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HEMATOLOGICAL AND BIOCHEMICAL CHANGES ASSOCIATED WITH PERIODONTAL DISEASE IN DOGS

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ABSTRACT

Periodontal disease (PD) is by far the most common problem in small animal veterinary medicine and has been suggested as cofactor in various other diseases. Hematological and biochemical changes associated with PD among dogs in India at present are meager. Of the 89 PD dogs, 27 (32.58%) had low hemoglobin and 3 (3.37%) had low hematocrit indicating concurrent anemia, 18 (20.22%) had leukocytosis indicating secondary bacterial infection, 28 (31.46%) had thrombocytopenia, 17 (19.10%) had elevated creatinine > 1.7 mg/dl, indicative of concurrent renal insufficiency and 10 (11.23%) had elevated ALT > 55IU/L, indicative of concurrent hepatic insufficiency. There was no significant difference observed between PD dogs and control dogs. However, the association among the PD dogs with renal insufficiency significant.

KEYWORDS: Periodontal disease, Hematology, biochemistry, Systemic disease association.

INTRODUCTION

Among all the oral cavity diseases, periodontal disease are most commonly encountered among the small animal practice. Periodontal disease is a progressive disease, affecting the structures that supports and hold the teeth. PD was considered as a factor that predisposes the dogs to bacteraemia and subsequently to systemic complications.[1]

The primary etiologic agents are bacterial plaque and bacterial byproducts. Several studies were conducted in the past in other parts of the world indicated, concurrent anemia, azotemia or lecopenia among PD dogs.[2] Such studies among the dogs in Indian scenario at present are meager and the hematological and biochemical changes associated with periodontal disease among dogs are lacking.

MATERIALS AND METHODS

The dogs presented to the Veterinary College Hospital, Hebbal, Bangalore, suggestive of periodontal disease (PD) were subjected for detailed oral cavity examination as per the American Veterinary Dental College guidelines.[3] A separate dental history case sheet was prepared to record the oral cavity examination and it essentially involved probing of gingival sulcus and furcation involvement. Blood samples (2 ml) were collected separately with ethylene-diamine-tetra-acetic acid (EDTA) and without EDTA (Clot activator) from the periodontal disease dogs and subjected to hematological evaluation such as, hemoglobin (Hb), packed cell volume (PCV), total leukocyte count (TLC) and thrombocyte counts (Plt) using Mindray (BC-2800 vet) semi automatic cell counter. Serum was separated and stored in aliquots of 2 ml and subjected for biochemical evaluation immediately for blood urea nitrogen (BUN), Creatinine (Crt) and Alanine amino Ttransferase (ALT) using Trivitron semi automatic analyzer and reagents manufactured by transasia pvt ltd. Instances where samples have to be stored, serum samples are stored in aliquots of 2 ml at appropriate storing condition.

Clinically healthy 15 dogs, without any signs of PD and not undergoing any sort of medications from 1 month were served as control dogs. Blood samples were collected, evaluated and analyzed using appropriate statistical tools.

RESULTS AND DISCUSSION

A total of 89 dogs were diagnosed for periodontal disease during the study period. For the purpose of analysis only mean ± standard error (SE), values have been presented in the Table 1. Among all the PD dogs, Hemoglobin ranged from 3.89 g/dl to 22.1 g/dl with a mean of 12.59 $\pm$ 0.89. However, a total of 27 dogs had less than 10 g/dl of hemoglobin, this indicated that 32.58% of dogs had low hemoglobin or were slightly anemic. Among the 15 control dogs, Hb ranged from 9.6 g/dl to 18.2 g/dl, with a mean of 11.39 $\pm$ 0.80 and the difference was not significant. This is similar to the reports of earlier workers who reported significant lower concentration of hemoglobin (Hb) and hematocrit.[4,5]

Packed cell volume (PCV) among the PD dogs in the current study ranged from 10.1 to 63% with a mean of 38.21 ± 0.98. Among these, 3 dogs had PCV less than 20%, this indicated that 3.37% of dogs were anemic and 6 dogs had PCV more than 50%, this indicated that 6.74% of dogs were dehydrated. Among the control dogs, PCV ranged from 29 to 44%, with a mean of 35.95 ± 1.71 and there was no significant difference. The low hematocrit (3.37%) observed in the current study could be due to anemia and the high hematocrit (6.74%) observed could be due to starvation, anorexia, dehydration, fluid deprivation or loss of body fluid through vomition or enteritis as evidenced through anamnesis. Further, anemia could also be caused in PD, if they are associated with concurrent leptospirosis[6], babesiosis, tick /flea infestations and anchylostomiasis and many of these diseases are endemic in Bangalore.

Total leukocyte count among the PD dogs ranged from 3100 to 79200 cells/cmm with a mean of 15753.59 ± 1314.91. Among these 18 dogs had TLC count more than 17000/cmm, this indicated that 20.22% of dogs to have higher values of TLC or were in the process of infection. Among the control dogs, TLC ranged from 8900 to 14650 with a mean of 12027 ± 1336.26 and the difference was not significant. This is in agreement with earlier studies that reported significant elevation of leukocyte counts.[4] However, this is not in agreement with earlier studies that reported leukopenia among the PD dogs.[7] The elevated leukocyte count observed in current study may be due to secondary bacterial infection or active infection.

Platelet count among the 89 PD dogs in the current study ranged from 11000 cells/cmm to 946000 cells/cmm with a mean of 270119.00 ± 16685.66. Among these, 28 dogs had Platelets count less than 200000/cmm, this indicated that 31.46% of dogs were thrombocytopenic. Among the control dogs, Platelets ranged from 192000 to 421500 cells/cmm with a mean of 322454 ± 44282.84 and there was no significant difference. Similar results have been reported in earlier studies that indicated thrombocytopenia in cases associated with PD.[5,8] Thrombocytopenia could also be observed in PD, if they are associated with concurrent diseases like ehrlichiosis or leptospirosis[9] and these diseases are considered endemic among the dogs in Bangalore.

Creatinine (Crt) and Blood Urea Nitrogen (BUN) among the PD dogs in the current study ranged from 0.13 mg/dl to 13.2 mg/dl and 5 mg/dl to 35mg/dl respectively with a mean of 1.38 ± 0.18 mg/dl and 15.27 ± 0.70 mg/dl respectively. Among the control dogs, Crt and BUN ranged from 0.3 to 1.7 mg/dl and 9 to 20 mg/dl respectively with a mean of 1.06 ± 0.10 and 12.89 ± 0.87 respectively, and the difference was not significant. However, among the

PD dogs, the association with renal insufficiency was significant but the association with hepatic insufficiency was not significant (Table 2). Similar results were reported in earlier studies indicating significant association of PD with chronic kidney disease.[2]

Alanineamino Tranferase (ALT/SGPT) among the PD dogs in the current study ranged from 2 IU/L to 360 IU/L with a mean of 43.81 ± 5.39. Among the control dogs, ALT ranged from 32 to 55 IU/L with a mean of 33.00 ± 3.59 IU/L and difference was not significant. Of the 89 PD dogs, 17 dogs had elevated levels of Crt and BUN, while, 10 dogs had elevated levels of ALT. This indicated that, there is concurrent disease associated with renal failure (19.10%) and hepatic insufficiency (11.23%). This is similar to the earlier study results that indicated elevation of ALT among PD dogs.[4]

Table 1: Hematological and biochemical changes associated with periodontal disease.

	Periodontal disease dogs (N=89)	Confidence Interval 95%		Control dogs (N=15)	Confidence Interval 95%	
Hematology and Biochemistry	**Mean± SE**	**Upper limit**	**Lower limit**	**Mean± SE**	**Upper limit**	**Lower limit**
Hemoglobin (g/dl)	12.59±0.89	14.33	10.85	11.39±0.80	12.95	9.83
Total leukocyte count (cells/cmm)	15753.59±1314.91	18330.35	13176.37	12027.00±1336.26	14646.06	9407.94
Platelets (cell/cmm)	270119.00±16685.66	302822.89	237415.11	322454.00±44282.84	409248.36	235659.64
Packed cell volume (%)	38.21±0.98	40.13	36.29	35.95±1.71	39.30	32.6
Creatinine (mg/dl)	1.38±0.18	1.73	1.03	1.06±0.10	1.25	0.87
Blood Urea Nitrogen (BUN) (mg/dl)	15.86±0.71	16.64	13.90	12.89±0.87	14.59	11.19
Alanine amino transferase (SGPT) (IU/L)	43.81±5.39	54.37	33.25	33.00±3.59	40.03	25.97

Note: The observed values were bared on normal range[9] ($P>0.05^{NS}$).

Table 2: Periodontal disease association with systemic diseases.

	Periodontal disease	P value
Renal insufficiency	17 (19.10 %)	0.04
Hepatic insufficiency	10 (11.23 %)	0.21
Cardiac insufficiency	02 (2.24 %)	0.63
No systemic involvement	60 (67.41 %)	0.00

CONCLUSION

Periodontal disease is a common oral cavity disease among dogs and hematological changes associated includes, mild to moderate degree of anemia (decreased Hb), thrombocytopenia (decreased platelets) and leukocytosis (increased TLC) among few PD dogs however, there is no significant variations. Biochemical changes associated includes, significant elevation of creatinine indicative of renal insufficiency.

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