The Pharma Innovation Journal 2022; SP-11(5): 986-990

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(5): 986-990

www.thepharmajournal.com
Received: 18-03-2022
Accepted: 28-04-2022

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Occurrence of canine cardiac disorders in and around Mahakaushal region of India from March 2021-November 2021

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Abstract
Cardiac disorders are one of the common causes of canine death. The symptoms are not very prominent in earlier stages of cardiac disorders causing overlooking of diagnosis and treatment on time. In this study, 6596 client owned dogs presented at Veterinary Clinical Complex, College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Jabalpur, Madhya Pradesh, India, were screened with the objective of determining the occurrence of cardiac disorders in canine population of Jabalpur region. The study was conducted from March, 2021 to November, 2021. Among them 191 dogs having clinical signs were subjected to thorough investigations (i.e., cardiac auscultation, electrocardiography, haemoglobin and biochemical estimation along with serum electrolyte and mineral estimation). Overall occurrence was 1.29% in the dog population. Out of the suspected cases (191 cases), 85 dogs (44.5%) were found to be affected with various types of cardiac disorders. Breed wise Labrador Retrievers were found to be affected predominantly followed by non-descript dogs. Cardiac disorders are mostly seen in older age dogs (more than 9 years of age) i.e., 32.94%.

Keywords: Auscultation, cardiac disorder, electrocardiography, occurrence

Introduction
Heart suffers from a variety of infectious, non-infectious, parasitic, genetic, nutritional and deficiency diseases leading to its compromised function. With the advancement in veterinary diagnosis, cases of cardiovascular diseases have spiked and are as common in canine patients as in human subjects. Veterinary medicine still lacks a comprehensive and up-to-date analysis of the prevalence of heart rhythm disturbances in animals (Nowak *et al.*, 2017) [9]. There is frequent omission of cardiac cases due to lack of awareness in veterinary clinicians and pet owners (Singh *et al.*, 2008) [16]. In India, attempts to diagnose the cardiac disorders in canines are rarely practiced which leads to non-availability of statistics related to cardiac diseases in dogs. Therefore, the present study was conducted with objective to record the prevalence of cardiac disorders in various breeds, age and sex of dogs, in Mahakaushal region of Madhya Pradesh, India.

Materials and Methods
The study was carried out in Veterinary Clinical Complex, College of Veterinary Science & A.H., Jabalpur, Madhya Pradesh. A total of 6596 dogs were presented from March, 2021 to October 2021. Out of which 191 dogs were suspected for having clinical signs related to cardiac disorders which were subjected to thorough investigation for confirmation. The clinical screening methods included complete history (diet offered, duration of illness and exercise status of animal), palpation and auscultation of the cardiac area (mediastinal space, extending from third rib to the border of sixth rib), pulse rate examination followed by electrocardiography, haemoglobin, biochemical and serum electrolyte estimation

Results
Occurrence of cardiac disorders in dog population and suspected cases
The overall occurrence of cardiac disorders was reported as 1.29% (85/6596) in the dog population. However, higher occurrence was reported in male (1.54%) as compare to female (0.86%). Results are depicted in table 01.

Out of total 191 dogs (145 male and 46 females) suspected for having cardiac disorders (showed clinical signs related to cardiac disorders). The occurrence in clinically suspected dogs was 44.50% (85/191). Higher occurrence of cardiac disorders was found in males 41.30% (19/46) as compared to female 45.51% (66/145). Results are depicted in table 01.

Table 1: Occurrence of cardiac disorders in dog population and suspected cases

Particular	Dogs screened	Suspected dogs	Affected dogs	Overall occurrence (%)	Occurrence (%) in suspected dogs
Male	4155	145	64	1.54	45.51
Female	2441	46	21	0.86	41.30
Total	6596	191	85	1.29	44.50

Age wise occurrence of cardiac disorders in dogs

The maximum occurrence (32.93%) of cardiac disorders was recorded in more than 9 years of age group followed by 28.23% (24/85) in 6-9 years of age group, 25.88% (22/85) in 3-6 year of age group, 09.41% (8/85) in 1-3 year age group and minimum 03.52% (03/85) in 0-1 year age group of dogs. Results are shown in table 02.

Table 2: Age-wise occurrence of cardiac disorders in dogs

Age group	Suspected dogs	Positive dogs	Occurrence (%)
0-1 year	12	3	03.52
1-3 year	21	8	09.41
3-6 year	48	22	25.88
6-9 year	59	24	28.23
> 9 year	51	28	32.94

$\chi 2$= 27.76, p= <0.001 (Significant)

Breed wise occurrence of cardiac disorders in dogs

The breed wise occurrence of cardiac disorders in dogs documented highest in Labrador 32.94% (28/85) followed by Non-descript 23.52% (20/85), German Shepherd 18.82% (16/85), Golden Retriever 11.76% (10/85), Small breed dogs (Pomeranian, Indian Spitz, Lhasa Apso, Pug, Dachshund, Beagle) 09.41% (08/85) and Giant breed dogs (St. Bernard, Rottweiler, Boxer, Greyhound, Great Dane, Dalmatian) 07.05% (06/85). Results are depicted in table 03.

Table 3: Breed wise occurrence of cardiac disorders in dogs

Breed	Suspected dogs	Affected dogs	Occurrence (%)
Labrador Retriever	51	28	32.94
Golden Retriever	18	10	11.76
German Shepherd	26	16	18.82
Non-descript	59	20	23.52
Giant breed*	17	06	07.05
Small breed**	20	08	09.41
$\chi 2$= 9.366, p= 0.095 (Non-significant)			

*Giant breed- St. Bernard, Rottweiler, Boxer, Greyhound, Great Dane, Dalmatian

** Small breed- Pomeranian, Indian Spitz, Lhasa Apso, Pug, Dachshund, Beagle

Body weight wise occurrence of cardiac disorders in dogs

The highest occurrence of cardiac disorders was reported (69.41%) in more than 30 kg body weight dogs followed by 25.88% in 10-30 kg body weight and minimum 04.70% in less than 10 kg body weight of dogs. Results are depicted in table 04.

Table 4: Body weight wise occurrence of cardiac disorders in dogs

Body weight (in kg)	Suspected dogs	Positive dogs	Occurrence (%)
<10	16	04	04.70
10-30	68	22	25.88
>30	107	59	69.41
$\chi 2$= 11.431, p= 0.003 (Significant)			

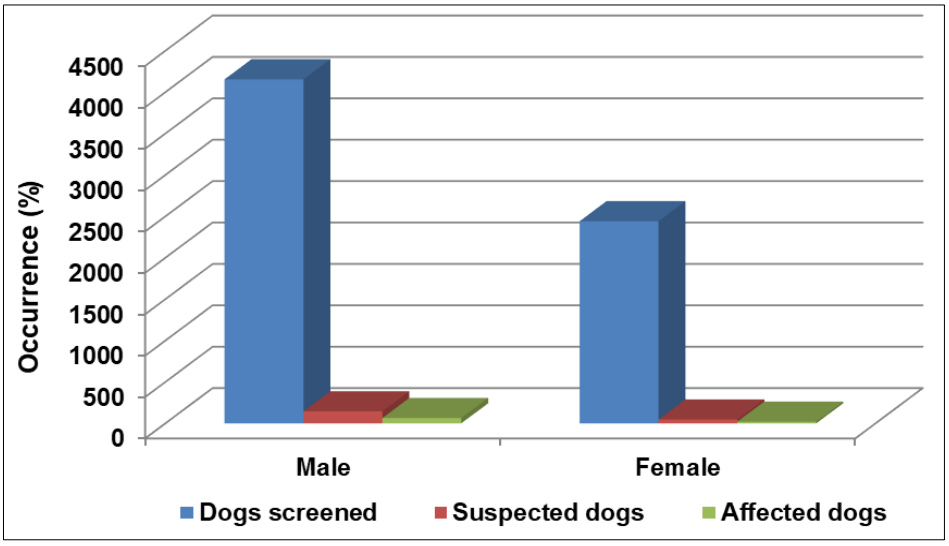

Fig 1: Overall occurrence and occurrence in suspected cases of cardiac disorders

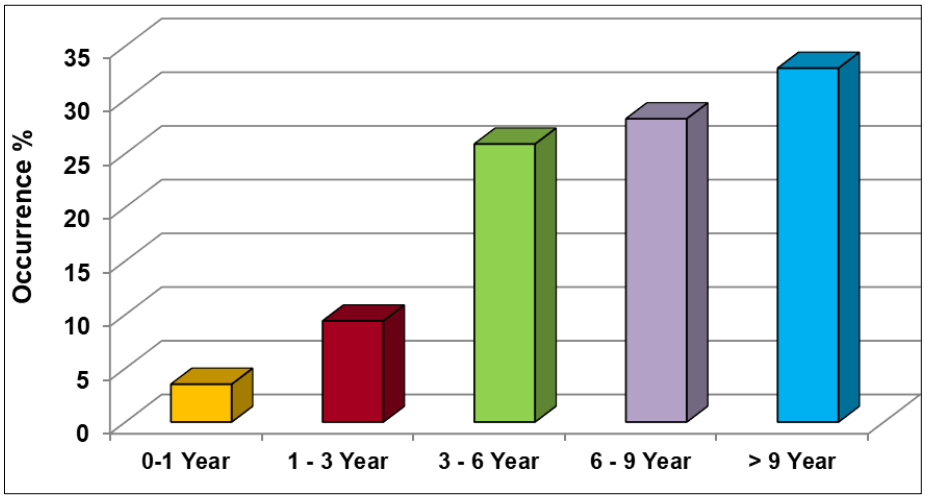

Fig 2: Age-wise occurrence of cardiac disorders in dogs

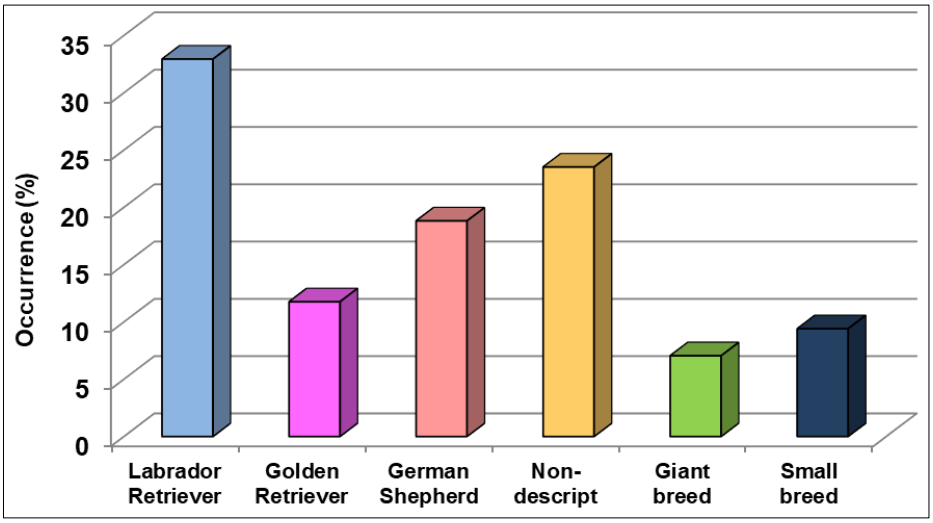

Fig 3: Breed wise occurrence of cardiac disorders in dogs

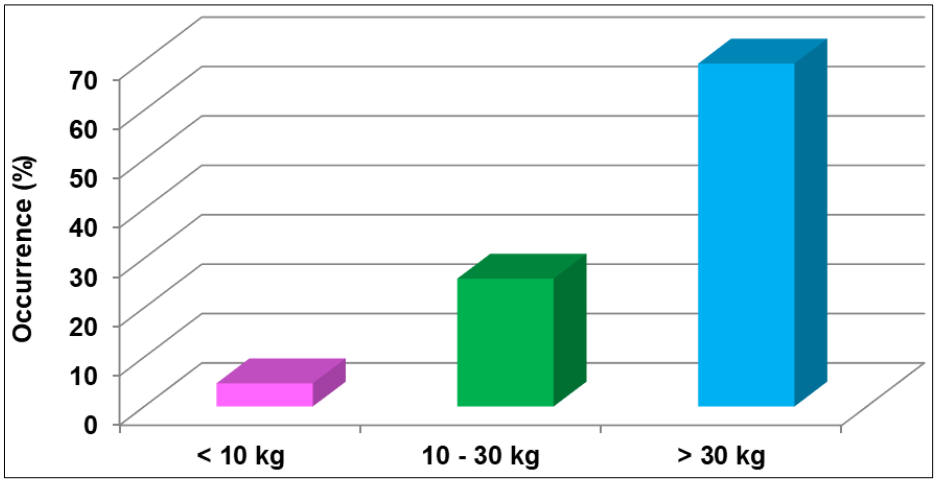

Fig 4: Body weight wise occurrence of cardiac disorders in dogs

Discussion

The overall occurrence recorded in the study is in accordance with Sahoo *et al.* (2022) [13] who reported an overall occurrence of cardiac disorders in and around Mahakaushal region of India as 1.23%. Similarly, Kumar (2011) [6] and Haritha *et al.* (2017) [3] reported an overall prevalence of cardiac disorders in dogs in and around Hyderabad, India as 1.65% and 1.77% respectively. Also, 2.14% occcurrence of cardiac disorders was reported by Badsar *et al.* (2018) [1] in dog population in and around Indore region of Madhya Pradesh. The findings of male predominance are in accordance with the previous studies who have also recorded higher prevalence of cardiac disorders in suspected cases and more male dogs were found to be affected. Sahoo *et al.* (2022) [13] reported 45.99%, Badsar *et al.* (2018) [1] documented 40.81% while, Haritha *et al.* (2017) [3] reported

little higher prevalence (56.21%) among the dogs exhibiting the clinical signs suggestive of cardiac disorders. A male predominance observed in the present study agrees with earlier reports of Sission *et al.*, 2000; Jafari *et al.*, 2011; Priyanka, 2012; Singh, 2013; Devi, 2015 and Nowak *et al.*, 2017 [17, 5, 11, 15, 2, 9]. Hence it was suggested that the higher occurrence of cardiac disorders in male may be because of preference of pet parents towards keeping male dogs. The release of ovarian hormones in females may reduce the risk of cardiovascular disorders. The female reproductive hormones offer a cardioprotective effect by modulating the process of atherosclerosis. This might be a reason for lower female prevalence in our study.

Geriatric dogs were found mostly affected in this study which is in partial agreement with the observations recorded by Sahoo *et al.* (2022) [13]. Who recorded highest occurrence in dogs above 10 years of age (53.85%) which is in partial agreement with our findings. Also, our findings are in partial accordance with Badsar, (2017) and Kumar, (2014). Kumar, (2014) documented highest prevalence in dogs of 1-3 year age group (23.17%) while, Badsar, (2017) reported highest prevalence in dogs more than 5 years of age (62.50%). Ageing is linked with the diminished function of pacemaker due to structural and functional changes in cardiac muscles. Also, there is an increase in deposition of collagen fibers between the tissue of atrio-ventricular node and bundle of His which causes reduced velocity of impulse conduction in the segments. This might be the reason behind higher occurrence in more than 9 years of dogs in our study.

In Labrador Retrievers more occurrence of the cardiac disorder might be due to genetic predisposition of breed to the cardiac affections. Also, this breed is more prone to obesity (in case of lack of exercise) which can lead to significant health issues (such as metabolic disorders, digestive disorders, joint problems and cardiac disorders). In this Mahakaushal region the frequency of cardiac disorders is prevalent in above mentioned breed may also depend upon the preference of specific breeds by the pet owners of this area. Breed wise mostly Labrador Retrievers were found affected and similar findings were reported by Sahoo (2020), Sawhney (2020), Haritha *et al.* (2017) [13, 14, 3]. They reported higher occurrence in Labrador Retriever dogs (*i.e.*, 67.65%, 33.33% and 38.05%, respectively). Also, Hoque *et al.* (2019), Badsar *et al.* (2018), Lanber *et al.* (2005) [4, 1, 8] observed that the risk of developing a particular type of heart disease varies with breed. Varshney *et al.* (2011) [19] also reported higher occurrence in large and giant breed dogs.

Obesity is associated with an increased risk of cardiovascular disease (Pinckard, 2019). Sahoo (2020) [10, 13] reported highest occurrence in dogs between 10-30 kg of body weight (56.25%), followed by dogs more than 30 kg (55.56%) and less than 10 kg of dogs (18.92%). This is in partial accordance with our findings. Compared to the ideal weight dogs, obese dogs have alterations in cardiac structure and function and increased concentration of inflammatory markers. This may lead to systemic hypertension which is a potential contributing factor for cardiac dysfunction (Tropf *et al.*, 2017) [18].

Cardiac disorders are second most common cause of death in canines after cancer. In brief it can be concluded that cardiac disorders affect significant population of canines and it must be dealt with top priority to avoid any untoward situation. Overall occurrence is found 1.29% and 44.5% in suspected cases. Breed wise Labrador Retriever dogs and age wise dogs more than 9 years of age were found maximally affected. Male dogs were predominantly affected when compared with the female dogs. Electrocardiography can be used as an early indicator of disorders of cardiac conduction system.

Acknowledgement

The authors acknowledge the support of Dean, College of Veterinary Sciences and Animal Husbandry, NDVSU, Jabalpur for providing the necessary facilities required to carry out the research work. Authors are grateful for generous cooperation and awareness of pet owners of Mahakaushal region (M.P.) India.

Statements & Declarations

Funding

The authors declare that no funds or grants were received during the course of this research work.

Competing Interests

The authors have no relevant financial or non-financial interest to disclose.

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Dr. Mitali Singh and Dr. Devendra Gupta. The first draft of the manuscript was written by Dr. Mitali Singh and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Statement of Animal Rights

This study was approved by Institutional Animal Ethical Committee after screening it thoroughly keeping in mind the guidelines of CPCSEA (Dated- 13/07/2021; CPCSEA Reg. No. 2071/GO/Re/S/19/CPCSEA)

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