

A Comprehensive Study of Canine Demodicosis: Epidemiology Insight, Clinic-Hematological Analysis, and Therapeutic Strategies

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(Received: 22 September 2023; Revised: 19 October 2023; Accepted: 26 November 2023; Published: 15 December 2023)

(Published by Research Trend)

ABSTRACT: This study was designed to investigate the prevalence, clinical examination, and therapeutic management of canine demodicosis cases presented to the Vet Care Centre in Degana, Nagaur. A total of fifty dogs (thirty males and twenty females) with dermatitis were examined, and fifteen (31.42%) were found positive for demodicosis. The prevalence of demodicosis was higher in dogs aged 1-2 years (33.33%) compared to those aged 0-1 years (26.67%). Demodex infestation was significantly ($p < 0.05$) higher in males (80%) than in females (20%). Clinically, alopecia, skin corrugation, crusts, and pruritus were observed. Out of the twenty-two cases, fifteen dogs had generalized demodicosis. Haematological examination revealed a significant reduction in total erythrocyte count ($5.57 \pm 0.14 \times 10^6/\text{mm}^3$) and haemoglobin level ($9.37 \pm 0.33\text{g/dl}$) in affected dogs. Affected dogs also showed leucocytosis ($12.33 \pm 0.74 \times 10^3/\text{mm}^3$) accompanied by neutrophilia ($74.73 \pm 2.30 \times 10^3/\text{mm}^3$), eosinophilia ($1.67 \pm 0.57 \times 10^3/\text{mm}^3$), and lymphopenia ($21.23 \pm 2.30 \times 10^3/\text{mm}^3$). The dogs were treated with ivermectin, amitraz, antibiotics, benzyl peroxide shampoo, along with supportive therapy, and showed recovery after treatment. Fifteen cases responded positively, with negative skin scrapings for Demodex spp. three weeks post-treatment. The results indicated a high susceptibility to Demodex spp. infestation among companion animals in and around the Degana area.

Keywords: Demodex, Prevalence, Haematological examination, Skin corrugation.

INTRODUCTION

Mange remains a challenging canine skin disease, causing concerns for both dog enthusiasts and veterinarians. Demodex and Sarcoptes mites, responsible for demodicosis and scabies, have been identified in dogs and isolated (Sakina and Mandial 2011). Demodex Canis, also known as demodectic mange or red mange, naturally inhabits the skin of young dogs, particularly in short-haired breeds, acquired during nursing from the dam (Sivajothi *et al.*, 2015; Greve and Gaafar 1966). The infection primarily affects immunodeficient animals, older dogs, and puppies aged 3 months to a year. Mite multiplication in hair follicles is facilitated by suppression or defects in the skin immune system, leading to clinical demodicosis (Mueller *et al.*, 2012). Two types are observed in dogs: localized demodicosis, presenting with one or two hairless spots, especially on the muzzle, face, legs, and around the eyes, requiring no treatment; and generalized demodicosis, characterized by five or more local lesions with patchy areas, erythematous lesions, scales, and papules (Sharma *et*

al., 2018; Regmi and Thakur 2018). The affected skin becomes crusted and ulcerated due to secondary superficial and deep pyoderma (Alice, 2006). The identification of Demodex spp. mites under a microscope in relevant diagnostic samples, including as hair scrapings, adhesive tape, impression smears, skin scrapings, and skin biopsies, is necessary to confirm the diagnosis of canine demodicosis (Kelly *et al.*, 2022). The juvenile (localized) stage of demodectic mange typically resolves itself without treatment, while the generalized stage demands prolonged and potentially life-threatening antibiotic treatment (Fourie *et al.*, 2007). Earlier studies recorded various forms of mange infestation in dogs in Rajasthan; however, literature on the prevalence, clinico-haematological alterations, and therapeutic management of demodicosis in Rajasthan is scarce. This paper aims to describe the prevalence, hematological changes, clinical signs, and therapeutic management of generalized demodicosis in dogs in Rajasthan.

MATERIAL AND METHOD

The Vet Care Center in Degana, Nagaur, encountered fifty cases of dermatitis for this study. Skin scrapings were collected from all affected dogs, spanning various breeds with ages ranging from 1 month to 18 years. Clinical symptoms included severe itching, alopecia, hyperpigmentation, scales, lichenification, crusts, pododemodiosis, and keratinization. Information on age, breed, and sex was documented. Fifteen cases were diagnosed with generalized demodicosis based on signalment, anamnesis, and skin scraping examination, with subsequent collection of skin swabs from affected dogs. In localized demodicosis, alopecia and lesions were primarily confined to the legs.

Deep skin scraping samples from different body areas/lesions were collected for microscopic examination (40X) using a No. 10 blunt scalpel blade in 10% potassium hydroxide (KOH) solution (Soulsby, 1982). Pyodermal lesion samples in transport medium were used for bacteriological culture (Bauer *et al.*, 1966). Blood samples, 2 ml each, were collected in EDTA (1.5mg/ml) tubes from six healthy and fifteen demodicosis-affected dogs for complete blood count studies, measuring packed cell volume (PCV), hemoglobin (Hb), total leucocyte count (TLC), total erythrocyte count (TEC), and differential count by standard methods. Owners were advised to bathe infected dogs with benzyl peroxide shampoo weekly for three to five times, along with Inj. Ivermectin at 1ml/20kg body weight and Amitraz rinses at 3 ml/liter of water, both administered weekly for three weeks. Tablets Cefpodoxime at 5mg/kg were given once daily for 10 days to address concurrent bacterial infection. Supportive nutritional therapy and immune stimulator at 5 ml orally two times daily for one month were administered along with adequate nutrition during the treatment period. Treatment continued until complete recovery, as indicated by two consecutive negative skin scrapings, aligning with previous studies (Mueller *et al.*, 2012).



Fig. 1. Mogrel dog showing lesion of alopecia and popular dermatitis in demodectic mange.



Fig. 2. Showing the *Demodex canis* in microscopic examination (40x).

RESULT AND DISCUSSION

The cases of Demodicosis found in allover world including India. Demodicosis infestation mainly occurs in young dogs and it is caused by *Demodex Canis*. Demodex is a type of mite that mostly lives in or on hair follicles. In the research we conducted, 50 (30 males and 20 females) dogs were taken, out of which 15 (30 %) dogs were found infected with demodicosis disease (Table 1).

Table 1: Etiology for dermatological affection in dogs.

Total no. of infected with skin infection	No. of dogs having demodicosis	Percentage (%)
50	15	30

The results of this research are very similar to Sharma *et al.* (2018) who conducted a case study on 70 dogs in TVC, Palampur, out of which 31.42% dogs get infected with demodicosis. These results also agree with research done by Sarma *et al.* (2013) who reported 52% cases of demodicosis. Earlier, Bindari *et al.* (2012) also conducted research in Kathmandu, Nepal and found 70% cases of demodicosis. Samples were taken by skin scrapping from all 50 dogs, 30 % of which had demodicosis infection which can be detected by cigar shaped *Demodex* spp. in microscopic examination. On the basis of different dermatological findings and diagnostics test, it was concluded that dogs were infected with generalized demodicosis and bacterial infection. According to age groups, the highest cases of demodicosis found in dogs of age group 1 to 2 years (33.33%), after that 0 to 1 year (26.67%), 20% in 2 to 3 years, 13.33% in above 5 years and lowest cases reported in dogs at age of 3 to 4 year (6.67%) (Table 2).

Table 2: Age wise occurrence of demodicosis.

Sr. No.	Age groups (years)	No. of dogs having demodicosis	Percentage (%)
1.	0-1	4	26.67
2.	1-2	5	33.33
3.	2-3	3	20
4.	3-4	1	6.67
5.	above 5	2	13.33
	Total	15	100

These results also found similar to Sharma *et al.* (2018) who reported 36.36% cases of demodicosis in below 1 year age group dogs and 13.64% cases in more than 5 year age groups dog. Sakina and Mandial (2011) also have the same opinion with Sharma *et al.* (2018) who reported 45.71% cases of demodectic mange in dogs at the age of less than 6 months. Likewise, 20% cases of demodicosis in less than 2-4year dogs, followed by 70% in 2 years and with the lowest occurrence of 10% in dogs aged > 4 years was also recorded by Kumari *et al.* (2017). Mites are sebophilic nature i.e., they love to live in sebaceous glands of hair follicles and sebaceous glands are more active in puberty so that

higher frequency of demodicosis seen in the younger age group of dogs, which might be due to more stimulation of sebaceous glands at puberty (Schwartzman and Orkin 1962). On the basis of gender wise case report, female (20 %) dogs showed significantly ($p < 0.05$) lower cases of demodicosis as compared to male (80 %) (Table 3).

Table 3: Gender wise occurrence of demodicosis.

Gender affected	No. of dogs having demodicosis	Percentage (%)
Male	12	80
Female	3	20
Total	15	100

These findings are similar to (Sharma *et al.*, 2018; Chen *et al.*, 2012) and this type of discrimination according to gender may be because of higher numbers of male dogs were taken in this study. We also recorded breed-wise prevalence rate which resulted that Pug breed was less susceptible (6.67%) and Mongrels are most susceptible (33.33%) for demodicosis (Table 4).

Table 4: Breed- wise occurrence of demodicosis

Sr. No.	Breed of dog	No. of dogs having demodicosis	Percentage (%)
1.	German Shepherd	4	26.67
2.	Labrador	3	20
3.	Pomeranian	2	13.33
4.	Non-descript± mongrel	5	33.33
5.	Pug	1	6.67
	Total	15	100

Table 5: Mean hematological value of healthy and demodicosis dog (Mean±SE).

Parameters	Normal group (N=6)	Dogs with demodicosis(N=15)	P value
Hb (g/dl)	13.67± 0.80	9.37±0.33*	0
PCV (%)	42.67±1.22	38.67±1.57	0.06
TEC ($10^6/\text{mm}^3$)	6.67±0.42	5.57±0.14	0.04
TLC ($10^6/\text{mm}^3$)	9.5±0.41	12.33±0.74*	0
Neutrophils ($10^3/\text{mm}^3$)	69±1.41	74.73±2.30*	0.04
Lymphocyte ($10^3/\text{mm}^3$)	27.5±1.73	21.53±2.30*	0.05
Monocyte ($10^3/\text{mm}^3$)	2.17±0.60	2.07±0.30	0.88
Eosinophils ($10^3/\text{mm}^3$)	0.75±0.48	1.67±0.57	0.5
Basophils ($10^3/\text{mm}^3$)	0.67±0.42	0.05±0.25	0.7

In demodectic dogs, mean value of hemoglobin was 9.37 ± 0.33 g/dl which showed highly significantly decreased as compared to normal group. In *Demodex* infection, mean value of packed cell volume was $38.67 \pm 1.57\%$ which showed non-significant effect, while TEC and lymphocytes levels were significantly decreased, which is in agreement with the results of Solanki and Hasnani (2006). Decreased level of hemoglobin and TEC showed that affected dogs were suffered from severe anemia and body condition loss because *Demodex* spp. cause hyporexia, toxemia, illness and decrease immune system which leads to increase the chances of secondary bacterial infection (Reddy *et al.*, 2015). A highly significant increase in mean total leucocyte count (TLC) (12.33 ± 0.74 Juneja *et al.*,

The findings of this research show similarity with Sharma *et al.* (2018) who also recorded that Nondescript/Mongrel (36.36%) were most susceptible, followed by German Shepherd (4.55%), Labrador Retriever (18.18%) etc. Previous studies showed that crossbreds are less prone to demodicosis as compared to pure breeds (Solanki *et al.*, 2007) which showed dissimilarity with this research. This may be due to poor body condition score of Mongrels so that they are more susceptible to demodicosis according to our results. The low occurrence in Pug dogs may be due to their good hygiene and regular bathing. Dogs afflicted with generalized demodicosis exhibited a diverse range of clinical manifestations (Fig. 1). Generalized demodicosis symptoms are loss of hair (alopecia), itching, pruritus and crust formation and these findings were in collaboration with the previous study (Kumari *et al.*, 2017). These symptoms comes because of infestation of *Demodex* mite in hair follicles which cause inflammation and irritation reaction in skin which leads to destruction of epidermal layer and secondary bacterial and fungal infection (Mueller *et al.*, 2012). In this current investigation, the presence of lesions across more than four specific areas signified the manifestation of generalized demodicosis in the dogs (Scott *et al.*, 1995). The distribution pattern of lesions closely resembled findings reported by previous researchers (Yogeshpriya *et al.*, 2017). However, the precise factors contributing to variations in mite infestation across different regions of the dog's body remained ambiguous. The mean values of Hb, PCV, TEC, TLC and all five types of WBC from both groups are given in Table 5. These all values are in reference range in normal healthy group of dogs.

$\times 10^6/\text{mm}^3$) was found in this study. Increased TLC in this study were in agreement with (Sharma *et al.*, 2018; Reddy *et al.*, 2015) who recorded higher leucocyte count in their investigations. Neutrophilia, lymphopenia and eosinophilia in infected animals were in association with the research of Sharma *et al.* (2018). Increase number of total leucocyte count may be due to stimulation of immune system of infected dog against *Demodex* spp. Eosinophilia (increase numbers of eosinophils in blood) condition also recorded in this research which could be due to hypersensitivity reaction occurs in different organs of infected dogs (Dhume *et al.*, 2002).

keratolytic and follicular flushing property found in Benzoyl peroxide shampoo so that it is suggested for

demodicosis treatment (Scott *et al.*, 1995). Amitraz and antibiotic combination give good results in treatment against demodectic mange (Mueller, 2012; Tarallo *et al.*, 2009). Immunosuppression can be caused by Demodicosis in dogs to boost immunity, immune boosters have been given to the dogs, which indicated good results.

CONCLUSIONS

The occurrence of generalized demodicosis comprised 30% of various dermatological disorders. Dogs aged 1 to 2 years, predominantly males, exhibited the highest prevalence. Mongrels had the highest occurrence, followed by German Shepherd, Labrador, Pomeranian, and Pug. Common clinical signs encompassed skin corrugation, alopecia, crusts, and pruritus. Stressing the importance of meticulous dermatological examination with baseline diagnostic testing is crucial. It is equally vital to comprehend the risks, benefits, and potential side effects associated with long-term treatment strategies.

Acknowledgements. We are thankful to Nodal officer of Veterinary Hospital, Degana.

Conflict of Interest. None.

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How to cite this article: Rohit Juneja, Punam, Arpita Sain and Kapil Kumar Godara (2023). A Comprehensive Study of Canine Demodicosis: Epidemiology Insight, Clinic-Hematological Analysis, and Therapeutic Strategies. *Biological Forum – An International Journal*, 15(12): 416-419.