



A Study on the Prevalence of Canine Endocarditis

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Canine cardiac ailments are disease associated with cardiovascular system of dogs. Congenital and acquired heart diseases are the two main categories of cardiac ailments. Congenital cardiovascular lesions includes patent ductus arteriosus, pulmonary stenosis, aortic stenosis, persistent right aortic arch, ventricular septal defect, tetralogy of fallot, atrial septal defect, persistent left cranial vena cava and mitral insufficiency which accounts for only 5% of all canine heart diseases and are generally diagnosed in puppies On the other hand, acquired diseases of the heart are those which a dog picks naturally during its lifetime usually as a result of infection, injury, or normal wear and tear and includes cardiac arrhythmias, hypertension disease, heartworm disease, congestive heart failure, dilated cardiomyopathy, pericarditis, myocarditis, and endocarditis.

Methods: A prevalence study of canine cardiac ailments was carried out by conducting the retrospective study and routine heart health screening at different veterinary polyclinics, of

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Dehradun, Haldwani and Rudrapur of Uttarakhand & nearby Veterinary Institutions (NDVSU, Jabalpur and DUVASU, Mathura).

Results: A total of 51655 cases were taken in the present study and it was found that 5.91% of canine population had clinical evidence of cardiac problems out of which 0.11% were found positive for endocarditis. Out of the screened areas maximum prevalence of endocarditis was found in Mathura (0.137%) and least in Jabalpur (0.070%). Out of positive endocarditis cases, the males were more affected as compared to the females. The highest prevalence of endocarditis was found in the 7-9 year age group (33.33%) and least in 2-4 year age group (15.78%). Endocarditis was found to be most prevalent in Labrador and least in Dalmatian.

Conclusion: On the basis of results of the present study, endocarditis showed variations in prevalence based on geographical location, gender, age, and breed, with middle-aged to older male Labradors being at higher risk.

Keywords: Cardiac disorders; prevalence; endocarditis; dilated cardiomyopathy; cardiology.

1. INTRODUCTION

The bonding of dogs and humans is known as the human-canine relationship. The foundation of the relationship had developed 15000 years ago and in today's framework, at least in areas populated by humans, dogs are the planet's most abundant tellurian carnivore [1]. Dogs are an essential part of human lives for centuries and their advantageous effects have been found for at least 200 years. The global dog population is estimated to 700 million and rising [2]. Canine cardiac ailments are disease conditions that are associated with the cardiovascular system of dogs. The cardiovascular disease of dogs is a common, complex, and devastating disorder [3]. Congenital and acquired heart diseases are the two main categories of cardiac ailments. Congenital cardiovascular lesions in descending order of frequency of occurrence are Patent Ductus Arteriosus, Pulmonary Stenosis, Aortic Stenosis, Persistent Right Aortic Arch, Ventricular Septal Defect, Tetralogy of Fallot, Atrial Septal Defect, Persistent Left Cranial Vena Cava and Mitral Insufficiency. Congenital heart diseases account for only 5% of all canine heart diseases and are generally diagnosed in puppies. Congenital heart disease has not been studied widely [4]. The acquired diseases of the heart are those which a dog picks naturally during its lifetime usually as a result of infection, injury, or normal wear and tear it includes Cardiac arrhythmias, Hypertension disease, Heartworm disease, Congestive heart failure, Dilated cardiomyopathy, Pericarditis, Myocarditis, Pulmonary, and Endocarditis [5-7]. Endocarditis commonly involving the heart valves, but also affecting the inner lining of cardiac chambers or the endocardium elsewhere [8]. Bacteria are the main pathogens isolated

from lesions in Valvular and Mural endocardial tissue. The two terms Bacterial and Vegetative Endocarditis are in use to describe the disease. Sometimes the term infectious endocarditis is also used, it's an infection of valvular and mural endocardium with the microbe, which may have cardiac and extracardiac sequelae [9].

Endocarditis is rare in cats and uncustomary in dogs but it can result in fatal outcomes. Common microbial etiological agents of the disease include *Bartonella sp.*, *Escherichia coli*, *Streptococcus spp.*, & *Staphylococcus spp.* It can also be due to fungal origin and *Candida albicans*, *Histoplasma capsulatum*, and *Aspergillus* are the fungi which demonstrated to cause Endocarditis [10]. The epidemiology of endocarditis in companion animals has not been studied substantially. Difficulty in diagnosis and under-reporting of cardiac ailments plays a key role in the reported low prevalence rate of Endocarditis. Otherwise, Endocarditis is one of the most common endocardial alterations which occurs in Middle-aged, Large breeds, Male dogs. Pure-bred dogs are more affected [11]. The most obvious signs of endocarditis are usually non-specific and early in the onset of the disease and after the spread of pathogens throughout the body, dogs may develop signs such as arthritis and lameness. The affected dogs often show respiratory abnormalities (cough, dyspnoea, tachypnoea etc.). Diagnosis of cardiac ailments and endocarditis is difficult because of its complex nature but it can be done by proper examination of clinical signs, auscultation of animal, haematology and biochemical profile of blood also plays a key role in diagnosing heart disease, electrocardiography and

echocardiography are advanced diagnosing facilities which are used for the confirmatory diagnosis of the disease. Keeping in view the importance of canine cardiac ailments, the present study was conducted to investigate the prevalence of the disease, with a specific focus on endocarditis and to analyse the epidemiological patterns of endocarditis in dogs, including its distribution across different locations taken in the study, gender of the animal, various age groups and breeds which helps in addressing the gap in substantial epidemiological studies on endocarditis in companion animals.

2. MATERIALS AND METHODS

The present study was conducted at Department of Veterinary Medicine and Teaching Veterinary Clinical Complex, C.V. A. Sc, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar. Along with this a routine heart health screening as well as retrospective study of various canine cardiac ailments was conducted at several other organizations and hospitals namely, government veterinary polyclinics/hospitals, veterinary clinics, non-governmental organizations situated at Dehradun, Rudrapur and Haldwani, Uttarakhand; Teaching veterinary clinical complex, College of Veterinary Science and Animal Husbandry, NDVSU, Jabalpur (M.P.); and Veterinary Clinical complex (Kothari hospital), DUVASU, Mathura, U. P., for a period of 1 year from July 2020 to July 2021. The usage of animals in the present study was approved by the Institutes Animal Ethics Committee (IAEC) of G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.

To screen the cases of endocarditis, a preliminary health check-up and general clinical assessment was performed on all the canines which included history from owner, general examination and cardiac auscultation. Dogs presenting evidence of cardiac illness underwent a thorough clinical examination which included a full history from the owner as well as a physical examination which included detailed auscultation of the heart and lungs, electrocardiography (CARDIART- 6208, 3 channel, 12 lead electrocardiography machine with preinstalled Smart Electrocardiographic Measurements and Interpretation Program (SEMIP), BPL India Ltd.),

echocardiography (M- mode echocardiography), and radiography (Allerigers-60 mobile with the stationary anode, Medical system limited, Chandigarh, India).

The cardiac ailments with a focus on endocarditis, were screened on the basis of areas under study (Pantnagar, Haldwani, Rudrapur, Dehradun, Mathura and Jabalpur), sex of animal (Male or Female), breed of animal (Labrador, German Shepherd, Pomeranian, Non-Descript, Doberman, Beagle, and Dalmatian) and age group of the animal (2-4 years, 4-7years, 7-9 years and > 9 years). The dogs found positive for endocarditis were selected for further study.

3. RESULTS AND DISCUSSION

As very little evidence has been reported in India, about canine endocarditis as well as other canine cardiac disorders so the present study was aimed to conduct the retrospective study and heart health screening of canine population. In the retrospective study a total of 51655 cases of total canine population were taken and out of the population screened, 3056 (5.91%) of them had clinical evidence of cardiac problems and 57 (0.11%) cases of cardiac diseases were found to be positive for endocarditis. Several prevalence studies of canine endocarditis has been conducted previously which showed a prevalence between 0.05% to 6.6% [12,13]. Other studies have reported the prevalence of endocarditis in dogs to be 0.06% to 9% [11]. It was found that the prevalence of canine endocarditis is low as compared to other cardiac ailments [14]. The prevalence study of endocarditis in companion animals has not been studied extensively in the world [15] so the reported data is very less about this disease. One of the chief factors contributing to the under-reporting of the disease leading to the low prevalence of the disease is the struggle in judgement [16].

Area wise prevalence of endocarditis: The area wise prevalence of canine endocarditis is depicted in Table 1. Out of all the study areas taken, the maximum prevalence of endocarditis was found in Mathura (0.137%) followed by Rudrapur (0.126%), Dehradun (0.121%), Pantnagar (0.102%), Haldwani (0.094%) and, Jabalpur (0.070%).

Table 1. Area wise prevalence of cardiac ailments in dogs with special reference to endocarditis (N=51655)

S. No.	Place	Total Canine Cases (N=51655)	Dogs affected with Endocarditis (n=57)	Prevalence of Endocarditis (%)
1	Dehradun	15590	19	0.121%
2	Mathura	5832	8	0.137%
3	Jabalpur	8571	6	0.070%
4	Rudrapur	10245	13	0.126%
5	Haldwani	9564	9	0.094%
6	Pantnagar	1853	2	0.107%

Table 2. Sex wise prevalence of endocarditis in canines (n=57)

S. No.	Sex	Number of affected cases (n=57)	Sex wise prevalence of endocarditis (%)
1	Male	34	59.64%
2	Female	23	40.35%

Table 3. Age wise prevalence of endocarditis in canines (n=57)

S. No.	Age Group	Number of affected cases (n=57)	Age wise prevalence of endocarditis (%)
1	0-2 Year age group	4	7.01%
2	2-4 Year age group	9	15.78%
3	4-7 Year age group	11	19.29%
4	7-9 Year age group	19	33.33%
5	>9 Year age group	14	24.56%

Table 4. Breed wise prevalence of endocarditis in canines (n=57)

S. No.	Breed	Number of affected cases (n=57)	Breed wise prevalence of endocarditis (%)
1	Labrador	17	29.82
2	German Shepherd	13	22.80
3	Pomeranian	8	14.03
4	Non-Descript	6	10.52
5	Doberman	4	7.01
6	Beagle	7	12.28
7	Dalmatian	2	3.50

Sex wise prevalence of endocarditis: The sex wise prevalence of endocarditis in dogs is depicted in the Table 2. Out of total 57 cases of endocarditis of different regions, the males were more affected as compare to the females as the prevalence in males was 59.64% whereas in females the prevalence was 40.35%. In previous studies, the ratio of male and female dogs for the occurrence of endocarditis is reported to be 2:1. Overall prevalence of other cardiac ailments is also more in male dogs as compared to female

dogs [17]. Larger breed of male dogs was more prone to suffer from tachycardia [18]. The reason for increased vulnerability of men and male dogs for cardiac failure is unidentified, although a genetic correlation is occasionally alleged in humans because familial cardiac failure has been described in studies [19,20].

Age wise prevalence of endocarditis: The age wise prevalence of endocarditis in dogs is

depicted in the Table 3. To analyse the age-wise prevalence of endocarditis the dogs were categorized into different age groups like 0-2 year age group, 2-4 year age group, 4-7 year age group, 7-9 year age group, and age group of > 9 years. Out of 57 dogs studied for endocarditis, the maximum prevalence was found in 7-9 year age group (33.33%) followed by >9 year age group (24.56%) and least in younger dogs of 2-4 year age group (15.78%). In a study it was observed that most of the clinical cases of endocarditis were found in middle aged group dogs (*i.e.*, >5 years) [21,22]. It was also reported that about 25% of cardiac ailments in dogs arises between the ages of 9 and 12 years, and 33% in dogs over the age of 13 years [23].

Breed wise prevalence of endocarditis: The sex wise prevalence of endocarditis in dogs is depicted in the Table 4. Out of 57 cases of endocarditis screened in different breeds, the highest prevalence was found in Labrador (29.82%) followed by German shepherd (29.82%), and least in Dalmatian (3.50%). Previously higher prevalence of endocarditis in German shepherd, Boxer, Golden retriever and Labrador retriever breeds was documented [13,24,25].

4. CONCLUSION

This comprehensive study on canine endocarditis provides valuable insights into the prevalence and distribution of this cardiac condition in dogs across different regions of India *viz.* Uttarakhand, Mathura and Jabalpur. A retrospective study revealed an overall prevalence of endocarditis to be 0.11% among dogs with cardiac issues, highlighting its relatively rare but significant occurrence. The research highlights the disease's predisposition towards male dogs, aged 7-9 years, followed by those > 9 years, emphasizing the disease's association with gender and aging. Certain breeds of dog such as Labrador retrievers and German shepherds, exhibit higher prevalence rates, which highlights the breed predispositions. Bacterial infections affecting heart valves and endocardium are the major causes of endocarditis which leads to severe complications if not diagnosed and treated promptly. Diagnosis is challenging due to nonspecific early symptoms, requiring

advanced diagnostic tools like echocardiography and careful clinical evaluation. These findings contribute to the limited body of knowledge on canine endocarditis in India and provide a foundation for further research and clinical management strategies. In conclusion, endocarditis is an underreported and underdiagnosed condition of canines but it is an exhaustive process to rule out the confirmatory diagnosis due to requirement of various modern techniques. Further research and increased awareness are essential to improve detection, management, and outcomes for dogs affected by this serious cardiac condition.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ETHICAL APPROVAL

The usage of animals in the present study was approved by the Institutional Animal Ethics Committee (IAEC) of College of Veterinary and Animal Sciences, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand (IAEC/C.V.A.Sc./VMD/431).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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