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Research Article

Symptomotology in Different Stages of Chronic Kidney Disease Affected Dogs

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Abstract

The present study was carried out on dogs presented to Veterinary Clinical Complex, Bhoiguda and Campus Veterinary hospital, College of Veterinary Science, Rajendranagar, Hyderabad, Telangana during period from October 2020- February 2021. A total of 4,690 dogs, Out of which, 140 dogs were suspected for chronic kidney disease based on the history and were further screened; among the monly56 dogs were diagnosed with chronic kidney disease (CKD) on the basis of history, observation of classical clinical manifestations, hematological alterations, biochemical profile, electrolyte profile, ultrasonographic findings, urinalysis. In dogs suffering with different stages of CKD, vomitions, inappetence, haematuria, weight loss, weakness, polyuria, polydipsia, pale mucous membrane, halitosis, hematemesis, edema and ascites were observed.

Keywords: CKD; Dogs; Stages; Clinical Signs

Introduction

Kidneys play a fundamental role in maintaining fluid and electrolyte balances, as well as removing nitrogenous waste, facilitating erythropoiesis via secretion of erythropoietin, vitamin D activation, maintaining acid–base balance, elimination of drugs by filtration/secretion, and maintaining blood volume via anti-diuretic hormone, also known as vasopressin [8]. Renal disease can develop at any age, but chronic renal diseases are more frequently diagnosed in aged pets and also a common cause of death. Potential causes of chronic diseases include trauma, infection, immunological diseases, neoplasms, renal ischemia, genetic anomalies and exposure to toxins. The initial underlying cause of renal damage is no longer present when the pet develops chronic renal failure and is mainly due to the ability of the kidney to compensate for large proportions of functional tissue loss [5].

Chronic kidney disease (CKD) is defined as the presence of structural or function abnormalities of one or both the kidneys for an extended period usually three months or longer [19]. Approximately 75% or more loss in the functional renal mass results in compromised excretory function to the extent of a state of azotemia [25]. And also hyper phosphatemia, melena, buccal ulcers and anaemia [22]. In CKD, animal fails to excrete many naturally occurring waste products such as blood urea nitrogen (BUN), creatinine and phos-

phorus, leading to accumulation of these substances in the body. An excessive accumulation of these substances leads to azotemia, resulting in vomition, inappetence, polyuria, polydipsia, halitosis, oral ulceration, oliguria, dental tartar, stranguria, weakness, ascites, pale mucous membrane, weight loss, hematemesis, emaciation, melena, dribbling of urine, edema and haematuria. Clinical signs associated with CKD are not pathognomonic and sometime do not appear until substantial renal damage develops [13]. At least loss of 70-85 per cent of functional renal capacity is necessary for a pet to show signs of renal failure [25]. Keeping in view the importance of renal failure in canines, the present study was undertaken to record various clinical signs exhibited in all four stages of CKD.

Materials and Methods

The present study was carried out on dogs presented to Veterinary Clinical Complex, Bhoiguda and Campus Veterinary Hospital, College of Veterinary Science, Rajendranagar, Hyderabad with the history and clinical signs suggestive of renal failure such as inappetence, vomiting, oral ulcers, halitosis, polyuria/polydipsia and other general signs were considered. A total of 56 dogs were diagnosed with chronic kidney disease (CKD) were classified according to International Renal Interest Society (IRIS, 2019) standards based on serum Creatinine levels the renal failure cases were classified into four stages is presented in table 1. In present study, out of 56 dogs with CKD, 27(48.21%) were in stage I, 14 (25%) were in CKD stage II, 7 (12.5%) were in CKD stage III, and 8 (14.28%) were in stage IV. Various clinical materials that were collected from renal failure and the clinical signs exhibited by CKD dogs were recorded and presented in percentages. The data collected were statistically analyzed as per the methods described by Snedecor and Cochran (1994) by using SPSS package version 15.0. The significance of results was evaluated by applying one way ANOVA (Duncan's multiple range test). Differences between means were tested using Duncan's multiple comparison test and significance was set at 5 percent ($p < 0.05$) and also 1 percent ($p < 0.01$). The values were represented as mean ± Standard Error.

S. No	Serum Creatinine	CKD stage
1	< 1.4 mg/dl	I
2	1.4-2.8	II
3	2.9-5.0	III
4	> 5.0	IV

Table 1: International renal interest society (IRIS) (2019) staging system standards based on serum creatinine levels.

Results and Discussion

The various clinical signs observed in dogs suffering from chronic kidney disease were Inappetence, vomition, polyuria, polydipsia, halitosis, oral ulceration, oliguria, dental tartar, stranguria, weakness, ascites, pale mucous membrane, weight loss, hematemesis, emaciation, melena, dribbling of urine, edema and haematuria. These findings were in agreement with [4,11,16,18,26].

Among 27 dogs diagnosed with CKD stage I, 11 (40.74%) dogs exhibited vomitions, in 7 (25.92%) dogs revealed inappetence and 4 (14.81%) dogs showed haematuria, presented in table 2.

Out of 14 dogs with CKD stage II, 9 (64.28%) dogs exhibited vomitions, 8 (57.14%) dogs revealed inappetence, 8 (57.14%) dogs exhibited weight loss, 7 (50%) dogs revealed weakness, 6 (42.85%) dogs showed polyuria and 6 (42.85%) dogs showed polydipsia, 4 (28.57%) dogs revealed pale mucous membrane, 2 (14.28%) dogs showed haematuria, 1 (7.14%) dog exhibited halitosis, 1 (7.14%) dog showed hematemesis,1 (7.14%) dog revealed edema and 1 (7.14%) dog showed ascites.

Among 7 dogs with CKD stage III, 5 (71.42%) dogs exhibited vomitions, 5 (71.42%) dogs showed weakness, 4 (57.14%) dogs revealed inappetence, 4 (57.14%) dogs showed pale mucous membrane, 4 (57.14%) dogs showed weight loss, 3 (42.85%) dogs showed polyuria and 3 (42.85%) dogs showed polydipsia, 3 (42.85%) dogs showed melena, 3 (42.85%) dogs showed emaciation, in 2 (28.57%) dogs halitosis is noticed, 2 (28.57%) dogs showed oliguria, 2 (28.57%) dogs showed hematemesis, 2 (28.57%) dogs showed dental tartar, 2 (28.57%) dogs showed haematuria 1 (14.28%) dog showed stranguria, 1 (14.28%) dog showed dribbling of urine, 1 (14.28%) dog showed ascites, and 1 (14.28%) dog showed oral ulcers.

Among 8 dogs with CKD stage IV, 8 (100%) dogs exhibited vomitions, 8 (100%) dogs showed weakness, 7 (87.5%) dogs showed pale mucous membrane, 6 (75%) dogs showed emaciation, 5 (62.5%) dogs showed polyuria and 5 (62.5%) dogs showed polydipsia, in 5 (62.5%) revealed inappetence, 5 (62.50%) dogs showed weight loss, 4 (50%) dogs showed melena, in 3 (37.5%) dogs halitosis is noticed, 3 (37.50%) dogs showed oliguria, 3 (37.50%) dogs showed dental tartar, 3 (37.50%) dogs showed

S.No	History and clinical signs	Stage-I (n = 27)		Stage-II (n = 14)		Stage-III (n = 7)		Stage-IV (n = 8)	
		n	%	n	%	n	%	n	%
1	Vomition	11	40.74	9	64.29	5	71.42	8	100
2	Inappetence	7	25.92	8	57.14	4	57.14	5	62.5
3	Oral ulcers	0	0	0	0	1	14.28	2	25.00
4	Halitosis	0	0	1	7.14	2	28.57	3	37.50
5	Polyuria	0	0	6	42.85	3	42.85	5	62.50
6	Polydipsia	0	0	6	42.85	3	42.85	5	62.50
7	Oliguria	0	0	0	0	2	28.57	3	37.50
8	Weight loss	0	0	8	57.14	4	57.14	5	62.50
9	Emaciation	0	0	0	0	3	42.85	6	75.00
10	Weakness	0	0	7	50	5	71.42	8	100
11	Palemucous membrane	0	0	4	28.57	4	57.14	7	87.50
12	Melena	0	0	0	0	3	42.85	4	50.00
13	Hematemesis	0	0	1	7.14	2	28.57	2	25.00
14	Edema	0	0	1	7.14	0	0	0	0
15	Ascites	0	0	1	7.14	1	14.28	2	25.00
16	Dental tartar	0	0	0	0	2	28.57	3	37.50
17	Stranguria	0	0	0	0	1	14.28	0	0
18	Dribbling of urine	0	0	0	0	1	14.28	0	0
19	Haematuria	4	14.81	2	14.28	2	28.57	3	37.50

Table 2: Clinical observations of chronic kidney disease dogs.

haematuria, 2 (25%) dogs showed oral ulcers, 2 dogs showed dental tartar, 2 (25%) dogs showed hematemesis, and 2 (25%) dogs showed ascites (Figure 1-10).

In renal failure, vomiting might be due to uremic gastropathy and retention of uremic toxins according to [21]. Vomition is caused due to the stimulation of chemoreceptor trigger zone (CTZ) caused by uremic toxins [17]. Decreased clearance of gastrin and increased production of gastric acid production is observed in renal failure which exacerbates the gastric lesions [19].

Inappetence might be due to accumulation of toxic metabolic waste products (unidentified anorexigenic substance), decreased clearance of leptin, ghrelin hormones which are involved in the appetite regulation center in the brain and hyper serotoninergic state from increased tryptophan transport to the brain [2]. Accumulation of blood nitrogen catabolic products leads to anorexia or inappetence [20] and decreased calorie intake due to uremia [10].

Figure 1: Hematemesis in a dog with CKD.

Polyuria and polydipsia was due to inability of the kidneys to concentrate urine [12]. Halitosis might be due to bacterial degradation of urea to ammonia [21]. Weight loss and Weakness in the present study might be due to azotemia/uremia [19]. Due to consequences of inadequate calorie intake, insulin resistance and com-

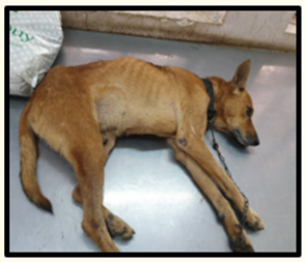

Figure 2: Dull, dehydrated and emaciated dog with CKD.

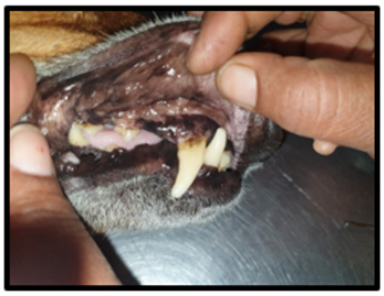

Figure 3: Dental Tartar in a dog with CKD.

Figure 4: The CKD dog with frothy vomiting.

Figure 5: Yellowish vomiting in a dog with CKD.

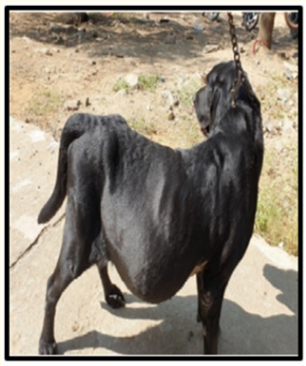

Figure 6: Ascites in CKD affected dog.

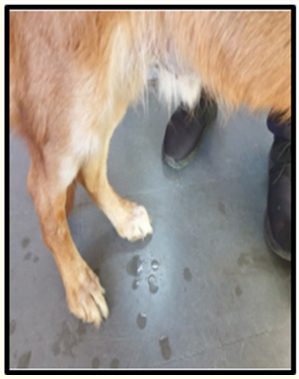

Figure 7: Dribbling urine in a dog with CKD.

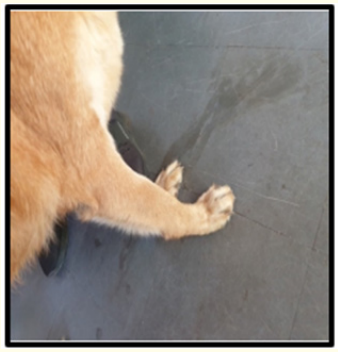

Figure 8: Edema in CKD affected dog.

Figure 9: Pale conjuctival mucosa in CKD affected dogs.

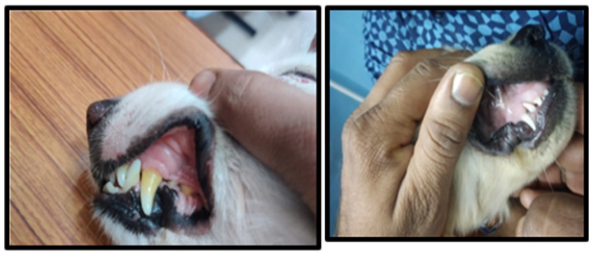

Figure 10: Pale buccal mucosa in CKD affected dogs.

bined catabolic effects of uremia and intestinal absorption weight loss is also evident in dogs affected with Renal disorders [14].

Anemia was a result of depressed renal erythropoietin factor production from the diseased kidneys, blood loss in the form of haematemesis [5]. Oliguria is a sign of renal failure, due to normal physiologic response or as manifestation of pathology within in renal system. Physiologic oliguria is usually characterized by a high urine specific gravity, and maximum reabsorption of water and sodium. Pathologic oliguria due to renal failure is characterized by decrease in glomerular filtration rate (GFR) and inappropriately isothenuric urine and increase in fractional excretion of sodium [23].

Melena is attributed due to gastric ulceration in response to hypergastrinemia. As a result of increased secretion or reduced renal clearance of gastrin, hypersecretion of gastric acid and direct damage to gastric mucosa, submucosa and vasculature by uremic toxins contribute further to gastritis [9]. Gastrointestinal ulcerations and thrombocytopathy in response to uremic toxins contribute to melena [21]. Emaciation is observed in the present study is due to chronic vomiting, less water intake and excessive urination [3].

Oral ulcers are a result of caustic effects of ammonia produced locally by the action of bacterial ureases and uremic alterations in mucus layer causing back diffusion of hydrochloric acid [8]. Ascites was a result of diminished production of albumin, increased excretion of proteins through urine or sodium retention by diseased kidney [11]. Dental tartar was observed in the present study was due to strong association between chronic azotemic kidney disease and severity of periodontal disease and increasing severity of periodontal disease was also associated with serum creatinine > 1.4 mg/dl and blood urea nitrogen > 36 mg/dl [7]. Gingival recession involving whole maxillary arcade, oral mucosa ulcers and tissue necrosis and mobility of mandibular incisors contribute to dental tartar [16].

Hematemesis was observed in the study was a result due to gastric ulceration in response to hypergastrinemia as a result of increased secretion or reduced renal clearance of gastrin hypersecretion of gastric acid and direct damage to gastric mucosa, submucosa and vasculature by uremic toxins contribute further to gastritis [9]. Stranguria and dribbling of urine was observed in the study was a result due to neoplastic and hyperplastic conditions [6] and also might be due to prostatitis as [24]. Edema was observed in the study was a result due to hypo albuminemia or vasculitis leading to interstitial fluid accumulation despite an intravascular volume deficit [27-30]. In CKD clinical signs are nonspecific but signs vary depending on uremic crisis and stage of CKD.

Conclusions

In the present study, various clinical signs observed in CKD affected dogs were vomition, inappetence, polyuria, polydipsia, halitosis, oral ulceration, oliguria, dental tartar, stranguria, weakness, ascites, pale mucous membrane, weight loss, hematemesis, emaciation, melena, dribbling of urine, edema and haematuria. It can be concluded that, by studying these clinical signs in dogs affected with various stages of chronic kidney disease, the intensity of the disease will be known and further diagnosis will be done.

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