



## Clinical findings in canines with suspected cardiac diseases

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### Abstract

Cardiac disorders are defined as structural, functional, mechanical, and electrical abnormality of heart. Common clinical signs associated with canine cardiac disorders are one of the least studied topics in Himachal Pradesh. Keeping this in mind, this study was carried out with the objective of enlisting the prevalence of common clinical signs and auscultation findings in common cardiac disorders. A total of 3166 dogs were screened for the presence of different cardiac diseases, out of which fifteen were diagnosed positive for cardiac malfunctioning. The study revealed that most of the cardiac disorders are characterized with the presence of exercise intolerance, dyspnoea, coughing, increased auscultation area, heart murmurs and tachycardia. This research showed the importance of conducting a thorough physical and clinical examination in dogs suspected of cardiac conditions. Dogs showing these clinical signs need more advanced diagnostic cardiac tests to understand the disease, how serious they are, and their state of health.

**Keywords:** Auscultation, clinical signs, diagnosis, exercise intolerance

Cardiological conditions in dogs are one of the major issues faced by the pet owners. As per American Veterinary Medical Association (AVMA), one in every ten dogs suffer from cardiac diseases (Dove 2001), however, due to limited research work done in this area, particularly in India, the important noticeable signs can sometimes be overlooked by the owner/ attending person. Although, definitive diagnosis can be done very easily by using advanced diagnostic aids such as biochemical testing or cardiac profiling, radiology and advanced diagnostic techniques using ECG (electrocardiography), echocardiography etc., but, primary/ tentative diagnosis can be made easily based on clinical signs, comprehensive clinical examination like auscultation of the cardiac region. Recognising the clinical signs can help putting a stop on the rising numbers of undiagnosed/ late diagnosed canine cardiac conditions, principally at field level with minimal facilities or by the owners themselves, guarding them from emotional and economical stress. Considering that no detailed study regarding common clinical signs

seen in the canine cardiac diseases has been done previously in this hilly state of Himachal Pradesh, the present study with the objective to scrutinize the common clinical signs and auscultation findings in the canine cardiac conditions was planned.

### Materials and Methods

The present study was carried out on dogs presented to the Department of Veterinary Medicine, DGCN COVAS, CSKHPKV, and Palampur (H.P.) during the period of 16 months *w.e.f.* May 2021 to September 2022. A total of 3166 dogs were screened for the presence of cardiac diseases like dilated cardiomyopathy (DCM), hypertrophic cardiomyopathy (HCM), myxomatous mitral valve disease (MMVD) and pericardial effusions, out of which fifteen dogs were confirmed with these illnesses. The dogs examined showed symptoms of dyspnoea, syncope, exercise intolerance, persistent coughing, change in body weight, general depression, and dullness. The clinical symptoms which were consistent with heart diseases were assessed through a

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comprehensive history obtained from owners, thorough clinical examination, and appliance of diagnostic tools. The definitive diagnosis was further done using auscultation, radiography, electrocardiography (ECG) and echocardiography. All the results were recorded for future reference.

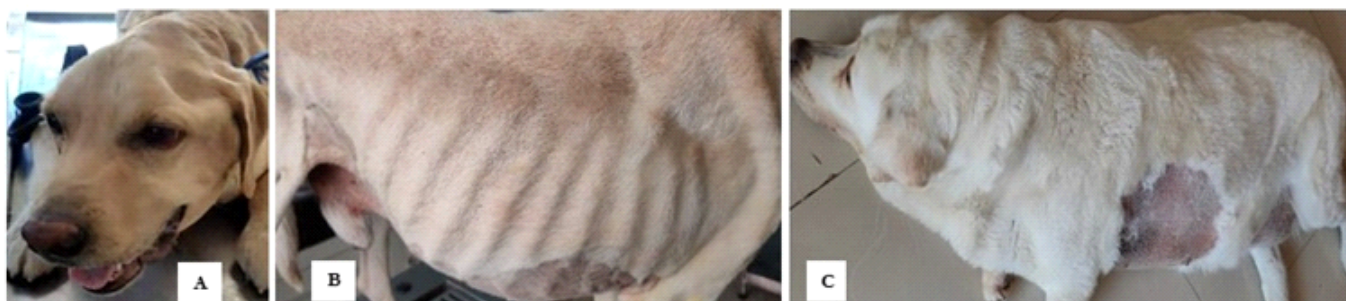
### Results and Discussion

The incidences of cardiac disease are quite common in dogs yet, the symptoms are often sidelined due to lack of awareness among pet owners Rush (2002). Despite many types of heart diseases affecting dogs, most share common signs that can alert the owners and potentially keep a bad situation of pet from

getting worse. The major clinical manifestations of affected dogs with cardiac diseases are presented in Table 1. In cases suffering from dilated cardiomyopathy (DCM), dyspnoea (n=8, 100%), exercise intolerance (n=7, 87.5%), inappetence, coughing and orthopnoea were the major clinical findings (Figure 1). Almost similar findings were reported by Jeyaraja *et al.* (2008), Martin *et al.* (2009) and Thirunavukkarasu (2019). Development of exercise intolerance, syncope, coughing and vomiting might be due to left-sided heart failure, whereas abdominal enlargement/ascites might be due to right-sided heart failure (Ettinger and Feldman 2000). Our study showed respiratory dyspnoea as the major

**Table 1. Clinical findings in cardiac diseases**

Clinical Findings	Cardiac Disease									
	Dilated Cardiomyopathy (N=8)		Hypertrophic Cardiomyopathy (N=2)		Valvular Disease (N=3)		Pericardial Disease (N=2)		Total (N=15)	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Coughing	4	50 %	1	50 %	3	100 %	1	50 %	9	60 %
Dyspnoea	8	100 %	2	100 %	2	66.67%	1	50 %	13	86.67%
Orthopnoea	4	50 %	1	50 %	1	33.33%	1	50 %	7	46.67%
Inappetence	5	62.50%	1	50 %	1	33.33%	1	50 %	8	53.33%
Syncope	3	37.50%	1	50 %	-	-	2	100 %	6	40 %
Exercise Intolerance	7	87.50%	2	100 %	3	100 %	2	100 %	14	93.33%
Jugular distension/ Pulsation	-	-	1	50 %	-	-	2	100 %	3	20 %
Ascites	3	37.50%	-	-	1	33.33%	2	100 %	6	40 %
Dependent oedema	3	37.50%	-	-	-	-	-	-	3	20 %
Cold extremities	-	-	1	50 %	1	33.33%	-	-	2	13.33%
Weight loss/Cachexia	2	25 %	-	-	1	33.33%	1	50 %	4	26.67%
Pulse deficit	3	37.50%	-	-	-	-	-	-	3	20 %
Paresis	1	12.50%	1	50 %	-	-	1	50 %	3	20 %



**Fig. 1 Clinical symptoms in dilated cardiomyopathy in a Labrador dog (A) Dyspnoea at rest (B) Cardiac cachexia; (C) Ascites**

clinical finding in all DCM affected dogs. Respiratory changes seen in DCM-affected dogs might be seen due to congestion / pulmonary oedema with resultant hypoxemia and hypercapnia (Tilley *et al.* 2008). The predominant cardiovascular findings were tachycardia, murmur, pulse deficit and ascites, the reason behind the development of ascites was increased sodium and water retention in cardiac cases due to right- side heart failure in DCM (Tilley *et al.* 2008). Pulmonary oedema and pulse deficit might be seen due to atrial fibrillation.

Out of two hypertrophic cardiomyopathy (HCM) affected cases dyspnoea (n=2, 100%), exercise intolerance (n=2, 100%) were present in all cases while one case had jugular pulsation (n=1, 50%), syncope (n=1, 50%) and coughing (n=1, 50%) as prominent clinical findings. Kumar *et al.* (2010) also observed exercise intolerance, in appetite, lethargy, cough, seizures, and syncope in dogs with HCM, which is in close agreement with our study. Hypertrophic cardiomyopathy causes numerous anatomical alterations in the heart, where the increase in the thickness of the ventricular and septum muscles are the most striking changes, these abnormalities may or may not cause clinical signs in the bearer, however, they almost always lead to cardiac dysfunctions and could be seen as a decrease in cardiac output (Abreu *et al.* 2022). This supports the occurrence of jugular pulsation, syncope; exercise intolerance in HCM affected dogs, as seen in our study.

In cases of valvular disease affected dogs, coughing (n=3, 100%), exercise intolerance (n=3, 100%) and dyspnoea (n=2, 66.67%) were major clinical findings. Lethargy, cough, inappetence, and poor exercise tolerance were the most common clinical signs of mitral valve disease in dogs and can be correlated with the findings of Gompf (2008) and Garnarcz *et al.* (2013). Sisson (2010) reported that fluid accumulation occurs due to systemic venous congestion secondary to right sided heart failure.

Out of two dogs affected with pericardial diseases, signs like exercise intolerance (n= 2, 100%), jugular pulsation and distention (n = 2, 100%), ascites (n= 2, 100%), syncope (n= 2, 100%) were found in all cases. Signs like cachexia, dyspnoea were found in 50% cases (n =1). Saini (2014) reported jugular pulsation and distension, tachypnoea, coughing, exercise

intolerance, dyspnoea, ascites, and cachexia in pericardial effusion and is in accordance to findings of our study.

Other clinical signs like weight loss (n = 4 out of total 15 *i.e.*, 26.67%) were also found, according to Dove (2001), anorexia / cachexia (loss of lean body mass or muscle wasting) are the common clinical findings in canine congestive heart failure (CHF). The cachexia / weight loss observed in the dogs can be due to reduced volumes of pleural fluid and ascites. Freeman and Rush (2010) reported that CHF secondary to DCM is a common finding, which might be due to the reason that in cardiomyopathy the heart fails to pump effectively, the contractions are weak, and blood is not supplied to the body so efficiently. Also according to Freeman and Rush (2010), congestive heart failure can directly promote anorexia by increasing the production of inflammatory cytokines including tumour necrosis factor (TNF) and interleukin 1.

The auscultation findings in all the cardiac cases revealed increased area of auscultation (73.33%), murmurs (66.67%), tachycardia, gallops, and crackles. In majority of DCM affected dogs increased area of auscultation (n=6, 75%), murmurs (n=4, 50%), gallops crackles and tachycardia were seen (Table 2). Regurgitation secondary to dilatation of ventricles in DCM could lead to murmurs. In both cases of HCM, wheezing (100%) and increased area of auscultation (100%) were seen. One of the HCM case had dull lung sound and muffled heart sounds. Prominent auscultation findings in valvular disease cases were murmurs (100%), gallops (66.67%) and presence of precordial thrill (66.67%). Similar findings were reported by Deepti (2015) who studied 78 cases, detected tachycardia (44.87%), murmurs (20.51%), gallop rhythm (6.41%) and muffled heart sounds. And is also consistent with the findings of Smith (2006), who reported that heart murmurs caused by MMVD are very common in CHF. As per Ljungvall *et al.* (2014), soft murmurs in small breed dogs are strongly indicative of subclinical heart disease and thrilling murmurs are associated with more severe heart diseases. Clinicians can confidently exclude CHF or even severe heart disease in small breed dogs with soft murmurs caused by MMVDs. Hence, murmurs either moderate or loud warrant additional investigation to

**Table 2. Auscultation findings in cardiac diseases**

Auscultation Findings	Cardiac Disease									
	Dilated Cardiomyopathy (N=8)		Hypertrophic Cardiomyopathy (N=2)		Valvular Disease (N=3)		Pericardial Disease (N=2)		Total (N=15)	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Bradycardia	1	12.50%	-	-	-	-	-	-	1	6.67%
Tachycardia	4	50%	1	50%	1	33.33%	2	100%	8	53.33%
Precordial thrill	2	25%	1	50%	2	66.67%	-	-	5	33.33%
Muffled sounds	-	-	1	50%	2	100%	3	20%		
Murmurs	4	50%	1	50%	3	100%	2	100%	10	66.67%
↑Area of Auscultation	6	75%	2	100%	1	33.33%	2	100%	11	73.33%
Gallops	4	50%	-	-	2	66.67%	1	50%	7	46.67%
Crackles	4	50%	1	50%	-	-	1	50%	6	40%
Hyper resonant	-	-	1	50%	-	-	-	-	1	6.67%
Wheezing	2	25%	2	100%	-	-	1	50%	5	33.33%

better define the disease severity and clinical status. The cases with pericardial diseases on auscultation showed signs like, muffled heart sounds (100%), systolic murmurs (100%), increased area of auscultation (100%) and tachycardia (100%) as prominent auscultation findings. Similar finding in pericardial effusion cases were reported by Macdonald *et al.* (2009) that muffled heart sounds is a common finding in condition like pericardial/ pleural effusions. As the condition worsens (especially in pericardial diseases, DCM), forward cardiac output diminishes, thereby stimulating a variety of compensatory mechanisms like tachycardia and increased auscultation area. These compensatory mechanisms alter blood volume to ensure that circulatory needs of the body are met, primarily by an increase in preload (Frank- Starling relationship). Tachyarrhythmia occurs when the heart does not receive enough oxygen and increased pressure in the lungs, due to pulmonary congestion and all these conditions further leads to improper functioning of heart. Cardiac diseases are characterized by a range of symptoms that are largely attributable to the cardiac muscles' inability to sustain normal blood flow.

Moreover, in our study haematological parameters revealed non-significant changes in cardiac patients when compared to control group and is similar to the findings of Tidholm *et al.* (1997) and Saini (2014). Biochemical findings in cardiac disease patients showed non-significant variation in the values of

aspartate aminotransferase (AST), blood urea nitrogen (BUN), Creatinine, Bilirubin and Triglycerides in comparison to value of control group animals. There is non-significant increase in value of alanine transaminase (ALT) in group III and IV animals. The values of alkaline phosphatase (ALP) varied non-significantly among all diseased groups in relation to the control group. However, Macdonald *et al.* (2009) observed an increase in liver enzymes in 23.30% dogs and mild azotaemia with pericardial effusions was also observed. The elevation in liver enzymes is attributed to liver congestion due to low cardiac output in dogs with DCM (Sisson and Thomas 1995). There was a significant decrease in the values of total protein in-group HCM and PE cases. Saini (2014) also found hypoproteinaemia (TP < 5.2 g/dL) and hypoalbuminemia (albumin < 2.3 g/dL) in DCM cases. The mean absolute value of total cholesterol was increased significantly in HCM group. Electrolyte findings showed non-significant changes when compared to control group. However, Boswood and Murphy (2006) opined that sodium concentration varies significantly in dogs with heart failure and hyponatremia could be considered a marker of severe or end stage heart failure.

### Conclusion

This study highlights the importance of performing a comprehensive clinical and physical assessment on dogs who might have cardiac conditions. One of the



main clinical findings in dogs suspected of having heart issues was exercise intolerance. The most prevalent auscultation finding for DCM and HCM was an increased area of auscultation; murmurs were the most common auscultation finding for pericardial and valvular illnesses. It was also found that most canine cardiac patients seemed to have these primary clinical

indicators at the same time. However, more research is required to substantiate the conclusions. Dogs exhibiting these symptoms therefore need further research to identify the diseases, their severity, and their clinical state.

**Conflict of interest:** Authors declare no competing interest.

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