



## The Incidence of Cardiac Diseases in Dogs of Kolkata Metropolitan Area

Joydip Mukherjee<sup>1\*</sup>, Pradip Kumar Das<sup>2</sup>, Prabal Ranjan Ghosh<sup>3</sup>, Kinsuk Das<sup>1</sup> and Dipak Banerjee<sup>1</sup>

<sup>1</sup>Assistant Professor, Department of Veterinary Physiology, Faculty of Veterinary and Animal Sciences, WBUAFS, West Bengal, INDIA

<sup>2</sup>Professor and Head, Department of Veterinary Physiology, Faculty of Veterinary and Animal Sciences, WBUAFS, Kolkata, West Bengal, INDIA

<sup>3</sup>Associate Professor, Department of Veterinary Physiology, Faculty of Veterinary and Animal Sciences, WBUAFS, Kolkata, West Bengal, INDIA

\*Corresponding Author: [joyphy@gmail.com](mailto:joyphy@gmail.com)

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### Abstract

*The present investigation was intended to investigate the incidence of cardiac diseases in dogs of Kolkata metropolitan area. Based on clinical signs, thoracic radiograph and electrocardiography, two hundred fifteen cases of cardiac problems were selected. The predominant signs were inappetence (31.16%) followed by persistent coughing (18.14%) weight loss (15.81%), and exercise intolerance (12.09%). Most of the dogs under investigation exhibited DCM (48.37%) followed by sinus arrhythmia (16.74%) and (29%) sinus tachycardia (14.42%). The highest incidence of cardiac disease was recorded in Spitz (22.11%) followed by Labrador (15.05%) and Mongrel (12.08%). There were progressively increasing incidences of cardiac diseases with the advancement of age with the highest incidence (32.09%) around 7-10 years of age. Males exhibits higher occurrence (57.21%) of cardiac diseases compared to females (42.79%).*

**Keywords:** Age, Breed, Cardiac Diseases, Clinical Signs, Dogs, Kolkata, Sex

## Introduction

Kolkata, the city of joy, in eastern India is a hub of elite pet owners and urbane animal lovers. According to Calcutta Canine Club (CCC), around 5,000 thoroughbred pups are registered each year and several thousand mongrels are adopted every year (TOI, 2018). The heart diseases are common in dogs with an incidence rate of 15% which may increase 60% or more above 7 years of age (Reetu *et al.*, 2017). Breed, age and sex predilection of cardiac diseases have been reported earlier in dogs (Oliveira *et al.*, 2011). Some specific cardiac diseases are hereditary in nature and breed specific (Vollmar, 1999; Urfer *et al.*, 2017). Doberman Pinschers have high risk of DCM (Wess *et al.*, 2017) inherited by an autosomal dominant trait (Meurs *et al.*, 1998). Small sized breed of dogs are susceptible to valvular diseases (Kim *et al.*, 2017). The occurrence of cardiac diseases increased with advancing age (Detweiler *et al.*, 1968). Juvenile DCM follows an autosomal recessive pattern of inheritance (Sisson and Thomas, 1995). But, Swenson *et al.* (1996) mentioned that age was not the only factor for development of cardiac diseases as DCM has been reported to develop within the first weeks or months of life in Portuguese Water dogs (Dambach *et al.*, 1999) whereas, in Doberman Pinscher, the disease was of adult occurrence (Calvert *et al.*, 1997). The incidence of cardiac diseases are more in male dogs compared to females (Reetu *et al.*, 2017; Sisson and Thomas, 1995). Atkins *et al.* (1999) reported higher incidence of chronic valvular diseases in males compared to females. In contrary, Tidholm *et al.* (1997) reported that sex had no influence over congenital heart diseases.

Lack of awareness among pet owners and insufficient diagnostic tools make cardiac disease a silent killer in our country (Devi *et al.*, 2009). Thirunavukkarasu (2019) studied the prevalence of canine acquired heart diseases in Chennai, India and found 0.37 per cent (106 out of 28467) incidence out of which dilated cardiomyopathy (DCM) and mitral valve diseases (MVD) were most common. There were no published reports on the incidence of cardiac diseases in dogs of Kolkata metropolitan area. Therefore, the present investigation was carried out to know the incidence of cardiac diseases in dogs of Kolkata metropolitan area in reference to breed, age and sex. The common clinical symptoms of cardiac diseases were also investigated which will help the clinicians to diagnose cardiac diseases in dogs.

## Materials and Methods

The present investigation was carried out on the dog patients presented to the Veterinary Clinic under West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal, India during the period from 2018-2019. The patients with cardiac problems (n=215) were considered for the study after investigating thoracic radiographs and electrocardiograms out of total 285 cases. Electrocardiography was done a singlechannel ECG machine (Make: BPL, model: Cardiart<sup>R</sup>) of 25 mm/s paper speed and 10 mm=1 mV calibration. The information regarding breed, age and sex were retrieved from hospital database of the said dogs patients. The symptoms of cardiac diseases were recorded from case sheets. The data was analysed in terms of incidence of occurrence along with breed, age and sex predilection.

## Results and Discussions

### Clinical Signs

The predominant clinical signs of cardiac diseases recorded under the investigation were presented in Table 1. The predominant signs were inappetence (31.16%) followed by persistent coughing (18.14%) weight loss (15.81%), and exercise intolerance (12.09%) which were in accordance with the earlier reports of Wright *et al.* (1996) and Devi *et al.* (2009).

**Table 1:** Manifestation of clinical signs in dogs with cardiac diseases

Clinical Signs	No. of Cases (n=215)	Percentage
Inappetence	67	31.16
Exercise intolerance	26	12.09
Persistent Coughing	39	18.14
Vomition	18	8.37
Dyspnoea	23	10.7
Ascites	8	3.72
Weight loss	34	15.81

In a related study, Mallery *et al.* (1999) observed anorexia in 84% of dogs with congestive heart failure. The cause of anorexia may be a consequence of dyspnoea or side effect of medication (Patrick *et al.*, 2012). The anorexia in cardiac illness may be attributed to increased levels of proinflammatory cytokines, such as tumour necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin-6 (IL-6), IL-1 $\beta$  and C reactive protein (CRP) (Cesari *et al.*, 2003; DeFrancesco, 2007). The causes of progressive weight loss with cardiac diseases are due to loss of body fat and muscle wasting due to inappetence, maldigestion and protein losing enteropathy (Gompf, 2008). Poor tissue perfusion and cellular hypoxia may lead to muscle wasting (Devi *et al.*, 2009). Dyspnoea and coughing are the cardinal signs of cardiac diseases in dogs which are manifested due to pulmonary oedema (Gompf, 2008) or compression of the bronchus by the dilated left atrium (DeFrancesco, 2007). Ascites is the consequence of right sided heart failure in dogs due to either acquired or congenital heart defects (Gompf, 2008). Exercise intolerance and weakness are the non-specific symptoms of cardiac diseases. However, it must be ruled out from other causes like anaemia, systemic diseases and metabolic diseases (Gompf, 2008).

### The Incidence of Cardiac Diseases

The incidence of different cardiac diseases in dogs has been presented in Table 2. Most of the dogs under investigation exhibited DCM (48.37%) followed by sinus arrhythmia (16.74%) and (29%) sinus tachycardia (14.42%).

**Table 2:** The incidence of different cardiac diseases in dogs

Cardiac Abnormalities		No. of Cases (n=215)	Percentage
Dilated cardiomyopathy	Left ventricular hypertrophy	55	25.58
	Left atrial hypertrophy	24	11.16
	Right atrial hypertrophy	25	11.63
Sinus arrhythmia		36	16.74
Sinus tachycardia		31	14.42
Atrioventricular block		2	0.93
Mitral Valve Disease		15	6.98
Myocardial ischaemia		5	2.33
Ventricular premature complex		9	4.19
Low voltage complex		10	4.65
Bradycardia		3	1.4

The findings were corroborated with the reports of Wess *et al.* (2017) who reported highest incidence of dilated cardiomyopathy (DCM) in his investigation. Rush (2002) also reported higher incidence (75%) of DCM in his investigation out of which 95% were acquired. Serres *et al.* (2007) and Schober *et al.* (2010) reported that DCM was the main cause of congestive heart failure in dogs. We categorized DCM into four groups based on the involvement of atria and ventricles upon ECG findings. Right and left atrial hypertrophy are characterised by increased P wave amplitude and duration respectively (Tilley, 1992; O'Grady *et al.*, 1992). The left ventricular enlargement is the main cause of cardiac hypertrophy (Gugjoo *et al.*, 2014) and characterised by increased R amplitude and QRS duration (Tilley, 1992; O'Grady *et al.*, 1992). The right ventricular hypertrophy was not well detectable by ECG (Tilley, 1992). Sinus arrhythmia was the second most common cardiac abnormalities found in this investigation with an incidence of 17% of total dogs examined indicated by uneven R-R distance depicted in ECG. The rate of incidence was similar to that reported by Tilley (1992) but, lower compared to the reports of Changkija (2007). However, Paławska *et al.* (2004) and Gabriel (1992) reported lower incidence of cardiac arrhythmias in their studies. The main cause of cardiac arrhythmias in our investigation was associated with ventricular premature complex (4%) right bundle branch block (1%) and bradycardia (1%). Ventricular premature complex is one of the major cause of arrhythmia with an incidence of 8.9% in arrhythmic dogs (Paławska *et al.*, 2004). Gabriel (1992) and Tilley (1992) reported higher incidence (34.67% and 25.5% respectively) of ventricular premature complex in cardiac arrhythmia. But, Detweiler (1993) reported 0.6–1% incidence of ventricular premature complex in clinically normal Beagle dogs. In our investigation, we found 1% dogs with atrioventricular block (AV block). In contrast, the studies of Noszczyk-Nowak *et al.* (2017) and Gabriel (1992) reported that AV block as the most common cause of cardiac arrhythmia with an incidence of 22.95% and 19.35% of arrhythmic dogs

respectively. The incidence of sinus bradycardia was 1% in our study. Noszczyk-Nowak *et al.* (2017) also reported least occurrence of sinus bradycardia in their study. The occurrence of mitral valve disease (MVD) in our study (7%) was lower compared to other reports indicating the occurrence of MVD from 21% to 89% in dogs (Buchanan, 1977; Kogure, 1980). Ischaemic heart diseases are common in humans and atherosclerosis is the main predisposing factor (Cotran *et al.*, 1994). But, dogs are naturally resistant to atherosclerosis thus the occurrence of ischaemic heart diseases are low (Liu *et al.*, 1986). We found myocardial ischaemia in 2% of the dogs under study indicated by depressed ST segment (Tilley, 1992). The low voltage complex in electrocardiogram was often associated with pericardial effusion (Tilley, 1992). In our findings, 5% dogs showed low voltage complex and most of them were associated with ascites.

### Breed Wise Incidence of Cardiac Diseases

Breed wise incidence of different cardiac abnormalities in dogs has been depicted in Table 3. The highest incidence was recorded in Spitz (22.11%) followed by Labrador (15.05%) and Mongrel (12.08%).

**Table 3:** Breed wise incidence of different cardiac diseases in dogs

Breed	No. of Cases (n=215)	Percentage
Mongrel	26	12.08
Labrador	32	15.05
Crossbred	18	8.17
Spitz	48	22.11
Beagle	20	9.2
Pug	18	8.33
Dachshund	7	3.19
German Shepherd Dog	13	6.47
Pomeranian	9	4.24
Golden Retriever	14	6.3
Doberman	10	4.65

There were lots of controversies relating to the breed wise incidence of cardiac diseases in dogs. Reetu *et al.* (2017) reported highest incidence of cardiac abnormalities amongst Spitz in agreement with our investigation. In contrary, Himalini *et al.* (2017) reported Labrador as the most susceptible breeds for cardiac diseases. On the other hand, Tidholm and Jonsson (1996) reported no major breed specific differences concerning clinical, pathological or prognostic characteristics of cardiac diseases in dogs. Vollmar (1999) studied the hereditary predispositions of cardiac diseases in dogs and reported highest incidence of dilated cardiomyopathy in certain breeds like Doberman pinscher. The valvular diseases are common in the small and medium sized breeds like Poodle, Chihuahua, Doberman Pinscher and Cocker Spaniel (Detweiler and Patterson, 1965) compared to giant breeds like GSD, Doberman Pinschers, Boxers and Great Danes mostly susceptible to DCM (Buchanan, 1977; Tidholm *et al.*, 1997). Some breeds are susceptible to specific cardiovascular diseases such as Cavalier King Charles Spaniel for valve incompetence and congestive heart failure due to mitral valve endocardiosis exclusively in small breeds (Abbott, 1998).

### Age Wise Incidence of Cardiac Diseases

Age wise incidence of cardiac diseases in dogs has been presented in Table 4. There was a progressive increasing trend of incidences of cardiac diseases with the advancement of age up to 10 years. The highest incidence (32.09%) was recorded in the dogs between 7-10 years of age. Hamlin, (2005) and Calvert *et al.* (1997) also reported that frequency of cardiac diseases increases with age in dogs. Borgarelli *et al.* (2004) reported higher prevalence of cardiac problems above 4-5 years of age in dogs. Generally, there is occurrence of valvular diseases at young age (Thrusfield *et al.*, 1985) and DCM in older dogs (Martin *et al.*, 2010). Decrease in the functional capabilities of heart with the advancement of age is multifactorial.

**Table 4:** Age wise incidence of different cardiac diseases in dogs

Age (years)	No. of Cases (n=215)	Percentage
< 1 year	25	11.63
1-4 years	37	17.21
4-7 years	39	18.14
7-10 years	69	32.09
>10 years	45	20.93

Strait and Lakatta (2012) mentioned three changes in the cardiovascular system of human in response to ageing. Firstly, the heart rate and myocardial contractility do not increase in response to  $\beta_1$ -adrenergic effects and the  $\beta_2$ -adrenergic vasodilatation is also reduced in ageing patients. Secondly, myocardium becomes stiffer due to deposition of abnormal collagen with ageing which impairs the diastolic filling. Thirdly, the mitochondria in cardiac cells are unable to generate sufficient ATP for contraction and relaxation of heart in response to stress (Lakatta, 1992).

### Sex Wise Incidence of Cardiac Diseases

Sex wise incidence of different cardiac diseases in dogs has been presented in Table 5. Males exhibits higher occurrence of cardiac diseases compared to females.

**Table 5:** Sex wise incidence of different cardiac diseases in dogs

Sex	No. of Cases (n=215)	Percentage
Male	123	57.21
Female	92	42.79

Sex predilection of cardiac abnormalities was studied earlier in dogs for both congenital (Tidholm *et al.*, 1997) and acquired (Vollmar, 2000) cardiovascular diseases. Sisson and Thomas (1995) also reported the occurrence of DCM in ratio of 2:1 amongst male and female dog populations. In a related study, Reetu *et al.* (2017) reported 25% higher occurrence of cardiac diseases in male dogs compared to females. Atkins *et al.* (1999) reported 1.5 times more occurrence of valvular diseases in male dogs. The reasons behind higher male predilection of cardiac diseases are yet to resolve but, similar trends in human populations may be due to less adaptive capabilities (physiologically, behaviourally, and emotionally,) in males to cope with stressful events (Weidner, 2000).

### Conclusion

The findings of this investigation permitted us to conclude that the highest incidence of cardiac problems in dogs of Kolkata was DCM and the Spitzs were mostly susceptible. The incidence was highest in male dogs. The dogs of 7-10 years were mostly susceptible. The study will help the clinicians to rule out cardiac problems and increase the awareness among pet owners.

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### Conflict of Interests

There is no conflict of interest.

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