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Indicators of congestive heart failure in elderly dogs: Occurrence and associated risk factors study in the hilly state of Himachal Pradesh

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Abstract

The present study was conducted at Dr. G. C. Negi College of Veterinary & Animal Sciences, CSKHPKV, Palampur, to evaluate the occurrence and causes of congestive heart failure (CHF) in geriatric dogs from June 2023 to August 2024. The total number of registered dogs was 2,574, out of which 275 geriatric dogs were screened and 24 were diagnosed with CHF, reflecting an occurrence rate of 0.93%. Dilated cardiomyopathy (DCM) was the most common cause (37%), followed by mitral valve disease (MVD) (29%). Labrador Retrievers and non-descript dogs were most affected. CHF was more common in male dogs (75%) and in dogs over 15 kg. DCM predominantly affected medium to large breeds, while MVD was more prevalent in smaller breeds and these findings highlight the need for early detection of CHF, especially in breeds prone to specific cardiac disorders.

Key Words: Canine, CHF, ECG, Geriatric, Heart

Heart diseases in dogs can occur at any age, but age is the primary risk factor for cardiac issues in both humans and canines. The incidence of heart disease increases dramatically with age. Cardiac diseases can be acquired or congenital, with the former accounting for 95% of all cardiac conditions. The common ultimate pathological feature for all cardiovascular diseases is congestive heart failure (CHF). Congestive heart failure is a multifaceted clinical syndrome that arises due to diminished cardiac function, leading to predictable hemodynamic alterations and involving various compensatory mechanisms within the neuroendocrine system (Packer *et al*. 1993). Significant factors contributing to the onset of congestive heart failure include dilated cardiomyopathy, endocarditis, mitral and tricuspid regurgitation, congenital heart defects, heartworm infection, elevated blood pressure, tumours, impaired contractile function and even pregnancy in female dogs (Santilli *et al*. 2017). According to Rao *et al.* (2008), heart failure stands out as one of the most frequent causes of sudden death among dogs in India. Significant research has been conducted on canine heart diseases in Western countries, but in India, particularly in Himachal Pradesh, this field is still in its early stages of development.Thus, the purpose of this study was to investigate the occurrence and risk factors of congestive heart failure in geriatric dogs, with a particular emphasis on the impact of gender, breed, and weight.

Materials and Methods

The present study was conducted from, June 1, 2023, to August 31, 2024, in the Department of Veterinary Medicine, Dr. G. C. Negi College of Veterinary & Animal Sciences, CSKHPKV Palampur, Himachal Pradesh. During the study period, the number of dogs registered was 2,574. Of these, 275 geriatric dogs were screened, and 24 geriatric dogs were diagnosed with congestive heart failure (CHF). Aged dogs were initially screened based on their history, signalment, clinical signs, haemato-biochemical and electrolyte estimation. Final CHF diagnosis was based on electrocardiography,

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radiography, and echocardiography. ECG was performed using the RMS Vesta 301i Electrocardiograph Machine, a 12-lead system, thoracic radiographs were taken using an X-ray machine (Allengers HF MARS 80' from Allengers Medical Systems, India) and confirmation with echocardiography was done, using the Siemens Acuson X 300 ultrasound system with a 3.5 – 7 MHz P-8 phased array probe.

Results and Discussions

In this study, occurrence of congestive heart failure in geriatric dogs was recorded nearly 1% (0.93%) and is represented in Table 1. These results are like the findings of Gupta *et al.* (2017) and Haritha *et al.*(2017) who reported CHF as one among the most frequent encountered cardiac disease, with estimated occurrence of 1, 1.60 and 1.77percent, respectively. Slight variation in contrast to their study, which included dogs of various ages, ours only included geriatric dogs, which may account for the somewhat lower incidence of CHF.

Based on the data from Table 2, out of 24 cases of congestive heart failure, 9 dogs (37%) were diagnosed with dilated cardiomyopathy (DCM), making it the most common cause. Additionally, 7 dogs (29%) were found to have mitral valve disease (MVD), 3 dogs (13%) were diagnosed with hypertrophic cardiomyopathy (HCM), and 5 dogs (21%) suffered from pericardial effusion, which are similar to the findings of Deepti *et al*. (2016)and Sharma and Palahania (2024). This analysis highlighted DCM as the leading contributor to CHF in geriatric dogs, accounting for more than one-third of the cases. This underscores the critical need for early detection and proactive management of DCM in older dogs. MVD also plays a significant role in our study, being the second most prevalent cause, responsible for nearly a third of the CHF cases.

The breed-wise distribution as depicted in Table 3 indicated that CHF cases were highest in the non-descript breed (ND) and Labrador Retriever, followed by Pomeranian, Rottweiler, Gaddi, Mastiff and one each for German Shepherd, Saint Bernard, and Pug.

Table 1. Occurrence of congestive heart failure (CHF) in geriatric canines

S. No.	Total registered dogs	Geriatric dogs screened	Geriatric Dogs affected	Occurrence (%)
1.	2574	275	24	~1 (0.93%)

Table 2. Frequencyof various causes of CHF in geriatric dogs (n=24)

S. No.	Cause	No. of dogs affected	Occurrence (%)
1.	DCM	9	37
2.	MVD	7	29
3.	HCM	3	13
4.	Pericardial Effusion	5	21

Table 3. Breed-wise Frequency of various causes of CHF in geriatric dogs

No.	Breed	DCM	MVD	HCM	PE	CHF
1.	Labrador Retriever	2 (22.23%)	2 (28.57%)	—	—	4 (16.67%)
2.	Non-descript dog	1 (11.12%)	—	1 (33.34%)	4 (80%)	6 (25%)
3.	Pomeranian	1 (11.12%)	2 (28.57%)	—	—	3 (12.50%)
4.	Golden Retriever	1 (11.12%)	—	—	—	1 (4.16%)
5.	German Shepherd	—	—	—	1 (20%)	1 (4.16%)
6.	Mastiff	2 (22.23%)	—	—	—	2 (8.34%)
7.	Saint Bernard	1 (11.12%)	—	—	—	1 (4.16%)
8.	Rottweiler	1 (11.12%)	1 (14.29%)	1 (33.34%)	—	3 (12.50%)
9.	Gaddi	—	2 (28.57%)	—	—	2 (8.34%)
10	Pug	—	—	1 (33.34%)	—	1 (4.16%)
11.	Total	9 (100%)	7 (100%)	3 (100%)	5 (100%)	24 (100%)

Labrador Retriever and Non-descript breed dogs were the majorly CHF-affected breeds. Similar, to the findings of Deepti *et al*. (2016), who reported that CHF was highest in the Labrador Retriever (32.05%), followed by non-descript breed dogs (21.80%).

The occurrence of dilated cardiomyopathy (DCM) was predominantly observed in Labrador Retrievers and Mastiffs. Non-descript dogs, Pomeranians, Golden Retrievers, Saint Bernards, and Rottweilers also exhibited DCM, while no cases were reported in German Shepherds, Gaddi dogs, or Pugs. Particularly, Mastiffs were exclusively affected by DCM, making it a key concern for this breed. The percent occurrence and number of dogs affected among DCM and CHF issimilar to the findings of Deepti *et al.* (2016), Martin *et al*. (2009) and Tilley and Smith (2011) who reported that the DCM is frequently observed in medium to giant breeds.

The breed-wise occurrence of MVD in Pomeranian, Labrador and Gaddi was 28.57%, followed by the Rottweiler breed. In the present study, DCM emerged as the leading cause of CHF, although some researchers highlighted MVD as the most prevalent heart disease in dogs (Wolf *et al.* 2012 and Baisan *et al.* 2021), the differing trend observed here may be attributed to the breed distribution at this hospital. Labrador Retrievers, being medium to large-sized dogs, are more prone to developing DCM than MVD, and their popularity as pets likely led to their over representation in this study. The breed-wise occurrence of HCM was identified in one dog each from non-descript, Rottweiler, and Pug breeds, each constituting 33.34% of the HCM cases.The breed-wise occurrence of pericardial effusion (PE) was overwhelmingly prevalent in non-descript dogs (80%), and one case was observed in a German Shepherd dog.

In this study, the gender-wise occurrence of CHF, as shown in Table 4, revealed a significant disparity between male and female dogs. CHF was far more prevalent in male dogs, with 75% of the cases, compared to only 25% in females. This clearly illustrates this trend, highlighting that CHF was predominantly a male condition, accounting for nearly three-quarters of all cases. Among MVD dogs, all were male. Among cases of DCM, 66.67% were male, while females accounted for only 3 cases. Among HCM dogs, two were male and one was female. PE showed a slightly more balanced distribution, affecting 3 males and 2 females. Similar findings were reported by Martin *et al.* (2009). The increased occurrence of CHF in male dogs could be linked to the tendency of owners to favour males over females when selecting pets.

The occurrence of CHF by body weight is summarized in Table 5, patients affected were categorized based on their body weight, <15 kg (25.00%), 15-30 kg and >30 kg (37.50%).

In the DCM cases, there was one dog in the <15 kg category, 6 dogs in the >30 kg group, and 2 dogs in the 15-30 kg range. Similar to the findings of Martin *et al.* (2009), they reported that over 95 per cent of dogs affected with DCM weighed more than 15 kg. This distribution supports the notion that DCM is primarily observed in medium to large breeds, may be due to the

Table 4. Gender-wise occurrence of CHF in geriatric dogs (n=24)

S. No.	Gender	DCM	MVD	HCM	Pericardial Effusion	Total (n=24)
1.	Male	6 (66.67%)	7 (100%)	2 (66.67%)	3 (60%)	18 (75%)
2.	Female	3 (33.34%)	—	1 (33.34%)	2 (40%)	6 (25%)
3.	Total	9 (100%)	7 (100%)	3 (100%)	5 (100%)	24 (100%)

Table 5. Distribution of congestive heart failure cases by body weight categories

S. No.	Body weight (Kgs)	DCM (n=9)	MVD(n=7)	HCM(n=3)	PE(n=5)	CHF(n=24)
1.	< 15	1 (11.12%)	3 (42.86%)	2 (66.67%)	0	6 (25%)
2.	15-30	2 (22.23%)	2 (28.57%)	0	5 (100%)	9 (37.5%)
3.	>30	6 (66.67%)	2 (28.57%)	1 (33.33%)	0	9 (37.50%)

fact that giant breeds have larger hearts and increased body mass, which can place extra demands on the heart. Over time, this strain may lead to dilation of the heart chambers and weakening of the heart muscle. For HCM, two dogs fell into the <15 kg category and one dog was in the >30 kg group, which aligns with the findings of Schober *et al.* (2022), who reported that 85% of HCM-affected dogs weighed less than 10 kg.

Among the mitral valve disease cases, 3 dogs were <15 kg, 2 dogs were between 15-30 kg, and 2 dogs were >30 kg. The majority of MVD cases were found in dogs weighing less than 30 kg, which may be attributed to the higher occurrence of MVD in small-breed dogs, as suggested by Slupe *et al.* (2008).This could be because of small breed dogs have unique heart structures, with smaller and more delicate mitral valves. Over time, these valves can develop thickening and degeneration, leading to MVD. Moreover, smaller breeds tend to live longer than larger breeds, allowing for more time for degenerative changes to develop in the mitral valve. In the group suffering from pericardial disease, all five dogs fell within the median weight range of 15-30 kg, which contrasts the findings of MacDonald *et al.* (2009), who reported a median weight range of 31.50 kg. Overall, most of the CHF cases were observed in dogs weighing more than 15 kg, likely because obesity can reduce systolic function and impair heart rate variability, potentially raising the risk of cardiovascular disease in dogs (Pongkan *et al*. 2020).

Conclusion

The present study concluded that occurrence of congestive heart failure in geriatric dogs was 0.93% with dilated cardiomyopathy (DCM) as the most common cause. Dogs weighing over 15 kg were more likely to develop CHF, with those over 30 kg being more susceptible to DCM and those under 15 kg more prone to MVD. Dogs in the 15-30 kg range showed a greater propensity for pericardial effusion. While this study offers valuable insights into the occurrence and distribution of heart conditions among geriatric dogs, few limitations should be considered asthese results could not apply to all dog populations because they are based on a small sample size. A bigger, more varied sample size and a prospective methodology should help future studies improve the precision and generalization of these results across different breeds and weight ranges.

Conflict of interest: The authors declare that there is no conflict of interest among the authors in this research paper.

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