

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; 10(6): 1197-1202
www.biochemjournal.com
Received: 15-03-2026
Accepted: 18-04-2026

Prutha J Patel
Department of Veterinary
Medicine, College of Veterinary
Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Jignesh A Vala
Department of Veterinary
Clinical Complex, College of
Veterinary Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Saurabh M Parmar
Department of Veterinary
Clinical Complex, College of
Veterinary Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Manish D Patel
Department of Veterinary
Medicine, College of Veterinary
Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Sudhir A Mehta
Department of Veterinary
Medicine, College of Veterinary
Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Corresponding Author:
Prutha J Patel
Department of Veterinary
Medicine, College of Veterinary
Science and Animal
Husbandry, Kamdhenu
University, Navsari, Gujarat,
India

Incidence and Clinicopathological evaluation of hepatic disorders in dogs from South Gujarat: A clinical study

Prutha J Patel, Jignesh A Vala, Saurabh M Parmar, Manish D Patel and Sudhir A Mehta

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i6o.8868>

Abstract

The present study was undertaken to evaluate haemato-biochemical alterations in dogs affected with hepatic disorders and to assess their diagnostic significance. The study was conducted from March 2025 to August 2025 at the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari. Out of 720 dogs presented during the study period, 23 dogs with clinical signs suggestive of hepatic dysfunction were included indicating an overall incidence of 3.19%. Diagnosis was based on detailed clinical examination and laboratory investigations. Chronic hepatitis was the most prevalent hepatic disorder (47.83%) followed by acute hepatitis (34.78%) and cirrhosis (17.39%). Vomiting (65.21%), anorexia (56.52%) and pyrexia (56.52%) were the predominant clinical manifestations. Haematological evaluation revealed significant reductions in haemoglobin, packed cell volume and total erythrocyte count suggestive of anaemia along with leucocytosis. Serum biochemical analysis showed marked elevations in alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, gamma-glutamyl transferase and bilirubin concentrations. Serum albumin levels were decreased, whereas globulin concentrations were increased resulting in a reduced albumin to globulin ratio. Mild increases in creatinine and blood urea nitrogen were also observed in some cases. The findings indicate that canine hepatic disorders are associated with characteristic haemato-biochemical alterations reflecting hepatocellular injury, cholestasis and impaired hepatic synthetic function. Integrated interpretation of these parameters may aid in the diagnosis and clinical management of hepatic disorders in dogs.

Keywords: Canine, hepatic disorders, incidence, Haemato-biochemical changes, chronic hepatitis

Introduction

The liver is a metabolically active organ responsible for a wide range of biochemical, synthetic, excretory and regulatory functions essential for maintaining homeostasis. Blood from the gastrointestinal tract reaches the liver via the portal circulation allowing hepatocytes to metabolize nutrients before their entry into systemic circulation (Center, 1998) ^[4]. The liver plays a central role in carbohydrate, protein and lipid metabolism, bile production, detoxification of endogenous and exogenous substances and synthesis of plasma proteins including albumin and clotting factors. It also regulates hormone metabolism, converts ammonia to urea and facilitates the excretion of bilirubin and waste products (Negasee, 2021) ^[17].

Hepatic disorders are among the leading non-accidental causes of mortality in dogs and often present with vague and nonspecific clinical manifestations posing a diagnostic challenge in Veterinary practice (Tantary *et al.*, 2014) ^[26]. Canine liver diseases are broadly classified as primary or secondary hepatopathies. According to the World Small Animal Veterinary Association (WSAVA), hepatic disorders are categorized into biliary, vascular, parenchymal and neoplastic disorders (Cullen, 2009) ^[7]. Among these, acute and chronic hepatitis are the most frequently encountered conditions in small animals. Secondary hepatic involvement may occur due to infectious, metabolic, toxic or systemic diseases (Dixit *et al.*, 2010) ^[9]. Clinical signs of hepatic disorders range from nonspecific manifestations such as anorexia, vomiting, weight loss, polydipsia and polyuria to more specific findings including jaundice, ascites, coagulopathy and hepatic encephalopathy (Rutgers, 1996; Patel *et al.*, 2022) ^[21, 18].

Because of the diverse functional roles of the liver, hepatic injury is typically reflected in alterations of haematological and serum biochemical parameters. Evaluation of liver function tests (LFTs) including hepatocellular enzymes such as alanine aminotransferase and aspartate aminotransferase and cholestatic markers such as alkaline phosphatase and gamma-glutamyl transferase is routinely used for diagnostic assessment (Hall and German, 2016) ^[11]. Additional parameters like bilirubin, albumin, globulins, blood urea nitrogen and creatinine provide information related to hepatic synthetic capacity and systemic involvement. Although these laboratory parameters are indispensable, they possess inherent limitations in sensitivity and specificity as alterations may also occur in extrahepatic conditions (Thapa and Walia, 2007) ^[28]. Therefore, a comprehensive evaluation of haemato-biochemical alterations is essential for accurate diagnosis, assessment of disease severity and therapeutic planning in dogs with hepatic disorders.

Materials and Methods

Selection Criteria: The present clinical study was conducted from March to August 2025 at the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari. Dogs irrespective of breed, age and sex were presented with clinical signs suggestive of hepatic dysfunction, including anorexia, pyrexia, polyuria, polydipsia, vomiting, diarrhoea, abdominal pain, ascites and jaundice were included in the study. Detailed clinical examination was performed in all cases and diagnosis of hepatic disorders was supported by laboratory investigations.

Haematobiochemical Study

Blood samples were collected aseptically; whole blood in K₂EDTA coated vials was used for haematological evaluation in an automated Blood Cell Counter (MEK-6420P, NIHON KOHDEN, India), while serum was separated using vacutainers containing a clot activator for biochemical analysis. Haematological parameters evaluated included haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leucocyte count (TLC), differential leucocyte count (DLC), erythrocytic indices (MCV, MCH and MCHC) and platelet count. Serum biochemical parameters evaluated included alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), gamma glutamyl transferase (GGT), total protein, albumin, globulin, A:G ratio, total bilirubin, creatinine and blood urea nitrogen (BUN) using standard diagnostic kits and a semi-automatic biochemistry analyzer (Microlab 300).

Statistical Analysis

The obtained data during present study in respect of different parameters were statistically analyzed for mean±standard error.

Results and Discussions

Incidence

A total of 720 fresh canine cases with various medical conditions were presented to the Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari, during March 2025 to August 2025. Among these, 92 dogs were presented for vaccination and routine health check-ups, while the

remaining 628 cases were associated with different disease conditions. Out of these, 23 dogs belonging to different age groups, breeds and sexes were diagnosed with hepatic disorders indicating an overall incidence of 3.19% among the total canine cases presented during the study period. The incidence recorded in the present study was comparable with the findings of Kumbhkar *et al.* (2018) ^[13] and Verma *et al.* (2023) ^[29] who reported incidences of 3.51% and 3.36%, respectively in dogs presented to Veterinary hospitals in Indore and Pantnagar. Likewise, Saravanan *et al.* (2014) ^[22] documented an incidence of 2% in dogs suffering from hepatic insufficiency, whereas Telagar (2017) ^[27] reported a comparatively lower incidence of 0.75% in the clinical population studied. Variations in incidence among different studies may be attributed to differences in geographical location, hospital population, management practices, breed distribution, diagnostic approaches and the prevalence of concurrent infectious or metabolic disorders. The present findings suggest that hepatic disorders constitute an important clinical problem in canine practice and emphasize the need for early diagnosis and appropriate therapeutic intervention.

Out of the 23 cases of hepatic disorders, chronic hepatitis was the predominant condition, accounting for 47.82% (11/23) of the affected dogs. Among these, 90.9% (10/11) were diagnosed with primary chronic hepatitis, while 9.09% (1/11) presented with hepatic abscess associated with chronic hepatitis. Acute hepatitis was the second most common disorder, with an incidence of 34.78% (8/23). Of these, 75% (6/8) were classified as primary acute hepatitis, whereas lymphoma-associated acute hepatitis and hepatomegaly were each recorded in 12.5% (1/8) of the cases. Cirrhosis accounted for 17.39% (4/23) of the total hepatic disorders. Within this category, 50% (2/4) of the dogs had uncomplicated cirrhosis, while the remaining 50% (2/4) exhibited cirrhosis associated with hepatic tumours. Overall, chronic hepatitis showed the highest incidence (47.82%) followed by acute hepatitis (34.78%) and cirrhosis (17.39%). The predominance of chronic hepatitis in the present study is in agreement with the findings of Poldervaart *et al.* (2009) ^[19], who reported a 66.33% prevalence of chronic hepatitis in dogs with primary hepatic diseases. Similarly, Assawarachan *et al.* (2019) ^[1] observed chronic hepatitis (57.5%) as the most frequent hepatic disorder. Wilkinson *et al.* (2022) ^[30] also reported chronic hepatitis (22.2%) as the leading histopathological finding in dogs with liver disease.

The dogs in the present study presenting with hepatic disorders ranged in age from 7 months to 14 years with a mean age of 6.92±0.16 years. The maximum incidence was observed in the 5-10 years age group accounting for 39.13% (9/23) of cases followed by the >1-5 years age group with 34.78% (8/23), >10-15 years age group with 21.74% (5/23) and up to 1 year age group with 4.35% (1/23) (Table 1). These findings indicate a higher predisposition of hepatic disorders in middle-aged to older dogs. The higher occurrence in the middle-aged group may be attributed to the fact that most clinical cases presented during the study period belonged to this age group. Similar observations were reported by Poldervaart *et al.* (2009) ^[19], who documented a predominance of acute and chronic hepatitis in middle-aged dogs with a mean age ranging from 5.9 to 7.7 years. Bexfield *et al.* (2012) ^[3] also reported a median age of 8 years in dogs diagnosed with chronic hepatitis.

Sex-wise incidence revealed a higher occurrence in females 56.52% (13/23) compared to males 43.47% (10/23) (Table 2). The higher predisposition in females may be associated with increased physiological stress and hormonal influences, as suggested by Verma *et al.* (2023) [29]. This finding is in agreement with Loan *et al.* (2025) [15] and Kumbhkar *et al.* (2018) [13] who also reported a higher prevalence of hepatobiliary disorders in females with incidences of 56.3% and 57.89%, respectively.

Breed-wise analysis revealed that Labrador Retrievers were most commonly affected, accounting for 43.48% (10/23) of cases followed by German Shepherds and non-descript dogs each contributing 13.04% (3/23). Beagles and Golden Retrievers each accounted for 8.70% (2/23), while Lhasa Apso, Rottweiler, and Husky breeds each contributed 4.35% (1/23) of cases (Table 3). The breed predisposition in Labrador Retrievers may suggest a genetic susceptibility to hepatic disorders.

Among disease categories, chronic hepatitis was most frequently observed in Labrador Retrievers, accounting for 36.36% (4/11) of chronic hepatitis cases, followed by German Shepherds at 18.18% (2/11). Beagle, Golden Retriever, Rottweiler, Husky and non-descript breeds each contributed 9.09% (1/11). In acute hepatitis cases, Labrador Retrievers showed the highest incidence at 62.5% (5/8) followed by non-descript dogs at 25% (2/8) and German Shepherds at 12.5% (1/8). Cirrhosis was observed equally among Beagle, Labrador Retriever, Lhasa Apso, and Golden Retriever breeds, each accounting for 25% (1/4) of cases. The predominance of hepatic disorders in Labrador Retrievers is consistent with previous studies by Poldervaart *et al.* (2009) [19] and Bexfield *et al.* (2012) [3], who identified this breed as having the highest prevalence of chronic hepatitis. Similarly, Lakshmi *et al.* (2017) [14], Telagar (2017) [27] and Kumbhkar *et al.* (2018) [13] also reported a higher occurrence of hepatic disorders in Labrador Retrievers with incidences of 22.86%, 30.90% and 21.06%, respectively.

Clinical Signs

In the present study, hepatic disorders were characterized by vomiting in 65.21% (15/23) of cases followed by anorexia and pyrexia in 56.52% (13/23) each. Polydipsia was observed in 47.82% (11/23) of cases, while polyuria and ascites were each recorded in 43.47% (10/23). Inappetence and abdominal pain were noted in 34.78% (8/23) of cases each. Icterus was observed in 26.08% (6/23) and diarrhoea in 21.73% (5/23) cases (Table 4). The predominance of vomiting, anorexia, and pyrexia indicates primary gastrointestinal involvement along with systemic inflammatory response in hepatic dysfunction. Similar observations were reported by Telagar (2017) [27], who documented anorexia (50.00%) and fever (48.18%) as common clinical signs in hepatic diseases. Verma *et al.* (2023) [29] also reported vomiting (57.44%) and anorexia (53.19%) as the most frequent clinical manifestations.

Polydipsia and polyuria observed in the present study suggest impaired renal concentrating ability secondary to hepatic insufficiency. Comparable findings were reported by Chaudhary *et al.* (2008) [5] who observed polyuria (44%) and polydipsia (42.5%) in dogs with hepatopathies. Poldervaart *et al.* (2009) [19] also reported polyuria-polydipsia as a common feature in primary hepatitis. The occurrence of ascites and icterus further reflects advanced

hepatic dysfunction associated with portal hypertension and impaired bilirubin metabolism.

Haematological Analysis

The mean haematological values of dogs affected with hepatic disorders (n = 23) are presented in Table 5. Overall, a consistent reduction in erythrocytic parameters was observed across hepatic conditions. Haemoglobin (Hb), Packed cell volume (PCV) and Total Erythrocyte Count (TEC) were decreased in affected dogs indicating anaemia associated with hepatic dysfunction. Hb was reduced in 86.96% of cases, PCV in 82.61% and TEC in 65.22% of cases. Similar reductions in erythrocytic parameters have been reported by Tantary *et al.* (2014) [26] and Saravanan *et al.* (2014) [22] suggesting impaired erythropoiesis due to chronic hepatic insufficiency, nutritional deficiency and altered protein synthesis (Stockham and Scott, 2008) [24]. A mild decrease in erythrocyte indices (MCV, MCH, MCHC) was also observed particularly in chronic hepatitis cases indicating a trend toward normocytic to mildly hypochromic anaemia. In chronic hepatitis, persistent inflammation and impaired hepatic metabolism likely contribute to suppression of erythropoiesis. Similar findings were reported by Poldervaart *et al.* (2009) [19], who observed reduced haematocrit and platelet counts along with leucocytosis in chronic hepatitis. Leucocytosis was a consistent finding across hepatic disorders with highest total leukocyte count (TLC) observed in chronic hepatitis ($33.37 \pm 5.04 \times 10^3/\mu\text{L}$) followed by acute hepatitis and cirrhosis. This indicates active inflammatory response and hepatocellular injury. Comparable increases in TLC have been reported by Saravanan *et al.* (2014) [22] and Telagar (2017) [27]. Thrombocytopenia was observed in 52.17% of cases, particularly in chronic hepatitis. This may be attributed to reduced hepatic synthesis of thrombopoietic factors and increased peripheral destruction as also reported by Poldervaart *et al.* (2009) [19] and Telagar (2017) [27]. Among differential leukocyte counts, neutrophilia was observed in all groups most marked in cirrhosis indicating ongoing inflammation, possible endotoxaemia and secondary infections in advanced hepatic disease. These findings are supported by Poldervaart *et al.* (2009) [19], Tantary *et al.* (2014) [26] and Elhiblu *et al.* (2015) [10]. Lymphopenia was more prominent in chronic hepatitis, while relatively higher lymphocyte percentages were noted in acute hepatitis, suggesting stress-mediated lymphocyte suppression in chronic disease states (Sumathi *et al.*, 2017) [25]. Eosinophils and monocytes remained within normal physiological limits in all groups. Overall, the haematological profile in hepatic disorders was characterized by anaemia, leukocytosis, and thrombocytopenia, reflecting chronic inflammatory response, impaired hepatic function and altered bone marrow activity.

Biochemical analysis

The mean $\pm$ SE values of liver and kidney function parameters in dogs with hepatic disorders are presented in Table 6. Overall, elevated levels of hepatic enzymes (AST, ALT, ALP, GGT), serum globulin, bilirubin fractions (total, direct, indirect) and renal parameters (BUN and creatinine) were observed indicating hepatocellular damage and altered metabolic clearance. These findings are in agreement with Schwartz *et al.* (2006) [23], Chaudhary *et al.* (2008) [5],

Poldervaart *et al.* (2009) [19] and Tantary *et al.* (2014) [26]. Among hepatic enzymes, AST was highest in chronic hepatitis followed by cirrhosis and acute hepatitis. ALT was elevated across all conditions with relatively comparable increases among chronic hepatitis, acute hepatitis and cirrhosis. ALP showed marked elevation in all groups, while GGT was particularly increased in chronic hepatitis and cirrhosis compared to acute hepatitis suggesting varying degrees of hepatocellular and cholestatic involvement. Total protein remained within or slightly above the reference range with higher values observed in acute hepatitis. However, serum albumin was consistently decreased across all hepatic conditions with the lowest levels recorded in chronic hepatitis. In contrast, serum globulin was elevated in chronic hepatitis and acute hepatitis, while remaining relatively normal in cirrhosis. Consequently, a reduced albumin: globulin (A:G) ratio was observed in all groups most prominently in chronic hepatitis. The elevation of aminotransferases reflects hepatocellular injury and inflammation, while comparatively moderate enzyme levels in chronic conditions may indicate reduced functional hepatocyte mass. Similar observations were reported by Poldervaart *et al.* (2009) [19], who documented increased ALT and ALP in both acute and chronic hepatitis cases. Elevation of ALP and GGT, particularly in acute hepatitis suggests early cholestasis or bile canaliculi injury, as also described by Chaudhary *et al.* (2008) [5] and Saravanan *et al.* (2014) [22]. Hypoalbuminemia and reduced A:G ratio observed in the present study indicate impaired hepatic synthetic function and chronic inflammatory response, with compensatory hyperglobulinemia. Comparable findings were reported by Saravanan *et al.* (2014) [22], Elhiblu *et al.* (2015) [10], Patel *et al.* (2022) [18], Kumbhkar *et al.* (2018) [13] and Prebavathy *et al.* (2020) [20]. Mild to moderate hyperbilirubinemia observed in chronic hepatitis is likely due to cholestasis, impaired bilirubin metabolism and hepatocellular dysfunction consistent with findings of Tantary *et al.* (2014) [26] and Kumbhkar *et al.* (2018) [13]. Renal parameters (BUN and creatinine) were also elevated in affected dogs suggesting possible prerenal azotemia secondary to dehydration, reduced hepatic perfusion or concurrent hepatorenal involvement. Similar biochemical alterations have been reported by Elhiblu *et al.* (2015) [10]

and Das and Lodh (2024) [8] in dogs with advanced hepatic disease and cirrhosis.

Table 1: Age wise incidence of Hepatic disorders in dogs (n = 23)

S.N.	Age	No. of cases	Percent (%)	χ^2 value	P value
1	Upto 1 years	1	4.35	10.26	<0.01*
2	>1-5 years	8	34.78		
3	>5-10 years	9	39.13		
4	>10-15 years	5	21.74		

*p<0.05: Highly significant

Table 2: Sex wise incidence of hepatic disorders in dogs (n = 23)

S.N.	Gender	No. of Cases	Percent (%)	χ^2 value	P value
1	Female	13	56.52	4.32	0.03*
2	Male	10	43.47		

*p<0.05: Significant

Table 3: Breed wise incidence of hepatic disorders in dogs (n = 23)

Sr. No	Dog Breed	No. of cases	Percent (%)	χ^2 value	P value
1	Labrador Retrievers	10	43.48	25.89	<0.01*
2	German Shepherd	3	13.04		
3	Non-descript	3	13.04		
4	Beagle	2	8.70		
5	Golden Retrievers	2	8.70		
6	Rottweiler	1	4.35		
7	Huskey	1	4.35		
8	Lhasa Apso	1	4.35		

*p<0.01: Highly significant

Table 4: Frequency distribution of clinical signs in dogs affected with hepatic disorders (n = 23)

S.N.	Clinical signs	No. of cases	Percent (%)
1	Vomiting	15	65.21
2	Anorexia	13	56.52
3	Pyrexia	13	56.52
4	Polydypsia	11	47.82
5	Polyuria	10	43.47
6	Ascites	10	43.47
7	Abdominal pain	08	34.78
8	Inappetence	08	34.78
9	Icterus	06	26.08
10	Diarrhoea	05	21.73

Table 5: The Mean haematological value of dogs affected with hepatic disorders (n = 23)

Sr. No.	Parameter	Mean $\pm$ SE				Reference range*
		All hepatic disorders (23)	Chronic Hepatitis (11)	Acute Hepatitis (8)	Cirrhosis (4)	
1.	Hb (g/dL)	08.47 $\pm$ 0.5	07.24 $\pm$ 0.6	09.38 $\pm$ 0.91	09.42 $\pm$ 1.28	11.9-18.9
2.	PCV (%)	26.55 $\pm$ 1.62	22.91 $\pm$ 1.74	30.06 $\pm$ 2.83	27.77 $\pm$ 4.49	35-57
3.	TEC (10 ⁶ / μ L)	04.37 $\pm$ 0.25	03.73 $\pm$ 0.3	04.62 $\pm$ 0.4	05.41 $\pm$ 0.63	4.95-7.87
4.	MCV (fL)	61.02 $\pm$ 1.84	61.91 $\pm$ 2.81	64.78 $\pm$ 2.15	50.37 $\pm$ 2.57	66-77
5.	MCH (pg)	19.36 $\pm$ 0.54	19.42 $\pm$ 0.85	20.22 $\pm$ 0.88	17.3 $\pm$ 0.47	21.0-26.2
6.	MCHC (g/dL)	31.86 $\pm$ 0.55	31.45 $\pm$ 0.84	31.17 $\pm$ 0.74	34.47 $\pm$ 1.29	32.0-36.3
7.	TLC (10 ³ / μ L)	26.46 $\pm$ 3.45	33.37 $\pm$ 5.04	22.76 $\pm$ 5.58	17.5 $\pm$ 7.09	5.4-14.1
8.	Platelet count (10 ⁵ / μ L)	02.5 $\pm$ 0.27	02.14 $\pm$ 0.19	02.49 $\pm$ 0.43	03.43 $\pm$ 1.19	2.11-6.21
9.	Neutrophil (%)	74.73 $\pm$ 3.76	74.7 $\pm$ 8.24	72.33 $\pm$ 3.13	80.25 $\pm$ 3.83	58-85
10.	Lymphocyte (%)	16.47 $\pm$ 2.11	12.4 $\pm$ 3.41	22 $\pm$ 2.81	14.25 $\pm$ 3.96	8-21
11.	Eosinophil (%)	02.04 $\pm$ 0.19	01.9 $\pm$ 0.23	02.22 $\pm$ 0.4	02.0 $\pm$ 0.4	0-9
12.	Monocyte (%)	03.21 $\pm$ 0.35	2.9 $\pm$ 0.43	3.44 $\pm$ 0.76	3.5 $\pm$ 0.5	2-10

*The Merck Veterinary Manual, 2016

Table 6: The mean value of liver and kidney function test of dogs affected with hepatic disorders (n = 23)

S.N.	Parameter	Mean±SE				Reference range*
		All hepatic disorders (23)	Chronic Hepatitis (11)	Acute Hepatitis (8)	Cirrhosis (4)	
1	AST (IU/L)	83.18±17.16	110.53±28.56	47.81±16.61	78.72±46.47	23-66
2	ALT (IU/L)	113.8±20	113.26±29.53	117.84±30.85	108.01±66.44	21-102
3	ALP (IU/L)	636.37±122.36	654.11±211.43	632.65±176.87	595.06±273.27	20-156
4	GGT (IU/L)	22.95±4.96	27.9±8.24	10.91±6.54	33.46±7.93	1.2-6.4
5	Total Protein (g/dL)	06.89±0.42	6.56±0.43	7.65±1.02	6.29±0.75	5.4-7.1
6	Serum Albumin (g/dL)	02.17±0.17	1.82±0.22	2.5±0.19	2.5±0.63	2.6-3.3
7	Serum Globulin (g/dL)	04.71±0.39	4.74±0.42	5.1±0.94	3.78±0.51	2.7-4.4
8	A: G ratio	0.54±0.07	0.46±0.11	0.57±0.08	0.73±0.26	0.59-1.11
9	Total Bilirubin (mg/dL)	02.07±0.71	1.51±0.64	3.27±1.85	1.2±0.59	0.10-0.50
10	Direct Bilirubin (mg/dL)	01.64±0.59	1.18±0.6	2.55±1.48	1.09±0.57	0.06-0.12
11	Indirect Bilirubin (mg/dL)	0.42±0.18	0.33±0.08	0.71±0.51	0.1±0.03	0.01-0.49
12	Serum creatinine (mg/dL)	02.81±0.53	2.25±0.44	4.22±1.3	1.61±0.41	0.5-1.5
13	BUN (mg/dL)	51.33±6.81	47.15±6.86	61.43±15.95	42.64±10.15	10-28

*Kaneko *et al.* (2008) ^[12]**Conflict of Interest**

Authors have no conflict of interest in this study.

Data availability

Data set compiled during research will be available from corresponding author on reasonable request.

Ethical statement

Materials for the study were obtained by compiling the routine clinical cases that came for examination at Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari.

Acknowledgement

The authors are thankful to the technical support and facilities received from the Principal, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari.

References

- Assawarachan SN, Chuchalermporn P, Maneesaay P, Thengchaisri N. Evaluation of hepatobiliary ultrasound scores in healthy dogs and dogs with liver diseases. *Vet World*. 2019;12(8):1266-1272. doi:10.14202/vetworld.2019.1266-1272.
- Bexfield N. Canine idiopathic chronic hepatitis. *Vet Clin Small Anim Pract*. 2017;47(3):645-663. doi:10.1016/j.cvsm.2016.11.012.
- Bexfield NH, Buxton RJ, Vicek TJ, Day MJ, Bailey SM, Haugland SP, *et al.* Breed, age and gender distribution of dogs with chronic hepatitis in the United Kingdom. *Vet J*. 2012;193(1):124-128.
- Center SA. Nutritional support for dogs and cats with hepatobiliary disease. *J Nutr*. 1998;128(12 Suppl):2733S-2746S. doi:10.1093/jn/128.12.2733S.
- Chaudhary PS, Varshney JP, Deshmukh VV. Application of ultrasonography, radiography and clinico-biochemical profile in the diagnosis of hepatic diseases and their clinical management. *Intas Polivet*. 2008;9(2):168-176.
- Chikazawa S, Nakazawa T, Hori Y, Hoshi F, Kanai K, Ito N, *et al.* Change in serum ferritin concentration in experimentally induced anemia of chronic inflammation in dogs. *J Vet Med Sci*. 2013;75(11):1419-1426. doi:10.1292/jvms.13-0149.
- Cullen JM. Summary of the World Small Animal Veterinary Association standardization committee guide to classification of liver disease in dogs and cats. *Vet Clin North Am Small Anim Pract*. 2009;39(3):395-418. doi:10.1016/j.cvsm.2009.02.003.
- Das S, Lodh C. Diagnostic studies in canine hepatic cirrhosis. *Indian J Canine Pract*. 2024;16(1):28-32. doi:10.29005/ijcp.2024.16.1.028-032.
- Dixit P, Varshney JP, Dixit AK, Shukla PC. Liver diseases in dogs—a prospective study. *Intas Polivet*. 2010;11(2):360-365.
- Elhiblu MA, Dua K, Mohindroo J, Mahajan SK, Sood NK, Dhaliwal PS, *et al.* Clinico-hemato-biochemical profile of dogs with liver cirrhosis. *Vet World*. 2015;8(4):487-491. doi:10.14202/vetworld.2015.487-491.
- Hall EJ, German AJ. Laboratory evaluation of hepatic disease. In: *BSAVA Manual of Canine and Feline Clinical Pathology*. Gloucester: BSAVA; 2016. p. 237-261. doi:10.22233/9781910443255.12.
- Kaneko JJ, Harvey JW, Bruss ML. *Clinical Biochemistry of Domestic Animals*. 6th ed. Amsterdam: Academic Press; 2008.
- Kumbhkar Y, Bagherwal RK, Mehta HK, Badsar P. A preliminary study on prevalence of hepatic disorders in dogs in Indore district (MP). *Indian J Vet Sci Biotechnol*. 2018;13(3):1-5. doi:10.21887/ijvsbt.v13i03.10617.
- Lakshmi K, Padmaja K, Nagaraj P, Reddy AG, Prakash MG. Incidence of hepatobiliary disorders in dogs. *Pharma Innov J*. 2017;6(5 Part B):70-72.
- Loan NVTH, Van Chao N, Nhung TT. Clinical features and hematological and biochemical blood parameters of dogs with hepatobiliary disorders. *Vet World*. 2025;18(4):986-993. doi:10.14202/vetworld.2025.986-993.
- Merck Veterinary Manual. 11th ed. New Jersey: Merck Publishing Group; 2016.
- Negasee KA. Hepatic diseases in canine and feline: A review. *Vet Med Open J*. 2021;6(1):22-31. doi:10.17140/VMOJ-6-155.
- Patel MD, Parikh PV, Barot HM. Clinical, ultrasonographic and haemato-biochemical assessment of liver and gall bladder affections in dogs. *Indian J Vet Sci Biotechnol*. 2022;18(1):65-71. doi:10.21887/ijvsbt.18.1.13.
- Poldervaart JH, Favier RP, Penning LC, Van den Ingh TSGAM, Rothuizen J. Primary hepatitis in dogs: a

- retrospective review (2002-2006). *J Vet Intern Med*. 2009;23(1):72-80.
doi:10.1111/j.1939-1676.2008.0215.x.
20. Prebavathy T, Amaravathi P, Rajesh K, Vaikuntarao V, Bharathi S, Raghunath M, *et al*. Haematobiochemical alterations in hepatic diseases in dogs. *J Entomol Zool Stud*. 2020;8(5):1382-1384.
doi:10.22271/j.ento.2020.v8.i5s.7698.
21. Rutgers C. Liver disease in dogs. In *Pract*. 1996;18(9):433-444.
22. Saravanan M, Mondal DB, Sarma K, Mahendran K, Vijayakumar H, Sasikala V, *et al*. Comprehensive study of haemato-biochemical, ascitic fluid analysis and ultrasonography in the diagnosis of ascites due to hepatobiliary disorders in dog. *Indian J Anim Sci*. 2014;84(5):503-506. doi:10.56093/ijans.v84i5.40649.
23. Schwartz SGH, Mitchell SL, Keating JH, Chan DL. Liver lobe torsion in dogs: 13 cases (1995-2004). *J Am Vet Med Assoc*. 2006;228(2):242-247.
doi:10.2460/javma.228.2.242.
24. Stockham SL, Scott MA. *Fundamentals of Veterinary Clinical Pathology*. 2nd ed. Oxford: Wiley-Blackwell; 2008.
25. Sumathi D, Prathaban S, Selvaraj P, Dhanapalan P, Murali Manohar B, Kumanan K. Clinicopathological changes in hepatobiliary disorders in dogs. *Indian J Vet Med*. 2017;37(2):29-35.
26. Tantary HA, Soodan JS, Chirag S, Ansari MM, Kumar S, Imtiyaz T. *Diagnostic studies in dogs with hepatic disorders*. 2014.
27. Telagar VN. *Studies on Clinicopathological and Ultrasonographic Evaluation of Hepatic Disorders in Dogs* [doctoral dissertation]. Bidar: Karnataka Veterinary Animal and Fisheries Sciences University; 2017.
28. Thapa BR, Walia A. Liver function tests and their interpretation. *Indian J Pediatr*. 2007;74(7):663-671.
doi:10.1007/s12098-007-0118-7.
29. Verma P, Arora N, Mrigesh M, Singh AK, Kalita JC, Prasad A, *et al*. Prevalence, clinical manifestations and etiology of canine hepatic dysfunction in and around Pantnagar. *Indian J Anim Health*. 2023;62(1):88-94.
doi:10.36062/ijah.2022.10522.
30. Wilkinson A, Panciera D, DeMonaco S, Boes K, Leib M, Clapp K, *et al*. Platelet function in dogs with chronic liver disease. *J Small Anim Pract*. 2022;63(2):120-127.
doi:10.1111/jsap.13342.