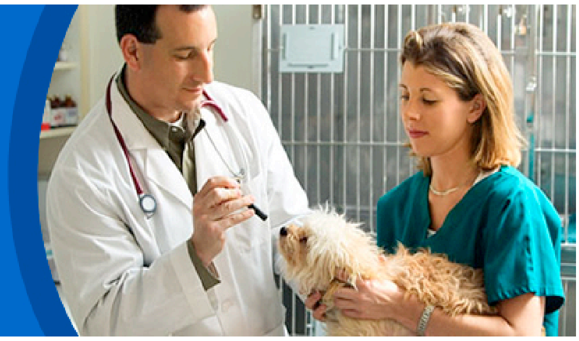
International Journal of Veterinary Sciences and Animal Husbandry



**ISSN:** 2456-2912
NAAS Rating (2026): 4.61
VET 2026; 11(1): 44-48

www.veterinarypaper.com
Received: 25-11-2025
Accepted: 27-12-2025

**Amal KA**
M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

**V Devi Prasad**
Professor and Head, Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, India

**Bhagyasri Kondeti**
M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

**Anjana Prasad**
M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

**Makkena Sreenu**
Dean, College of Veterinary Science, Garividi Sri Venkateswara Veterinary University, Tirupati, India

**Y Chaitanya**
Assistant Professor, Department of Veterinary Medicine, NTR College of Veterinary Science Gannavaram, Sri Venkateswara Veterinary University, Tirupati, India

**Corresponding Author**
**Amal KA**
M.V.Sc. Scholar, Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India

# Prevalence, clinical profile and integrated laboratory and biomarker analysis of cardiac disorders in dogs

**Amal KA, V Devi Prasad, Bhagyasri Kondeti, Anjana Prasad, Makkena Sreenu and Y Chaitanya**

**DOI:** https://www.doi.org/10.22271/veterinary.2026.v11.i1a.2918

**Abstract**
This study evaluated the prevalence, clinical features, and hematobiochemical alterations of cardiac disorders in dogs under Indian clinical conditions. Out of 3,043 dogs presented to a university teaching hospital, 42 were confirmed with cardiac diseases with a prevalence of 1.38%. Cardiac disorders were the most common in geriatric and middle-aged males. Large breeds, including Labrador Retrievers, German Shepherds, and Great Danes, had dilated cardiomyopathy, whereas Spitz dogs were diagnosed with myxomatous valvular disease. Lifestyle factors such as overweight, commercial feeding, and indoor air-conditioned housing were observed as predisposing factors. Haematological findings revealed anaemia, neutrophilic leucocytosis, lymphopenia, and elevated ESR, while serum biochemistry indicated secondary hepatic and renal involvement. Cardiac troponin I was proved as a sensitive biomarker of myocardial injury, supporting early diagnosis and prognostication. Integrated clinical, laboratory, and biomarker evaluation is essential for timely intervention, improved prognosis, and enhanced quality of life in affected dogs.

**Keywords:** Canine cardiac disease, haemato-biochemical parameters, cardiac troponin I, prevalence

## 1. Introduction

In India, the pet dog population grew from 19.5 million in 2018 to a projected 31 million by 2023 alongside a rise in lifestyle-related disorders. Among the latter, acquired cardiac diseases account for nearly 95% of canine heart conditions and often progress to fatal congestive heart failure (MacPete, 2018) [14]. Delayed diagnosis and therapy worsen prognosis (Vengsarkar, 1988) [21]. Although epidemiological data indicate rising prevalence and improved recognition, diagnosis remains challenging due to nonspecific signs, such as abdominal distension, positional respiratory distress, and nocturnal coughing, which often overlap with primary respiratory disorders, complicating early detection. Many of these clinical signs overlap with those of primary respiratory disorders, particularly coughing and dyspnoea, thereby limiting diagnostic reliability and complicating early detection of congestive heart failure.

Thoracic radiography remains the most commonly performed investigation in small animal practice (Root and Bahr, 2002) [17]. However, a definitive diagnosis cannot be established based on radiography alone, as certain cardiac conditions, including arrhythmias and mild valvular insufficiencies, do not consistently result in detectable cardiac enlargement (Kraetschmer *et al*., 2008) [10]. Moreover, thoracic radiography has variable sensitivity and specificity, especially with concurrent cardiac and pulmonary disease, limiting its standalone diagnostic value. Hence, comprehensive evaluation appears complimentary using haematological and biochemical changes which often accompany cardiac diseases, reflecting reduced cardiac output, tissue hypoxia, organ congestion, and metabolic disturbances. There is also a growing need for simple, sensitive, cardiac-specific biomarkers for early detection, risk stratification, and staging, particularly in predisposed dogs (Linklater *et al*., 2007) [12].

## 2. Materials and Methods

The present study, was undertaken to determine the incidence of cardiac diseases in dogs presented to the Department of Veterinary Surgery and Radiology, NTR College of Veterinary Science, Gannavaram with clinical signs suggestive of heart disease, such as ascites, nocturnal cough, respiratory stridor, fatigue, and exercise-induced dyspnoea. Details regarding age, sex, breed, body weight, and reproductive status (intact, spayed, or castrated) were recorded for all dogs to assess susceptibility related to age, gender, breed, obesity, and hormonal influence. The collected data were statistically analysed to determine prevalence patterns associated with individual factors.

Each dog underwent a thorough clinical evaluation and detailed physical examination. Clinical signs, including dyspnoea, exercise intolerance, syncope, stridor, persistent or nocturnal cough, anorexia, oedema, fatigue, weight loss, cyanosis, and tachycardia were systematically documented. Selected cases were subsequently subjected to haematological and serum biochemical investigations. Routine haematological parameters were evaluated following standard methods as described by Schalm *et al*. (1975) [18]. Serum biochemical parameters *viz* total protein, albumin, serum creatinine, alanine aminotransferase (ALT), and (CRP) were estimated. Dogs exhibiting clinical signs suggestive of cardiac disease were further evaluated for cardiac troponin I (cTnI) using the Fine care Fluorescence Immunoassay System for rapid quantitative estimation of this cardiac-specific biomarker. The data obtained were subjected to appropriate statistical analysis using SPSS software version 20.

## 3. Results and Discussion

In the present study, out of 3,043 dogs presented during the study period and 164 with clinical signs suggestive of cardiac disease were subjected to detailed evaluation, out of which 42 had cardiac diseases, yielding an overall prevalence of 1.38%. This finding is comparable to the prevalence of approximately 1% reported by Fischer *et al*. (2001) [6] in dogs but lower than that reported by Häggström *et al*. (2004) [7], The comparatively lower prevalence observed may be attributed to underestimation of cardiac diseases, particularly dilated cardiomyopathy, in which sudden death may precede clinical diagnosis (Calvert and Meurs, 2000) [4]. Breed-wise prevalence of cardiac diseases is presented in Table 1. Among the 42 dogs affected, the highest prevalence was observed in Labrador Retrievers (28.57%), followed by Spitz (19.06%) and German Shepherds (16.67%). This finding is consistent with earlier reports highlighting predisposition to DCM in large breed dogs (Vezzosi *et al*., 2020) [22]. The observed breed-wise variation may also reflect regional breed popularity and case representation, as suggested by Martin *et al*. (2009) [15]. Age-wise distribution of cardiac diseases is presented in Table 2. Among the 42 affected dogs, the highest prevalence was observed in geriatric dogs (42.86%), followed by middle-aged (33.33%), young adult (19.05%), and young dogs (4.76%). The predominance of cardiac diseases in older dogs may be attributed to age-related degenerative changes, cumulative cardiovascular stress, and prolonged exposure to predisposing factors as also observed by (Martin *et al*., 2009) [15].

Sex-wise prevalence is summarized in Table 3. Out of the 42 affected dogs, males constituted 73.81%, while females accounted for 26.19%. Intact animals of both sexes were more frequently affected than gonadectomized dogs. The higher prevalence in males concurs with earlier reports suggesting a male predisposition to canine cardiac diseases (Martin *et al*., 2009) [15]. However, contrasting observations of higher incidence in females have also been reported by Kumar *et al*. (2014) [11]. Notably, reduced risk of dilated cardiomyopathy in neutered males, as reported by Belanger *et al*. (2017), suggests a contributory role of sex hormones, particularly testosterone, in disease expression.

Body weight-wise prevalence of cardiac diseases is presented in Table 4. Among the 42 affected dogs, 47.62% were overweight, 50.00% had normal body weight, and only 2.38% were underweight. Similar associations were also reported by Chetboul *et al*. (2004) [5]. Managemental factors revealed that 66.67% of affected dogs were fed commercial diets and 73.81% were maintained under air-conditioned housing. These practices may indirectly contribute to cardiac disease development through reduced physical activity, obesity, and associated metabolic stress.

The haematological findings of the 42 dogs included in the present study are summarized in Table.5. The concurrent reduction in haemoglobin, PCV, and TEC suggests a

**Table 1:** Breed wise incidence of cardiac disease in dogs (n= 42)

| SI. No. | Breeds | No. of animals diagnosed with cardiac disease | Percentage |
|---|---|---|---|
| 1. | Labrador Retriever | 12 | 28.57 |
| 2. | Spitz | 8 | 19.06 |
| 3. | German Shepherd | 7 | 16.67 |
| 4. | Pug | 5 | 11.90 |
| 5. | Mongrel | 4 | 9.52 |
| 6. | Great Dane | 2 | 4.76 |
| 7. | Beagle | 1 | 2.38 |
| 8. | Boxer | 1 | 2.38 |
| 9. | Dachshund | 1 | 2.38 |
| 10. | Shih Tzu | 1 | 2.38 |
| | Total | 42 | 100 |

**Table 2:** Age wise incidence of cardiac disease in dogs (n= 42)

| SI. No. | Age Group | No. of animals diagnosed with cardiac disease Percentage | Percentage |
|---|---|---|---|
| 1. | >9 years | 18 | 42.86 |
| 2. | 5-9 years | 14 | 33.33 |
| 3. | 1-5 years | 8 | 19.05 |
| 4. | < 1 year | 2 | 4.76 |
| | Total | 42 | Total 42 100 |

**Table 3:** Sex wise incidence of cardiac disease in dogs (n=42)

| SI No. | Sex | | No. of animals diagnosed with cardiac disease Percentage | Percentage |
|---|---|---|---|---|
| 1. | Male* | Intact | 25 | 80.65 |
| | | Castrated | 6 | 19.35 |
| 2. | Female** | Intact | 9 | 81.82 |
| | | Spayed | 2 | 18.18 |
| | Total | | 42 | |

Among 42, *Male-31 (73.81%) and **Female-11 (26.19%)

Normocytic normochromic anaemia, likely due to haemodilution associated with congestive heart failure. Neutrophilia with a left shift and lymphopenia indicated a stress-related or inflammatory response. The elevated values of ESR were thought to reflect the ongoing inflammatory activity. These findings are consistent with those of Amaravathi *et al*. (2019) [1]. The anaemic profile observed in the present study is likely attributable to haemodilution secondary to fluid retention in congestive heart failure, as suggested by Martin *et al*. (2009) [15].

The serum biochemical parameters estimated in dogs affected with cardiac diseases are presented in Table.6. Hypoproteinaemia and hypoalbuminemia were observed in seven dogs (16.67%). The concurrent reduction in total protein and albumin may be attributed to hepatic congestion, impaired hepatic synthesis, protein-losing enteropathy, or dilutional effects associated with chronic heart failure. Elevated levels of ALT in 11 dogs and AST in 10 dogs were observed which indicated hepatocellular injury or passive hepatic congestion secondary to impaired venous return. These findings corroborated earlier reports of Jan *et al*. (2018) [9] and Amaravathi *et al.* (2019) [1], highlighting the systemic impact of chronic cardiac dysfunction on hepatic metabolism.

Elevated serum creatinine values recorded in only 2 dogs (4.76%), indicating minimal overt renal impairment in most cases. In contrast, increased BUN levels were observed in 11 dogs. The disproportionate elevation of BUN relative to serum creatinine suggests prerenal azotaemia, likely secondary to reduced renal perfusion associated with compromised cardiac output. Similar observations have also been reported in dogs with cardiac disease, where elevated BUN without concurrent creatinine increase was attributed to altered haemodynamic or gastrointestinal factors (Boswood and Murphy, 2006) [3]. The absence of CRP elevation suggests limited utility of CRP as a biomarker for detecting cardiac disease or assessing disease severity in dogs, particularly in chronic, non-inflammatory cardiac conditions. This finding

**Table 4:** Incidence of cardiac disease in dogs with respect to body weight (n= 42)

| SI. No. | Particulars | No. of animals diagnosed with cardiac disease Percentage | Percentage |
|---|---|---|---|
| 1. | Under weight | 1 | 2.38 |
| 2. | Normal weight | 21 | 50.00 |
| 3. | Over weight | 20 | 47.62 |
| | Total | 42 | 100 |

**Table 5:** Haematological parameters of dogs presented with cardiac disease (n= 42)

| SI. No. | Parameters | | Mean ± SE (n=42) | Mean ± SE* | Range |
|---|---|---|---|---|---|
| 1. | Haemoglobin (11.9-18.9 g/dl) | | 12±0.28 | 10.58±0.19(n= 20) | 8.2- 16.8 |
| 2. | PCV (35- 57%) | | 36.01±0.84 | 30.93±0.63 (n= 20) | 24.6- 50.4 |
| 3. | TEC (4.95- 7.87x$10^6$ /µl) | | 4±0.09 | 3.79±0.11 (n= 20) | 2.7- 5.6 |
| 4. | TLC (5.0- 14.1x103 /µl) | | 13.36±0.47 | 16.91±0.40 (n= 15) | 8.2- 20.6 |
| 5. | DLC(%) | Neutrophils (58- 85%) | 80.33±0.90 | 88±0.49 (n= 15) | 72- 92 |
| | | Band Neutrophils (0- 3%) | 2.59±0.21 | 4.44±0.18 (n= 9) | 0- 5 |
| | | Lymphocytes (8- 21%) | 10.45±0.74 | 4.27±0.36 (n= 11) | 3- 19 |
| | | Monocytes (2- 10%) | 4.95±0.29 | ** | 2- 9 |
| | | Eosinophils (0- 9%) | 1.09±0.17 | --- | 0- 4 |
| 6. | ESR (6- 10 mm/hr) | | 9.24±0.46 | 12.11±0.27 (n= 18) | 4-14 |

*Mean of the abnormal values

Then numbers in the parenthesis indicate the number of animals.

**Table 6:** Biochemical parameters of dogs presented with cardiac disease (n= 42)

| SI No. | Biochemical Parameters | Mean±SE (n=42) | Mean±SE* | Range |
|---|---|---|---|---|
| 1. | Total Protein (5.4- 7.5 g/dL) | 6.04±0.11 | 5.01±0.07 (n= 7) | 4.8- 7.2 |
| 2. | Albumin (2.3-3.1g/dL) | 3.34±0.12 | 2.03±0.05 (n= 7) | 1.8-4.3 |
| 3. | BUN (8- 28 mg/dL) | 25.55±1.06 | 33.91±1.14 (n= 11) | 11-39 |
| 4. | Creatinine (0.5- 1.7 mg/dL) | 1.12±0.05 | --- | 0.5-2 |
| 5. | ALT (10-109 U/L) | 92.43±3.49 | 120.82±2.58 (n= 11) | 51- 134 |
| 6. | AST (5- 55 U/L) | 46.43±2.94 | 76.5±1.88 (n= 10) | 19-86 |
| 7. | CRP (<10mg/L) | 7.48± 0.21 | --- | 4-10 |

*Mean of the abnormal values

Then numbers in the parenthesis indicate the number of animals.

**Table 7:** cTnI values in dogs presented with cardiac disease (n= 20)

| SI. No. | Parameter | Mean±SE | Range |
|---|---|---|---|
| 1. | cTnI | 104±7.19 | 45- 214 |

Concurs with Ljungvall *et al*. (2010) [13], who reported no association between CRP concentration and the severity of myxomatous mitral valve disease. In the present study, quantitative estimation of cardiac troponin I (cTnI) was performed in 20 out of the 42 dogs diagnosed with cardiac disease, considering the affordability of the clientele. The mean±SE cTnI concentration was 104±7.19 ng/mL, with values ranging from 45 to 214 ng/mL, which were markedly higher than the established reference range (Table.7). A cut-off value of <0.03-0.07 ng/mL was adopted for interpretation, as suggested by Sleeper *et al*. (2001) [20], who reported that cTnI concentrations in healthy dogs generally remain below 0.02 ng/mL. Cardiac troponin I is a highly specific biomarker of myocardial injury, released into circulation following cardiomyocyte membrane disruption. It typically becomes detectable within 3-6 hours after myocardial insult and may remain elevated for 7-10 days, thereby providing a useful diagnostic window (McCord *et al*., 2003) [16]. Elevated cTnI concentrations observed in all dogs tested in the present study were found consistently associated with confirmed cardiac disorders, indicating its high sensitivity for detecting myocardial injury. These findings corroborate earlier reports by Linklater *et al*. (2007) [12], who identified cTnI as a reliable early marker of myocardial cellular damage in dogs. It is noteworthy that Sharkey *et al*. (2009) [19] cautioned against false elevations of cTnI in dogs with concurrent renal dysfunction, as partial renal excretion may influence circulating levels. Hence, interpretation of cTnI values must be undertaken in conjunction with renal function assessment to avoid diagnostic ambiguity. In nut shell, the findings of the present study indicate that cTnI is a highly sensitive and clinically valuable biomarker for myocardial injury in dogs. When used in combination with clinical evaluation and echocardiographic findings, cTnI estimation can significantly enhance diagnostic accuracy and prognostic assessment, as also advocated by Hori *et al*. (2020) [8]. Thus, incorporation of cTnI into routine diagnostic protocols may substantially improve the early detection and management of canine cardiac diseases.

## 4. Conclusion

In conclusion, canine cardiac diseases are multifactorial, often presenting with nonspecific signs. Early recognition through integrated clinical, laboratory, and biomarker evaluation is essential for timely intervention, improved prognosis, and enhanced quality of life. These findings provide valuable reference data for veterinary cardiology and underscore the need for awareness, preventive strategies, and standardized diagnostic protocols.

**Conflict of Interest**
Not available

**Financial Support**
Not available

## Reference

1. Amaravathi P, Prebavathy T, Rajesh K, Vaikunta Rao V, Bharathi S, Raghunath M. Clinicopathological findings in dogs with cardiac diseases. Health. 2019;58(1):1-20.
2. Belanger M, Tan L, Wittnich C. Does young age really put the heart at risk? Canadian Journal of Physiology and Pharmacology. 2017;95(10):1177-1182.
3. Boswood A, Murphy A. The effect of heart disease, heart failure and diuresis on selected laboratory and electrocardiographic parameters in dogs. Journal of Veterinary Cardiology. 2006;8(1):1-9.
4. Calvert C, Meurs KM. Doberman Pinschers occult cardiomyopathy. In: Kirk's Current Veterinary Therapy; c2000. p. 800-803.
5. Chetboul V, Tran D, Carlos C, Tessier D, Pouchelon JL. Congenital malformations of the tricuspid valve in domestic carnivores: a retrospective study of 50 cases. Schweizer Archiv für Tierheilkunde. 2004;146(6):265-275.
6. Fischer Y, Filzmaier K, Stiegler H, Graf J, Fuhs S, Franke A, Janssens U, Gressner AM. Evaluation of a new, rapid bedside test for quantitative determination of B-type natriuretic peptide. Clinical Chemistry. 2001;47(3):591-594.
7. Häggström J, Pedersen HD, Kvart C. New insights into degenerative mitral valve disease in dogs. Veterinary Clinics of North America: Small Animal Practice. 2004;34(5):1209-1226.
8. Hori Y, Iguchi M, Hirakawa A, Kamiya Z, Yamano S, Ibaragi T, Yuki M. Evaluation of atrial natriuretic peptide and cardiac troponin I concentrations for assessment of disease severity in dogs with naturally occurring mitral valve disease. Journal of the American Veterinary Medical Association. 2020;256(3):340-348.
9. Jan A, Wani SA, Ashraf T, Nisar M, Taifa S, Parray OR, Nabi SU. Studies on hemato-biochemical, radiological and echocardiographic changes in geriatric canine heart failure. Journal of Pharmacognosy and Phytochemistry. 2018;7(2):1197-1200.
10. Kraetschmer S, Ludwig K, Meneses F, Nolte I, Simon D. Vertebral heart scale in the beagle dog. Journal of Small Animal Practice. 2008;49(5):240-243.
11. Kumar A, Dey S, Mahajan S. Incidence and risk assessment of cardiac arrhythmias in dogs with respect to age, breed, sex and associated biochemical changes. Advances in Animal and Veterinary Sciences. 2014;2(5):277-281.
12. Linklater AK, Lichtenberger MK, Thamm DH, Tilley L, Kirby R. Serum concentrations of cardiac troponin I and cardiac troponin T in dogs with class IV congestive heart failure due to mitral valve disease. Journal of Veterinary Emergency and Critical Care. 2007;17(3):243-249.
13. Ljungvall I, Höglund K, Tidholm A, Olsen LH, Borgarelli M, Venge P, Häggström J. Cardiac troponin I is associated with severity of myxomatous mitral valve disease, age, and C-reactive protein in dogs. Journal of Veterinary Internal Medicine. 2010;24(1):153-159.
14. MacPete R. Dogs and heart disease: an overview. IDEXX Laboratories Inc.; c2018.
15. Martin MWS, Stafford Johnson MJ, Celona B. Canine dilated cardiomyopathy: a retrospective study of signalment, presentation and clinical findings in 369 cases. Journal of Small Animal Practice. 2009;50(1):23-29.
16. McCord J, Nowak RM, Hudson MP, McCullough PA, Tomlanovich MC, Jacobsen G, Tokarski G, Khoury N, Weaver WD. Prognostic significance of serial myoglobin, troponin I, and creatine kinase-MB measurements in patients evaluated in the emergency

department for acute coronary syndrome. Annals of Emergency Medicine. 2003;42(3):343-350.
17. Root CR, Bahr RJ. The heart and great vessels. In: Textbook of Veterinary Diagnostic Radiology. 2nd ed. 2002. p. 316-317.
18. Schalm OW, Jain NC, Carroll EJ. Veterinary Hematology. Philadelphia: Lea & Febiger; 1975.
19. Sharkey LC, Berzina I, Ferasin L, Tobias AH, Lulich JP, Hegstad-Davies RL. Evaluation of serum cardiac troponin I concentration in dogs with renal failure. Journal of the American Veterinary Medical Association. 2009;234(6):767-770.
20. Sleeper MM, Clifford CA, Laster LL. Cardiac troponin I in the normal dog and cat. Journal of Veterinary Internal Medicine. 2001;15(5):501-503.
21. Vengsarkar SA. The diagnosis of cardiac diseases in canines. [M.V.Sc thesis]. Bombay Veterinary College, Mumbai, India; 1988.
22. Vezzosi T, Puccinelli C, Tognetti R, Pelligra T, Citi S. Radiographic vertebral left atrial size: a reference interval study in healthy adult dogs. Veterinary Radiology & Ultrasound. 2020;61(5):507-511.

**How to Cite This Article**
Amal KA, Prasad VD, Kondeti B, Prasad A, Sreenu M, Chaitanya Y. Prevalence, clinical profile and integrated laboratory and biomarker analysis of cardiac disorders in dogs. 2026; 11(1): 44-48.