



Demographic studies and clinical characteristics of dogs affected with mitral valvular disease[#]

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Abstract

Myxomatous mitral valve disease (MMVD) is considered as the most prevalent acquired cardiac disorder in dogs, characterised by progressive degeneration of mitral valve, leading to mitral regurgitation and heart failure. This study was conducted to investigate the demographic characteristics and clinical presentations of MMVD in dogs across districts of central Kerala. A total of 537 dogs presented with clinical signs suggestive of cardiac disease were examined and 187 were confirmed to have cardiac disease. Of these, 97 were diagnosed with mitral valve disease (MVD). The study focused on evaluating breed, age and sex predispositions, along with clinical signs associated with MVD. Results indicated a higher occurrence of MVD in small-breed dogs, with Spitz (24.74 per cent), being the most affected breed, followed by Dachshund (15.46 per cent), non-descript (13.40 per cent), Miniature Pinscher (6.19 per cent), etc. The predominant clinical manifestations included cough, exercise intolerance, lethargy and respiratory difficulty. Pearson's chi-square test was performed to compare the occurrence of MVD between age groups and sexes. The findings of study highlight the importance of breed predisposition, age and sex distribution and clinical symptoms in dogs affected by MVD.

Keywords: Mitral valvular disease, occurrence, canine, clinical signs

Myxomatous mitral valvular disease is the most prevalent cardiovascular condition in dogs, primarily affecting the atrioventricular valves, with the mitral valve being the most commonly involved (Pascon *et al.*, 2021). This disease is caused by progressive myxomatous degeneration of the mitral valve, leading to incomplete coaptation of the leaflets and valvular regurgitation. Mitral valve disease is the leading cause of heart failure in dogs, responsible for over 70 per cent of cases reported in small-breed dogs (Borgarelli and Haggstrom, 2010). While the disease is more frequently diagnosed in small-breed dogs, it can also be seen in large-breed dogs. The occurrence of MVD is strongly associated with breed, age, sex and body size. Middle-aged to older males are more prone to developing MVD (Borgarelli and Buchanan, 2012). Mitral valve disease exhibits a wide range of severity, with many dogs remaining asymptomatic, as the progression of MMVD varies greatly and only a small percentage of affected dogs develop clinical signs. In this

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scenario, an analysis of the occurrence of MVD in relation to breed, age and sex, as well as its clinical presentation across districts of central Kerala is highly warranted. The American College of Veterinary Internal Medicine (ACVIM) developed a consensus statement system to classify the severity of the disease (Keene *et al.*, 2019).

In light of the significance of MVD in canine cardiology, this study aimed to explore the demographic characteristics and clinical presentation of dogs affected by MVD in districts of central Kerala. It sought to identify breed, age and sex predispositions and to document the common clinical signs associated with this condition. By comparing cases of MVD with a control group of healthy dogs, this research also aimed to contribute to a better understanding of the clinical spectrum of the disease and to support the development of more targeted diagnostic and management strategies for affected canines.

Dogs presented to the Teaching Veterinary Clinical Complex, Mannuthy and University Veterinary Hospital, Kozhikode with the clinical signs suggestive of cardiac diseases such as exercise intolerance, cough, dyspnoea, lethargy, ascites and abnormal cardiac sounds on auscultation were included in the study. They were subjected to detailed clinical examination. Mitral valve disease was confirmed based on the clinical examination, haematological, electrocardiographic, radiographic and echocardiographic studies. All the selected animals were subjected to routine clinical examination as suggested by Houston (2000) and detailed cardiovascular assessment as suggested by Tilley (1992), Ware (2007) and Ettinger and Feldman (2010). The data obtained were subjected to statistical analysis using the IBM software package SPSS version 24.0 for Windows. Pearson's chi-square test was performed to compare the occurrence of MVD between age groups and sexes. The data on breed, age and sex were collected for demographic studies during the study period.

During this study, a total of 537 dogs presented with clinical signs were suspected for cardiovascular

diseases and 187 cases were confirmed with cardiac disease through echocardiography. In this diseased population, different types of cardiac disorders were identified which included chronic mitral valvular disease in 97 dogs (51.87 per cent), dilated cardiomyopathy (DCM) in 53 dogs (28.35 per cent), tricuspid valve dysplasia in 17 dogs (9.09 per cent), non-dilated hypokinetic cardiomyopathy in 9 dogs (4.82 per cent), combined mitral and tricuspid valvular dysplasia in 5 dogs (2.67 per cent), three hypertrophic cardiomyopathy cases (1.61 per cent) and one case (0.53 per cent) each of combined MVD and DCM, juvenile DCM and idiopathic pericardial effusion (Table 1).

The most common breed affected with MVD was Spitz (24.74 per cent), followed by Dachshund (15.46 per cent), Non-descript (13.40 per cent), Miniature Pinscher (6.19 per cent) and Labrador Retriever (8.25 per cent), Lhasa Apso, Beagle and Pug each comprised 7.22 per cent of the cases, while Rottweiler and Golden Retriever each accounted for 5.15 per cent. The present study revealed that the majority of the cases diagnosed with MVD belonged to small- to medium-sized breeds, with the highest occurrence seen in Spitz followed by Dachshund and Non-descript breeds which aligns with the findings of Vishnurav *et al.* (2018), Thirunavukkarasu (2019), Pascon *et al.* (2021), Rajesh (2021) and Greeshma (2022) which may be attributed to the larger heart-to-body size ratio observed in small breeds compared to larger breeds, as reported by Parker and Kilroy-Glynn (2012). Borgarelli and Buchanan (2012) reported that the disease was most commonly observed in geriatric small-breed dogs, with prevalence varying across breeds. The authors also found that Cavalier King Charles Spaniels (CKCS), Dachshunds, Miniature Poodles and Yorkshire Terriers were reported to be most frequently affected. In the present study, the prevalence of MVD was also observed in large breeds such as Labrador Retrievers, Rottweilers and Golden Retrievers. This finding is supported by Sindhu (2023), who reported that MVD commonly affected large-breed dogs as well. It is consistent with the studies of Borgarelli *et al.* (2004) and Keene *et al.* (2019) who opined that although MVD is more

Table 1. Different types of cardiac disorders

Sl. No.	Cardiac disease / disorders	No. of animals	Per cent of animals
1	Chronic mitral valve disease	97	51.87
2	Dilated cardiomyopathy	53	28.35
3	Tricuspid valve dysplasia	17	9.09
4	Non-dilated hypokinetic cardiomyopathy	9	4.82
5	Combined mitral and tricuspid valvular dysplasia	5	2.67
6	Hypertrophic cardiomyopathy	3	1.61
7	Combined MVD and DCM	1	0.53
8	Juvenile DCM	1	0.53
9	Idiopathic pericardial effusion	1	0.53
	Total	187	100

frequently observed in small breeds, large-breed dogs can also be affected.

The mean age of the cases in the present study was 10.02 ± 0.29 years, with the affected dogs ranging in age from 3 to 15 years. Similar findings were made by Kim *et al.* (2017), Baisan *et al.* (2021), Pascon *et al.* (2021) and Greeshma (2022). The prevalence of MVD increased progressively with advancing age, with valve lesions of varying severity, becoming apparent as the dogs approached their geriatric stage (Borgarelli *et al.*, 2008) and it was characterized by incomplete coaptation of the leaflets and subsequent valvular regurgitation, which were the primary manifestations of chronic myxomatous degeneration of the mitral valve, accounting for 75–80 per cent of cardiac disorders in dogs (Haggstrom *et al.*, 2005). In the present study, a statistically significant association was observed between age group and occurrence ($p < 0.05$) using Pearson's chi-square test (Table 2). Most of the affected dogs were middle-aged to old, with some cases diagnosed in dogs as young as 3 and 4 years old. This finding aligns with Kumar *et al.* (2021), who reported that MVD was more prevalent in the 0 to 4-year age group, although their study specifically focused on large-breed

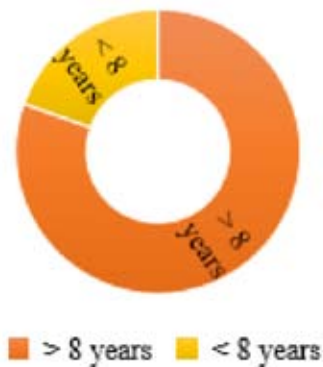


Fig. 1. Diagrammatic representation of age wise distribution of MVD affected dogs

dogs. The highest occurrence was observed in the age group of > 8 years (80.41 per cent), followed < 8 years (19.59 per cent) (Borgarelli *et al.*, 2008) (Fig. 1).

In the present study, the sex-wise comparison revealed a higher incidence of MVD in male dogs and showed a statistically significant association between sexes and occurrence ($p < 0.05$) as presented in Table 2.

Table 2. Association between age and sex on prevalence of dogs affected with MVD

		No: of animals (n)	Percentage (%)	Total (N)	Chi square value (p value)
Age	> 8 years	78	80.41	97	5.756* (0.016)
	< 8 years	19	19.59		
Sex	M	63	64.95	97	28.252** ($p < 0.01$)
	F	34	35.05		

** Significant at 1 per cent level

* Significant at 5 percent level

Among these 97 dogs, males accounted for 64.95 per cent, while females comprised 35.05 per cent. This is consistent with the findings of Rajesh (2021), Elsharkawy *et al.* (2022) and Greeshma (2022). The predominance of male dogs in this study might be attributed to their higher representation in the population, which could account for the observed male dominance. Males have a lower threshold for disease development than females, according to Olsen *et al.* (1999), who also indicated that polygenic inheritance affects the condition.

The major clinical signs and presenting complaints in dogs with MVD are presented in Table 3. Twenty-nine dogs were classified as ACVIM Stage B, while the remaining were classified as Stage C. The clinical signs included cough (56.71 per cent), exercise intolerance (34.03 per cent), respiratory distress (32.98 per cent), lethargy (10.31 per cent), hyporexia (8.25 per cent), distended abdomen (4.12 per cent), seizures and recumbency (3.09 per cent each) and syncope (2.06 per cent). The most common presenting complaint in dogs affected by dogs were cough, exercise intolerance, respiratory difficulty, hyporexia and lethargy. These findings align with reports by Merveille *et al.* (2015), Petric (2015), Kim *et al.* (2017), Mattin *et al.* (2018) and Vishnurahav *et al.* (2018). Cough and exercise intolerance were the predominant clinical signs observed in the present study. As reported by Abbott (1998), Ferasin *et al.* (2013) and Thirunavukkarasu and Nagarajan (2019), the enlargement

Table 3. Chief presenting complaints in dogs affected with MVD

Chief presenting complaints	No. of animals (n=97)	Percentage of animals
Cough	55	56.71
Exercise intolerance	33	34.03
Respiratory distress	32	32.98
Asymptomatic	29	29.89
Lethargy	10	10.31
Hyporexia	8	8.25
Distended abdomen	4	4.12
Seizures	3	3.09
Recumbency	3	3.09
Syncope	2	2.06

of the left atrium in cases of MVD can lead to tracheal elevation and compression of the left mainstem bronchi, which may significantly contribute to recurrent coughing in dogs. Freeman (2012) and Morgan *et al.* (2020) suggested that these findings may be associated with decreased cardiac output, leading to reduced oxygen delivery to tissues and subsequent hypoxemia, which is further correlated with lower SpO₂ levels. Respiratory difficulty was exhibited by dogs in the present study aligned with the findings of Pascon *et al.* (2021). In dogs with impaired pulmonary function, dyspnoea serves as a mechanism to optimise oxygenation by facilitating air intake, promoting lung expansion and enhancing oxygen exchange (Morgan *et al.*, 2020).

Summary

The study found that MMVD was more prevalent among small-breed dogs, with Spitz being the most commonly affected, followed by Non-descript breeds and Dachshunds. The occurrence was highest in male dogs of the age group > 8 years. The observed clinical signs include cough, exercise intolerance, hyporexia, lethargy and respiratory difficulty. Overall, this study provides insights into the demographic characteristics and clinical presentations of dogs affected by MVD. The findings highlight breed predisposition, age distribution and common clinical signs, aiding in the early identification and effective management of this condition in the canine population.

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Conflict of interest

The authors declare that they have no conflict of interest.

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