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Clinico-diagnostic aspects of demodecosis in dogs

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Abstract
The present investigation is conducted to study the symptoms and diagnosis of Demodecosis in dogs. The study was conducted on six dogs suspected of Demodecosis. Skin scrapings were collected and examined for ticks and mites. Skin lesions were observed on the chin, neck, fore limbs, face and around the ears. Clinical examination of these dogs revealed foul smelling, crusting and bleeding tracts, alopecia, follicular papules, pustules, scaling. Skin Scrapping were collected and examined which revealed the infestation of Demodex mites. Hemato-biochemical studies revealed decrease in red blood cells (RBC) and increase in white blood Cells (WBC) significantly among affected dogs. Biochemical parameters revealed an increase in AST, ALT, total protein, globulin with a decrease in albumin.

Keywords: Dog, demodecosis, diagnosis, hematology, biochemistry

Introduction
Canine Demodicosis is considered as one of disease occurring commonly among dogs caused which is generally caused by Demodex mites proliferation. Demodex mites are usually present as commensal organisms normally in the hair follicles of most of the mammals. Among dogs, they are transmitted within first week of life from the mother to the puppies. Dogs which are immune-compromised due to other diseases or undergoing immunosuppressive therapies are most affected. Generally, Demodicosis are also documented in immunosuppressed humans, dogs and cats etc. Usually, demodicosis among Juveniles was assumed as one of the cause occurring due to Cell-Mediated Deficiency (Miller *et al*., 2013) [8]. In demodecosis, Clinical signs occurs after proliferation of the mite, and varies according to the degree of proliferation of the mite. Non-inflammatory hypotrichosis/ alopecia with mild erythema, comedone formation, scaling, inflammatory dermatitis and associated hypotrichosis/ alopecia were recorded in the Initial stages (Gera, 2009) [4].

Materials and Methods
During the present investigation, Skin scrapings were collected deeply from the affected areas of head (cheek, ear, eyelid, nose, upper lip), fore and hind groins, limbs (the knee region), belly, and genital-anal regions from the suspected dogs with sharp or dull scalpel blades or spatulae. Mineral oil drop was placed on the skin directly and it was helpful to adhere the collected skin scrapings to the scalpel blade. Many skin scrapings of 1 cm^2 of suspected skininfection was collected towards the direction of the hair growth. During skin scrapings, affected skin was squeezed intermittently or constantly to collect mites from the inner depth of the follicles to the superficial surface. Slide containing scrapings were generally mixed with paraffin oil or mineral and observed under the microscope with a cover slip at low magnification for recognition of mites. Blood samples are usually collected from the Cephalic vein of suspected dogs and poured into two tubes *viz*., Plain tubes without anticoagulant and EDTA vaccutainers. Blood collected with EDTA as anticoagulant was used for hematological estimation, While, blood collected from Plain tubes was used for Serum separation. Serum Samples collected were used to estimate the values of Alanine transaminase (ALT), Aspartate aminotransferase (AST), Total protein, Albumin, Blood urea nitrogen (BUN), and Creatinine by using specific test kits

Results and Discussion

In the present study, dogs affected with demodecosis exhibited clinical signs of alopecia, erythema, severe pruritus and scaling. Demodecosis was confirmed under a light microscope by the presence of cigar shaped organisms (Fig-1).

Hematological changes revealed a significant decrease in red Blood Cells (RBCs) along with a non-significant decrease in the packed Cell Volume (PCV), significant increase of white blood cells (WBCs) and eosinophils as compared with the healthy control group. Biochemical values in the investigation, revealed a significant increase in aspartate aminotransferase (AST), alanine transaminase (ALT), total protein, globulin along with a reduction in albumin in the dogs affected with demodecosis as compared with the control dogs (Table 1 and 2).

Fig 1: Microscopic picture of Demodex mite

Table1: Mean values of hematology among healthy and Demodecosis affected dogs.

S. No	Parameter	Healthy Control	Demodecosis affected dog
1	Hemoglobin (gm/dl)	12.82±0.47	11.16±0.34**
2	Total erythrocyte count (x10^6/µL)	7.59±0.13	5.14±0.23**
3	Total Leucocyte Count (x 10^3/µL)	9.67±1.85	13.93±0.82**
4	Packed Cell Volume (%)	42.83±1.24	35.85±3.19
5	Neutrophils (%)	58.68±1.70	60.64±2.51*
6	Lymphocytes (%)	31.70±0.65	30.31±3.07
7	Monocytes (%)	1.08±0.49	1.15±0.81
8	Eosinophils (%)	2.30±1.88	2.47±1.20
9	Basophils (%)	1.02±1.14	1.62±1.52

** significant at ($P < 0.01$), * significant at ($P < 0.05$)

Table 2: Mean values of biochemical values in healthy and Demodecosis affected dogs

S. No	parameter	healthy Control	Demodecosis affected dog
1.	ALT(U/L)	31.07±0.96	43.24±1.86**
2.	AST(U/L)	42.55±1.32	44.67±1.68**
3.	ALP(U/L)	57.42±1.58	60.72±0.29**
7.	Total Protein (g/dl)	6.41±0.03	6.06±0.51**
8.	Albumins (g/dl)	2.93±0.53	2.52±1.02**
9.	Globulins (g/dl)	3.26±0.24	3.41±0.22*

** significant at (P <0.01), * significant at ($P < 0.05$)

Demodecosis among canines is considered as one of the common most skin diseases affecting dogs in Veterinary practice. The etiological causative agents *viz*., the hair follicular mites, are considered as typical canine parasites affecting dog population. Clinical signs of Demodecosis in dogs usually appear with diminished host resistance and with increased level of mite infestation (Healey *et al*., 1077) [5]. In the present investigation, the mean hematology values of affected dogs revealed a significant decrease in red blood cells (RBCs) along with a non-significant decrease in the packed cell volume (PCV), significant increase of white blood cells (WBCs) and eosinophils as compared with the control group. While, Biochemical parameters revealed a significant increase in aspartate aminotransferase (AST), alanine transaminase (ALT), total protein, globulin along with a reduction in albumin in the dogs affected with demodecosis as compared with the healthy control dogs. Similar findings were documented by other studies [Sharma *et al.*, 2018] [11]. Reduced appetite along with systemic illness in dogs affected with Demodecosis deteriorated their health status and might be the reason for decreased levels of RBCs. However, protein loss was due to Demodex infestation might contribute to anemia [Deb *et al*., 2000] [2]. Hypersensitivity reaction and extended antigenic stimulation was subsequent to persistence of Demodex mites in the tissues and might be responsible for an increase in the leukocytes and eosinophils [Dhume *et al*., 2002] [3]. During the present investigation, a significant increase in Total proteins and Globulins with non-significant reduction in albumin was observed in demodicosis affected dogs as compared with healthy control. Decrease in albumin levels and increase in globulin levels with normal Total protein levels in the present study attributed to the albumin loss through skin injury. However, Johnson (2011) [6] documented that, most common causes of increased Globulin values in demodicosis affected dogs were pyoderma, cutaneous parasitism like demodicosis. A non-significant reduction in albumin levels were corroborated with the observations made by Martínez-Subiela *et al*., 2014 [7], who stated that albumin is said to be a Negative Acute phase protein which gers altered during the inflammation process [Ceron, 2005] [2]. While, albumin levels changes in demodicosis affected dogs shall be the result of ongoing inflammation process according to [Ulutas *et al.*, 2011] [12]. Significant increase in AST and ALT levels with an unaltered BUN and Creatinine levels was noticed in demodicosis affected dogs. Dogs diagnosed with generalized demodicosis showed a significant decrease in total erythrocyte count (TEC) and Hemoglobin (Hb), normal Packed cell volume (PCV) with neutrophilia, leukocytosis accompanied by lymphopenia and eosinophilia [Reddy *et al.*, 2015] [9]. Reduction in RBC and elevation in WBC was significant in

the demodicosis group as compared with control [Salem *et al.*, 2020] [10].

Conclusion

Among younger dogs diagnosed with Juvenile demodicosis, immunological and genetic factors are key factors in the occurrence of the disease. Whereas, in older dogs and cats, certain underlying immunosuppressive diseases are responsible for contributing to the demodicosis needs to be explored. Skin scrapings are to be collected deeply for demonstration of demodex mites and is considered as the diagnostic gold standard for demodicosis.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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