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Clinico-haematological and biochemical studies on canine demodicosis

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Abstract

The present study was conducted in the Dept. of Veterinary Clinical Medicine, Ethics and Jurisprudence, College of Veterinary and Animal Sciences, Mannuthy. Dogs from different parts of Kerala were screened for clinical signs specific for demodicosis like erythema, alopecia, papules, pustules, and furunculosis. Diagnosis was made based on the clinical signs and microscopic examination of deep skin scrapings. Out of the 356 cases with demodicosis, twenty four animals with generalized demodicosis were selected for detailed study. Whole blood and serum samples were collected for haemato-biochemical analysis. The variation in the haemato-biochemical parameters was compared with values of control animals. Haematological analysis of dogs with demodicosis revealed a significant decrease in haemoglobin, volume of packed red cells and total erythrocyte count. A significant increase in erythrocyte sedimentation rate was observed in dogs with demodicosis. Leucocytosis with neutrophilia and eosinophilia was observed in dogs with demodicosis compared to control animals. A non-significant rise in serum C-reactive protein was noticed in diseased dogs.

Keywords: Dogs, demodicosis, demodex, C-reactive protein

Introduction

Demodicosis is considered as one of the most common cutaneous infections encountered in canine practice (Sivajothi *et al.*, 2015) ^[13]. The disease is mainly caused by *Demodex canis* and the other two less common mites include short bodied *Demodex cornei* and large bodied *Demodex injai* (Gortel 2006) ^[2]. *Demodex canis* and *D. injai* were two different species and the short-bodied *D. cornei* was a morphological variant of *D. canis* (Sastre *et al.*, 2012) ^[10].

The two clinical forms of demodicosis are localized and generalized. The major clinical signs of demodicosis include alopecia, erythema, pustules, crusts and furunculosis. Secondary pyoderma is a most common complication of demodicosis (Scott *et al.*, 2001) ^[11]. Acute phase response (APP) is considered as a part of the innate host defense system which shows elevated serum levels after a tissue injury. Ulutas *et al.* (2011) ^[16] and Martínez-Subiela *et al.* (2014) ^[7] reported an increase in serum C-reactive protein (CRP) in dogs with generalized demodicosis. The present study aimed to determine the possible clinical signs and haemato-biochemical alterations associated with canine demodicosis.

Materials and Methods

All the dogs presented to the Small Animal Dermatology Unit, Teaching Veterinary Clinical Complex, Mannuthy with dermatological signs like alopecia, erythema, scaling, crusting of hairs, pustules, furunculosis, and secondary infections were screened. The diagnosis was made by microscopic examination of deep skin scrapings from the lesions. Out of the 356 cases with demodicosis, twenty four animals showing more than four characteristic skin lesions with a diameter greater than 2.5 cm with or without feet involvement were selected for detailed study. Six apparently healthy dogs were selected as controls to obtain normal values for the parameters under study. Whole blood samples were collected for the estimation of total leucocyte count ($10^3 / \mu\text{L}$), neutrophil ($10^3 / \mu\text{L}$), eosinophil ($10^3 / \mu\text{L}$), lymphocyte ($10^3 / \mu\text{L}$), monocyte ($10^3 / \mu\text{L}$), haemoglobin (g/dL), volume of packed red cells (percent) and total erythrocyte count ($10^6 / \mu\text{L}$). The differential leucocyte count and erythrocyte sedimentation rate were estimated manually. Serum- CRP was estimated using commercially available ELISA Kit (Origin diagnostics, Kerala).

Results and Discussion

Examination of deep skin scrapings from dogs with clinical signs suggestive of demodicosis revealed the presence of cigar shaped *Demodex* mites (Fig.1) and its different stages of development in 356 animals out of the 1655 dermatological cases screened. Major clinical signs like erythema (Fig.2), alopecia (Fig.3) and pustular lesions (Fig.6) were observed in all the animals studied (Table 1). Other clinical signs observed were papules (83.33 percent, Fig.7), crusts (79.16 percent, Fig. 3), scales (50 percent, Fig. 4), comedones (8.33 percent, Fig. 5) and furunculosis (4.16 percent, Fig.8). Similar findings were made by Shipstone (2000) [12] and Kuznetsova *et al.* (2012) [6]. They reported that local or diffuse erythema, alopecia, crusts, or scales with pustular or papular dermatitis as the clinical signs of demodicosis in dogs.

The major sites of skin lesions were the forelimbs (95.83 percent), followed by periocular skin (91.66 percent), cheeks and neck (83.33 percent), ventral abdomen and hind limbs (79.16 percent), chin and trunk (75 percent), nasal area (70.83 percent), commissures of mouth and head (66.66 percent), pinnae (45.83 percent) and tail (16.66 percent). The distribution of lesions in demodicosis was given in Table 2. This was similar to the findings made by Thushara, (2003) [14]. In case of pups, head and forelimbs were in most intimate with the female dog while nursing. The transmission of mites may occur during this time and hence the lesions were found to develop first in these areas as suggested by Greve and Gaafar, (1966) [3].

The mean values of the haematological parameters of dogs with demodicosis and control animals were given in Table 3. Haematological study revealed a significant decrease ($p \leq 0.01$) in mean values of haemoglobin and volume of packed red cells in diseased dogs compared to control animals. A significant decrease ($p \leq 0.05$) in total erythrocyte count was noticed in diseased dogs compared to control animals as observed by Janus *et al.* (2014) [5]. Similar findings were reported by Pathak and Bhatia, (1986) [9]. The reduced haemoglobin concentration in dogs with demodicosis could be due to the deteriorating condition of affected dogs as a result of decreased food intake, systemic illness, toxemia, and septicaemia resulting from mite infestation as well as secondary bacterial infections. A significant increase ($p \leq 0.01$) in the mean values of erythrocyte sedimentation rate was observed in diseased animals compared to the control group as suggested by Militello *et al.* (2020) [8]. The speed and extent of settling of red blood cells were inversely influenced by the volume of packed red cells and hence, lower the VPRC, faster the sedimentation of red blood cells as explained by Jain and Kono, (1975) [4].

A statistically significant leucocytosis with neutrophilia and eosinophilia were noticed in dogs with demodicosis as

observed by Janus *et al.* (2014) [5]. Thushara *et al.* (2016) [15] reported a significant increase in absolute eosinophil count in dogs with demodicosis. Leucocytosis in demodicosis might be due to wide spread inflammatory response of leucocytes in response to a protracted antigenic stimulation in the form of chronic *Demodex* mite infection. Dhume *et al.* (2002) [1] observed eosinophilia in dogs with demodicosis and suggested that it may be due to a reflection of hypersensitivity to persistent *Demodex* mites in tissues.

Table 1: Major clinical signs in demodicosis affected dogs

Clinical signs	Diseased dogs	
	Number (n=24)	Percent
Erythema	24	100
Alopecia	24	100
Pustule	24	100
Papule	20	83.33
Crust	19	79.16
Scales	12	50
Comedones	2	8.33
Furunculosis	1	4.16
Area	Number (n=24)	Percent
Forelimbs	23	95.83
Periocular skin	22	91.66
Cheeks	20	80.33
Neck	20	80.33
Ventral abdomen	19	79.16
Hind limbs	19	79.16
Chin	18	75
Trunk	18	75
Nasal area	17	70.83
Commissures of mouth	16	66.66
Head	16	66.66
Pinnae	11	45.83
Tail	4	16.66

Table 2: Distribution of skin lesions in generalized demodicosis

Area	Number (n=24)	Percent
Forelimbs	23	95.83
Periocular skin	22	91.66
Cheeks	20	80.33
Neck	20	80.33
Ventral abdomen	19	79.16
Hind limbs	19	79.16
Chin	18	75
Trunk	18	75
Nasal area	17	70.83
Commissures of mouth	16	66.66
Head	16	66.66
Pinnae	11	45.83
Tail	4	16.66

Table 3: Haemato-biochemical changes in demodicosis in dogs

Parameters	Diseased (n=24)	Control (n=6)	t-value	p-value
Total leucocyte count ($10^3/\mu\text{L}$)	14.16±1.14	10.71±0.77	2.511*	0.019
Neutrophil ($10^3/\mu\text{L}$)	9.81±0.72	7.21±0.53	2.905**	0.008
Eosinophil ($10^3/\mu\text{L}$)	0.31±0.03	0.14±0.03	2.518*	0.018
Lymphocyte ($10^3/\mu\text{L}$)	3.28±0.47	2.92±0.28	0.374	0.712
Monocyte ($10^3/\mu\text{L}$)	0.74±0.09	0.42±0.07	1.828	0.079
Haemoglobin (g/dL)	11.98±0.54	13.92±0.43	2.826**	0.01
Volume of packed red cells (percent)	33.3±1.21	39.33±1.22	3.514**	0.003
Total erythrocyte count ($10^6/\mu\text{L}$)	5.07±0.18	5.95±0.3	2.205*	0.036
Erythrocyte sedimentation rate (mm/hr)	28±4.59	4.33±1.67	4.849**	< 0.001

** Significant at 0.01 level; * Significant at 0.05 level

Table 4: Estimation of C-reactive protein in demodicosis in dogs

Parameter	Diseased (n=24)	Control (n=6)	t-value	p-value
C-reactive protein (mg/L)	16.34±1.66	15.83±1.51	0.149	0.883

The mean values of serum C-reactive protein of diseased dogs and control animals were shown in Table 4. A non-significant elevation in CRP values was noticed in diseased dogs compared to healthy controls and as reported by Ulutas *et al.* (2011) [16]. Increased serum CRP might be due to the release of inflammatory cytokines from follicular epithelium as a result of the increased inflammatory response in demodicosis.



Fig 1: *Demodex* mites in deep skin scrapings



Fig 2: Erythema



Fig 3: Alopecia, erythema and crust

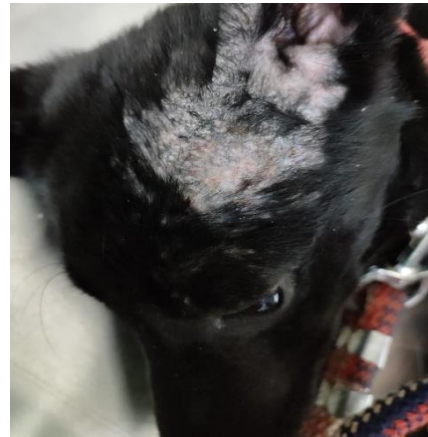


Fig 4: Scales

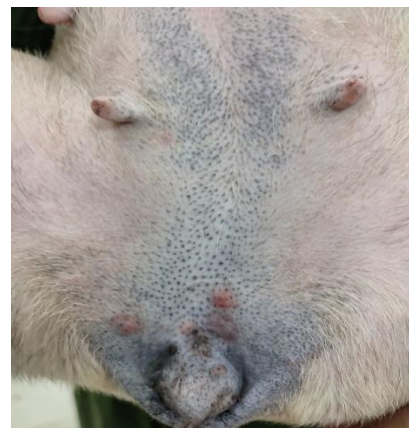


Fig 5: Comedones



Fig 6: Pustules



Fig 7: Papules



Fig 8: Furunculosis

Conclusion

The major clinical signs associated with demodicosis were alopecia, erythema, and pustules. The major sites of skin lesions were the forelimbs followed by periocular skin cheeks and neck. Haematological analysis of dogs with demodicosis revealed a significant decrease in haemoglobin, volume of packed red cells and total erythrocyte count when compared to healthy dogs. A significant increase in erythrocyte sedimentation rate was observed in dogs with demodicosis. A significant leucocytosis with neutrophilia and eosinophilia was noticed in dogs with demodicosis. The estimation of serum CRP revealed a non-significant rise in dogs with demodicosis.

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