

Clinical features and incidence of dilated cardiomyopathy in dogs of South Gujarat, India

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Abstract

The present study aimed to study the incidence of dilated cardiomyopathy and its clinical features in dogs of South Gujarat, India. The dogs showing clinical signs such as exercise intolerance, dyspnoea, coughing, abdominal enlargement, vomiting and syncope were suspected of cardiac abnormalities and subjected to ECG and Echo for confirmatory diagnosis. All 56 suspected cases of cardiac abnormalities were screened for confirmatory diagnosis using electrocardiography and echocardiography, and their incidence of dilated cardiomyopathy was recorded as per age, breed and sex. The overall incidence of DCM was recorded as 0.52% (33 of total 6366 registered cases) with the higher incidence in dogs aged between 3-6 years (51.52%), followed by >6 years (42.42%) and < 3 years (6.06%). The most commonly affected breed was Labrador Retriever (69.70%), followed by Non-descript breed (12.12%), Cocker Spaniel (6.06%) and Golden Retriever, Bullmastiff, German Shepherd and Pug (3.03% each). Incidence was more predominant in males than females. Among all prominent clinical signs, exercise intolerance and dyspnoea were most frequently observed, followed by weakness, coughing, inappetence, weight loss, abdominal enlargement, vomiting and syncope. Special cardiovascular clinical signs were tachycardia and murmur, pulse deficit, ascites, pedal oedema, pulmonary oedema, jugular venous distension and muffled heart sound. In the present study, dilated cardiomyopathy was observed most commonly in middle-aged dogs; therefore, it is suggested that awareness in owners will be helpful for early diagnosis and further follow-up treatment to enhance the lifespan of affected dogs.

Key words: Clinical feature, DCM, Dogs, Incidence

Highlights

- Dilated cardiomyopathy (DCM) is one of the common acquired cardiovascular diseases in dogs.
- Out of 56 suspected cases, 33 cases of DCM were confirmed with 0.52% overall incidence of DCM among 6366 registered patients, indicating that, it is difficult to diagnose in field conditions.
- Clinically DCM-affected dogs showed clinical signs of exercise intolerance and dyspnoea (83.33%) along with weakness (77.78%) and coughing (72.22%).
- Special cardiovascular examination of DCM-affected dogs showed the presence of tachycardia and murmur (77.78%), pulse deficit (72.22%), ascites (55.56%) and pedal oedema (50%)

INTRODUCTION

Canine cardiac diseases are common, complex and often silent killers. Hence, any cardiac abnormality requires to be dealt with priority to avoid morbidity and mortality (Kumar *et al.*, 2014). Dilated cardiomyopathy (DCM) is one of the most common acquired cardiovascular diseases of dogs, which is characterized by impaired myocardial

contractility with dilation of the left ventricle or both ventricles. The chambers of the heart increase in size, and the muscles forming the walls of the heart become thinner, resulting in weakened contractions and poor pumping ability (Sisson, 2010). As the disease progresses, the heart chambers continue to enlarge in size and signs of congestive heart failure develop.

Surveys indicate that DCM is diagnosed

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more commonly in dogs aged between 2-6 years (Martin *et al.*, 2009). Further, it is observed that large and giant-sized dogs are particularly at a higher risk of DCM, but smaller breeds like Cocker Spaniel could also be affected. Sex is another predisposition factor which results in a higher occurrence of DCM in male dogs. There is a long preclinical phase in dogs with DCM, and those that present with clinical signs likely represent a small portion of the total number of dogs in the population that have DCM. The duration of clinical signs before referral is often short, and the survival times are poor (Sisson, 2010).

In clinical practice, and except in breed screening schemes, dogs with DCM will generally be diagnosed when they develop clinical signs or present with a clinical abnormality on examination. Hence, greater awareness of affected breeds, clinical signs and diagnostic findings based on ECG and echocardiography may help in the early recognition of this disease which often has a short clinical phase (Martin *et al.*, 2009). With this background information, the present study was planned to study the incidence and clinical features of DCM in dogs of south Gujarat.

MATERIALS AND METHODS

Ethical approval: As per CPCSEA guidelines, a study involving clinical cases does not require the approval of the Institute Animal Ethics Committee.

Experimental details: The present study was carried out during a period from April 2018 to March 2021 in the Department of Veterinary Medicine in collaboration with the Department of Veterinary Clinical Complex (VCC), College of Veterinary Science and Animal Husbandry, NAU, Navsari, Gujarat, India. During the study period, 56 out of 6366 dogs registered at VCC were presented with one or more clinical signs of cardiac involvement like dyspnoea, exercise intolerance, syncope, cyanosis, peripheral oedema, ascites, cough and murmur on auscultation were suspected of cardiac

abnormalities and screened further for confirmatory diagnosis using electrocardiography (Scillers ECG unit) (Fig. 1) and thereafter ultrasonography and echocardiography (Sonosite M-turbo system, USA) (Fig. 2 & 6). The ECG was recorded using the standard limb leads at 50 mm/s speed and interpreted as per guidelines are given by Tilley *et al.* (2008). The MMode echocardiography was performed with a phased array Cardiac Probe PA320 with a frequency range between 5.0 to 8.0 MHz. 2-Dimensional (2-D) and Motion-Mode (Mmode) imaging was done as per standard protocols (Tilley *et al.*, 2008).

All important information related to age, sex and breed as well as clinical examinations and vital parameters were collected and noted in the prepared proforma. Data pertaining to the incidence of DCM were analyzed using chi-square test on probability at 5% and confidence interval at 95% level, whereas various vital parameters of clinical examination of DCM-affected dogs were compared with 8 healthy dogs using student 'T' test using IBM SPSS statistical software version 20.0. Further, the frequency distribution of various clinical signs and special cardiac observations was also studied (Snedecor and Cochran, 1994).

RESULTS

Over a study period of 3 years, total 56 cases were suspected and screened for various cardiovascular abnormalities out of total 6366 registered cases of dogs at VCC. Of these, 33 patients were confirmed to have dilated cardiomyopathy (DCM) with 0.52% the overall incidence of DCM. Among them, comparatively higher incidence of DCM was recorded in dogs aged between 3-6 years (51.84%), followed by >6 years (42.42%) and <3 years (6.06%). Further, comparatively higher incidence of DCM was observed in Labrador Retriever (69.70%) followed by non-descript breed (12.12%), Cocker Spaniel (6.06%) and Golden Retriever, Bullmastiff, German Shepherd and Pug (3.03% each). Gender-wise incidence of DCM was more

predominant in males (69.70%) than females (30.30%). The variation in incidence of DCM due to age, breed and sex was non-significant (Table 1).

On detailed clinical examination of affected dogs, a history of exercise intolerance and dyspnoea was reported in 84.84% cases, followed by weakness (78.78%), coughing (72.22%), inappetence (66.67%), weight loss

(60.60%), abdominal enlargement (54.55%), vomiting (30.30%) and syncope (18.18%) (Table 2). The mean rectal temperature was found to be within normal range ($101.94 \pm 0.30^{\circ}\text{F}$) in DCM-affected dogs, but the means of heart rate (149.17 ± 4.59), pulse rate (145.94 ± 4.27) and respiration rate (36.39 ± 1.17) were significantly increased ($p < 0.01$) than healthy dogs (Table 3). Special cardiovascular

Table 1. Age, breed and sex-wise incidence of dilated cardiomyopathy in dogs

Parameters	No. of cases	Percentage	pvalues
Age			
<3 year	02	06.06	0.204
3-6 years	17	51.52	
>6 years	14	42.42	
Total	33	100.00	
Breed			
Labrador Retriever	23	69.70	0.128
N.D	04	12.12	
Cocker Spaniel	02	06.06	
Golden Retriever	01	03.03	
Bullmastiff	01	03.03	
German Shepherd	01	03.03	
Pug	01	03.03	
Total	33	100.00	
Gender			
Male	23	69.70	0.724
Female	10	30.30	
Total	33	100.00	

Table 2. Frequency distribution of clinical signs in dilated cardiomyopathy-affected dogs (n=33)

Sr. No.	Clinical signs	Frequency distribution	
		No. of cases	Percentages
1.	Exercise intolerance	28	84.84
2.	Dyspnoea	28	84.84
3.	Weakness	26	78.78
4.	Coughing	24	72.72
5.	Inappetence	22	66.67
6.	Weight loss	20	60.60
7.	Abdominal enlargement	18	54.55
8.	Vomiting	10	30.30
9.	Syncope	06	18.18

Table 3. Vital parameters in dilated cardiomyopathy-affected dogs

Sr. No.	Parameters	Unit	Healthy dogs (n=8)	DCM affected dogs (n=33)	pvalue
1	Temperature	°F	101.33±0.17	101.94±0.30	0.090
2	Heart rate	BPM	114.78±4.37 ^a	149.17±4.59 ^b	0.000
3	Pulse rate	RPM	114.67±4.40 ^a	145.94±4.27 ^b	0.000
4	Respiration rate	RPM	22.33±0.88 ^a	36.39±1.17 ^b	0.000

Different superscripts within row showed significant differences between groups (P<0.05)

Table 4. Frequency distribution of associated cardiac parameters in dilated cardiomyopathy-affected dogs (n=33)

Sr. No.	Cardiac parameters	Number of cases	Percentage
1.	Tachycardia	26	78.78
2.	Murmur	26	78.78
3.	Pulse deficit	24	72.72
4.	Ascites	18	54.55
5.	Pedal oedema	17	51.51
6.	Pulmonary oedema	13	39.39
7.	Jugular venous distension	11	33.33
8.	Muffled heart sound	04	12.12

examination in DCM revealed the highest occurrence of tachycardia and murmur (78.78%), followed by pulse deficit (72.72%), ascites (54.55%), pedal oedema (51.51%), pulmonary oedema (39.39%), jugular venous distension (33.33%) and muffled heart sound (12.12%) (Table 4).

DISCUSSION

The higher incidence of DCM (33/56 cases of cardiac abnormalities) showed that it is one of the commonly observed acquired cardiovascular disease in dogs, which is characterized by impaired myocardial contractility with dilation of the left ventricle or both ventricles (Egner, 2003; Vishnurahav *et al.*, 2018). In the present study, the overall incidence of DCM was 0.52% which is in accordance with the previous report of the overall incidence of DCM between 0.5-1.1% (Martin *et al.*, 2009). Velhankar (2013) and Thirunavukkarasu (2019) also reported that the DCM in dogs is below 1%, which agrees with

the present study.

The incidence of DCM in dogs was comparatively higher in the age group between 3-6 years is in agreement with the finding that indicated higher affection for cardiac diseases in dogs ranging between 3-7 years (Ettinger and Feldman, 2005). A study from India also reported 6.68±0.47 years as the average age of DCM-affected dogs (Jeyaraja *et al.*, 2015). Similarly, Thangapandiyan *et al.* (2016) reported the highest incidence of DCM in the age group between 6-9 years. Previously, DeFransesco (2001) also stated that a higher prevalence of DCM is observed in young to middle-aged dogs. Among the different breeds of dogs presented, a comparatively higher incidence of DCM was observed in Labrador Retriever. The observation of higher incidence in Labrador Retriever is in agreement with few Indian reports (Thangapandiyan *et al.*, 2016; Himalini *et al.*, 2017; Thirunavukkarasu, 2019). Generally, large and giant breed dog breeds, mainly Great Dane, German Shepherd, Saint

Bernard, English Bulldog, Doberman Pinscher, Boxer and Afghan Hound, are most predisposed to develop DCM, with the exception of Spaniel breeds (especially Cocker Spaniels (English and American)). Further, it was stated that the higher prevalence of DCM in specific breed might be due to breed popularity than the true frequency of disease (Ettinger and Feldman, 2005), which could be the probable reason for the higher prevalence of DCM in Labrador breed in the present study. Moreover, a comparatively higher incidence was observed in males than females, which is in agreement with two Indian reports that indicated a higher prevalence of DCM in male dogs (Thangapandiyan *et al.*, 2016; Vishnurahav *et al.*, 2018). Prevalence increases with age, and males are usually reported as being over represented in the population of dogs with congestive heart failure (Sisson, 2010).

Clinically, DCM-affected dogs showed exercise intolerance, syncope, coughing, vomiting, and abdominal enlargement/ascites (Fig. 3). Similar symptoms were also recorded in DCM-affected dogs in previous studies (Bodh *et al.*, 2016; MacPete, 2018; 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, 2005).

Non-significant changes in rectal temperature were also observed in previous reports (DeFransesco, 2001; Bodh *et al.*, 2016). On contrary, one study mentioned the elevation of body temperature in some cases of DCM and also stated that clinical presentation could vary from case to case and according to breed (McEwan *et al.*, 2003). Significantly increased means of heart and pulse rates were also reported previously (DeFransesco, 2001; Bodh *et al.*, 2016). The significantly increased respiration rate in DCM-affected dogs might be due to congestion / pulmonary oedema with resultant hypoxemia and hypercapnia (Tilley *et al.*, 2008).

The predominant cardiovascular findings were tachycardia, murmur, pulse deficit, ascites and pedal oedema. Murmur might be due to regurgitation secondary to dilatation of ventricles. Whereas, 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 due to atrial fibrillation. In some cases, jugular venous distension and muffled heart sound were also observed. The jugular venous distension (Fig. 4) could be due to elevated right heart diastolic pressure in dogs with right heart failure, whereas muffled heart sound could be due to pericardial effusion in DCM affected condition. Observation of the above cardiovascular findings in DCM-affected dogs is in close agreement with previous reports (Tilley *et al.*, 2008; Singh *et al.*, 2014; Jeyaraja *et al.*, 2015).

Based on observations of the present study, it is concluded that dilated cardiomyopathy is an acquired heart disease of dogs with a higher prevalence in middle-aged male dogs. A history of exercise intolerance and weakness along with tachycardia and murmur, pulse deficit and ascites are the typical characteristic features of DCM.

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

Author's contribution: SMP: Drafted the manuscript; MDP: Supervised the work, analyzed the data and revised the manuscript; JAV, SAM and SVM: Rendered their help for clinical examination, identification and diagnosis of cases. All authors read and approved the final manuscript.

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Fig. 1. Lead placement for ECG on right lateral recumbency



Fig. 2. Echocardiographic using cut out wooden table in RPLAX position

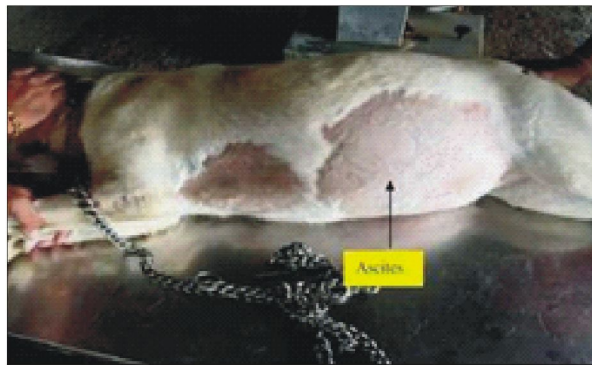


Fig. 3. Ascites in dilated cardiomyopathy-affected dog

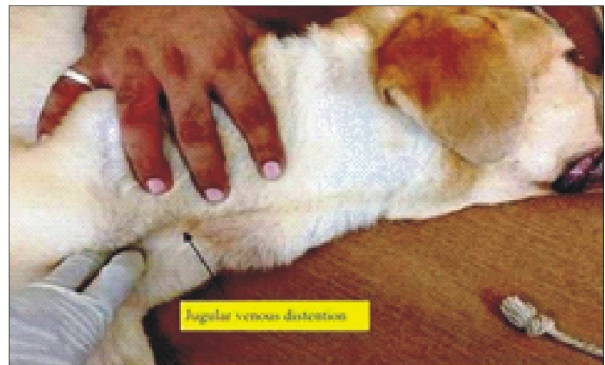


Fig. 4. Jugular engorgement in dilated cardiomyopathy-affected dog



Fig. 5. Emaciated body condition and severe weakness in dilated cardiomyopathy-affected dog



Fig. 6. Dilated four chambers in dilated cardiomyopathy-affected dog (RPLAX view)

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