46%)
	Normal	12 (25.53%)
Urination	Polyuria	20 (42.56%)
	Oliguria	11 (23.40%)
	Normal urination	16 (34.04%)

either unknown or due to more than one causative agent. Ailments such as canine babesiosis 4 (8.51%) and canine trypanosomiasis 2 (4.25%), intestinal parasitism 6 (12.76%), *Hepatozoon canis* 2 (4.25%), ivermectin overdose 3 (8.51%), paracetamol overdose 4 (8.51%), prolonged drug therapy 8 (17.02%) and infectious canine hepatitis 3 (8.51%) were among the common findings in the etiology of affected cases (Table 4).

Table 4. Various etiology in dogs with hepatic dysfunction (n= 47)

Etiology	Number of cases (n= 47)
Unknown/multiple causes	15 (31.91%)
Canine babesiosis	4 (8.51%)
Canine trypanosomiasis	2 (4.25%)
Hepatozoon canis	2(4.25%)
Ivermectin overdose	3 (8.51%)
Paracetamol overdose	4 (8.51%)
Intestinal parasitism	6 (12.76%)
Prolonged drug therapy	8 (17.02%)
Infectious canine hepatitis	3 (8.51%)

DISCUSSION

The prevalence of hepatic dysfunction in dogs was moderate (3.36%) in and around Pantnagar. This prevalence was almost comparable to that found in a previous study by Kumbhkar *et al.* (2018), who found a prevalence of 3.51%. The number of dogs affected with hepatic dysfunction was highest in the middle age group, i.e., 4-6 years, as compared to dogs belonging to other age groups. The highest number of cases in the 4-6-year age group could be attributed to the fact that the majority of dogs presented in this study belonged to this age group. The age-wise prevalence findings were supported by Vijayakumar *et al.* (2003), who noted that the majority of cases among canines with hepatic dysfunction occurred in the 4-6 years age group. In the present study, female dogs were found to be more affected by hepatic dysfunction as compared to male dogs. Females are outnumbered as compared to males, as they are more inclined to stress than males (Kumbhkar *et al.*, 2018). Bexfield *et al.* (2012) reported a similar finding in which they found more females (326) were affected with canine hepatic dysfunction than males (214). In terms of breed, the Mongrel breed of dogs was found to be more affected by hepatic dysfunction as compared to other breeds of dogs. The highest incidence among the Mongrel breed could be attributed to the greater number of dogs of this breed presented in this study. Contrasting findings were reported by Sameeksha *et al.* (2021), who observed the highest incidence of hepatic disorders in Labrador retriever breeds. Clinical signs manifested by dogs affected by hepatic dysfunction in the present study were varied. Sumathi *et al.* (2017) observed clinical signs of hepatic dysfunction in dogs and documented lethargy, vomiting, polyuria, polydipsia, weight loss, jaundice, diarrhoea, abdominal distention, signs of hepato-encephalopathy, hepatomegaly, urinary incontinence, abdominal fluid wave, pruritis and abdominal pain as clinical manifestations. Similar clinical manifestations were also reported in the present study. The etiology of canine hepatic dysfunction in most of the cases

presented in this study was either unknown or due to multiple etiological agents. This finding was also reported by Poldervaart *et al.* (2009) and Gur and Acra (2011). The results attained in this study could play an important role in understanding canine hepatic dysfunction. Furthermore, the findings can be used for better understanding of the etiological agents of hepatic dysfunction in and around Pantnagar in order to select effective therapeutic agents.

Conflict of interest: Authors have no conflict of interest in this study.

Author's contribution: PV, NA: Involved in investigation, data generation, preparing original draft; MM, AKS: Engaged in conceptualization, data curation, supervision and final editing; AP, JCK: Involved in statistical analysis, methodology and editing.

ACKNOWLEDGEMENT

The authors are thankful to the Dean, College of Veterinary and Animal Science, Pantnagar for providing necessary facilities and aid during the research investigation.

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Received- 17.08.2022, Accepted- 03.12.2022, Published- 28.12.2022 (Online), 01.06.2023 (Print)
Section Editor: Prof. S. K. Nandi, Associate Editor