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Detection and Pathological Manifestations of Canine Demodicosis in Various Breeds and Age of Dogs in Lahore

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Abstract

Among endo and ecto-parasite, canine demodicosis is one of the major infestations. It's a severe skin infection which can occur at any age and alters various blood, biochemical and hormonal parameters in the body. The current study investigated the prevalence rates and pathological manifestations in various breeds of dog with respect to age and breeds. A total of 100 dogs suspected for canine demodicosis were selected randomly for canine demodicosis based on clinical signs. The confirmation was done by deep skin scraping and tape impression method. Over all it found prevalent up to 44% in the district Lahore. Moreover, "Pug dogs" found most susceptible to demodex mites (M=15.91%, F=13.64%). The second most infestation breeds were "Pointer" male dogs and "Dobraman" male dogs (6.82%). The lowest incidence rates were recorded in "Boxer", "Terrier" and "Labrador" (2.27%). At the meantime, all age groups are found susceptible to demodex canis infestation. The TLC, MCH, MCHC, PCV, monocytes, basophils and neutrophils were significantly increased in infected breeds. Total proteins, globulins, aspartate aminotransferase and alanine aminotransferase were increased in infected breeds. The level of cholesterol, T3 and T4 were increased in infected breeds but only cholesterol level was found statistically significant.

Keywords: Canine Demodicosis; Breeds; Pathological Manifestation; Deep Skin Scraping; Tape Impression Method

Introduction

Due to socio-economic scenario and their service to mankind, dogs are considered as integral part in the world [1]. Some common roles played by dogs for humans are assisting military and police, aiding handicapped peoples, hunting, pulling loads, herding, guarding and companion as a pet. Due to all these roles, they have been given the name as "man's best friend" [2]. Skin is largest organ in the body and it is associated with many local and systemic diseases in dog's body. Inflammation of skin due to any reason is known as dermatitis. It can be due to local & many systemic bacterial, parasitic and fungal diseases [3]. In canine practice, it has been assumed that on an average 20% to 75% of the case have skin problems as a main or concurrent owner complaint [4]. Among these skin anomalies, canine demodicosis is more important because demodex mites are commensal organism of both animals as well as humans and also induces uncomfortable body condition [5].

The etiological agent of canine demodicosis is demodex mite. Most common cause of canine demodicosis is Demodex canis while less common cause is Demodex injai [6]. Canine demodicosis is a multifactorial disease. It is associated with many predisposing factors. These factors may include immunosuppressive therapy, endoparasitism, malnutrition, genetic factors, endocrine disorders, environmental factors, cutaneous ecology and stages of whelping. These are those underline factors which are associated either directly or

indirectly with caine dermicosis [7,8]. The current study presents the prevalce rates and pathological manifestations of normal and diseased (demodicosis) dogs in various breeds, so that the actual growth rate and control measures can be implicated.

Material and Methods

Experimental Station

The present study was performed in different clinics and shelter homes in district Lahore. The study was accomplished by following the rules and regulation inscribed by Ethical Review Committee (ERCULA), University of Veterinary and Animal Sciences, Lahore.

Research Area, Study Animals and Source of Samples

In present study 100 random samples of suspected for canine demodicosis were selected and confirmation was done by deep skin scraping and tape impression method in different veterinary clinics, hospitals and shelter homes in Lahore. Sampling was done both from pups and adult dogs.

Anamnesis (History taking)

In the present study a complete history were included age, gender, breed, hair coat, diet, deworming, seasonal occurrence of disease, origin of hair loss on body, duration of disease, intensity and frequency of itching if present, occurrence of same disease in other dog of same kennel if any, previous investigation and therapy, any disease or lesion in member of the family of owners, use of disinfectant for cleaning floor and any other relevant information was collected from the dog owners which was record in the case history Performa [9].

Analysis of Prevalence

The prevalence of demodicosis was calculated among the total number of dermatological cases screened. The prevalence was further analyzed in relation to age, gender and breed. Records were reviewed for signalment, disease history, potential underlying etiologies, diagnosed concurrent diseases, medications and demodicosis treatment. Analyses were performed to evaluate for potential breed predispositions and because of the large number of dogs with allergic dermatoses, analyses for this diagnosis as a disease associated with demodicosis was also performed [5].

Identification by Deep Skin Scraping and Tape Impression

Skin scraping was done by using scalpel blade. The tape impression or deep skin scraping slide was placed on microscopic slide immediately after putting cover slip on it. Skin scraping slide was observed under magnification of 4X and 10X respectively. Another method that was used for diagnosis of canine demodicosis was acetate tape impression and then it was placed on a clean glass slide then observed for confirmation of demodex canis.

Blood Sampling for Allergic Response

After confirmation of Demodex canis by microscopic examination for each confirmed case 5ml blood was collected from the cephalic vein by using a sterile syringe and taken in an EDTA and Clot Activator vaccutainer to check the effect on various blood and biochemical parameters. Complete blood count performed by hematology analyzer (BC-2300 Mindray). LFT, RFT performed by using semi-automatic biochemistry analyzer (BA-88A Mindray) at Aliyan pet hospital.

Statistical Analysis

The data originating from different studies was analyzed by using descriptive analysis and one sample t-test.

Figure 1: Dogs suspected for demodex infestation.

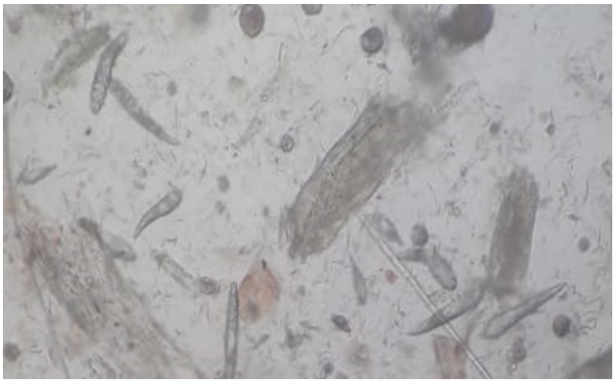


Figure 2: Demodex canis confirmation under compound microscope.

Results

The present survey study was conducted to find out the prevalence of demodex canis in the district Lahore (Table 1). In present study 100 random samples of dogs suspected for canine demodicosis were collected by deep skin scraping in different veterinary clinics, hospitals and shelter homes in Lahore region.

Sr. No.	Prevalence	Percentage	Cumulative Percentage
Normal	56	56%	56%
Infected	44	44%	44%
Total	100	100%	100%

Table 1: Prevalence of infected and normal dogs.

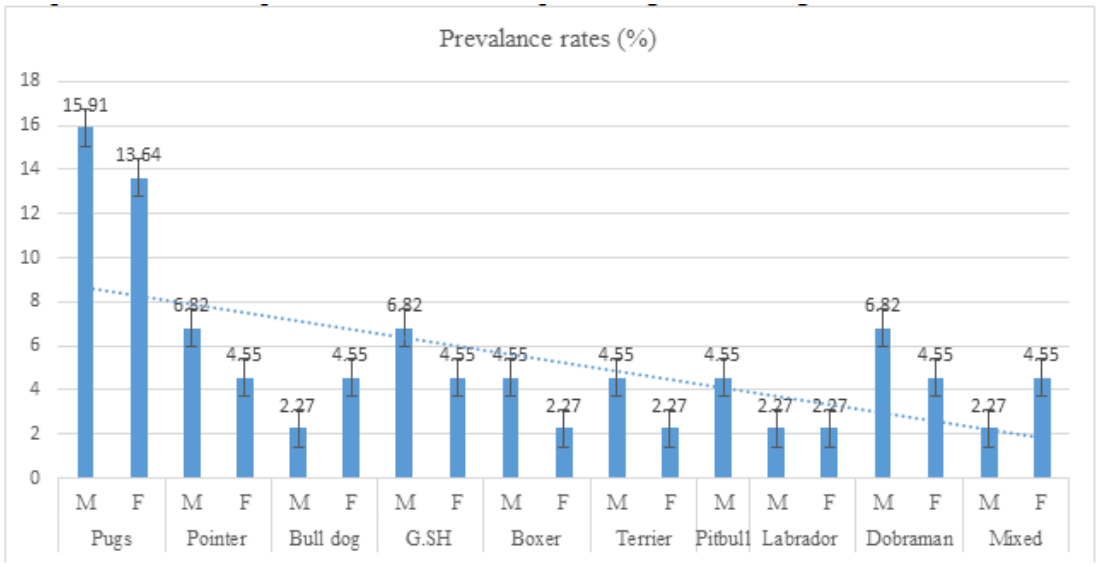
The prevalence rates of demodex canis among various breeds were found significant and at over all count, it was prevalent 44% in the district Lahore.

The prevalence of demodicosis was calculated among the total number of dermatological cases screened. The prevalence was further analyzed in relation to age, gender and breed (Table 2). Clinical examination Cases showing dermatological lesions like alopecia, folliculitis, pustules, erythema, scales, hyper pigmentation and lichenification on clinical examination were suspected for demodicosis, selected for further examination. After confirmation of demodex canis by microscopic examination for each confirmed case 5ml blood was collected from cephalic vein by using a sterile syringe and was taken in EDTA vacutainer to check the effect on various blood and biochemical parameters.

Sr. No	Breed	Age (year)	Sex	Weight (kg)	Prevalence (Demodex)	Percentage (Demodex)	Cumulative Percentage
1	Pugs	0.5-6	M	Nov-17	Jul-44	15.91	15.91
	Pugs	0.4-7	F	Sep-16	Jun-44	13.64	13.64
2	Pointer	02-Apr	M	14-19	Mar-44	6.82	6.82
	Pointer	03-Jun	F	16-21	Feb-44	4.55	4.55
3	Bull dog	0.3-3	M	13-15	Jan-44	2.27	2.27
	Bull dog	02-Apr	F	15-19	Feb-44	4.55	4.55
4	German Shepherd	02-May	M	18-26	Mar-44	6.82	6.82
	German Shepherd	03-Jul	F	18-26	Feb-44	4.55	4.55
5	Boxer	01-Mar	M	13-21	Feb-44	4.55	4.55
	Boxer	0.4-3	F	13-19	Jan-44	2.27	2.27
6	Terrier	02-Apr	M	Dec-18	Feb-44	4.55	4.55
	Terrier	02-Mar	F	Oct-18	Jan-44	2.27	2.27
7	Pitbull	02-Apr	M	Dec-16	Feb-44	4.55	4.55
8	Labrador	04-Aug	M	Dec-28	Jan-44	2.27	2.27
	Labrador	Apr-16	F	15-26	Jan-44	2.27	2.27
9	Dobraman	02-Apr	M	15-17	Mar-44	6.82	6.82
	Dobraman	0.6-6	F	13-16	Feb-44	4.55	4.55
10	Mixed	03-Jun	M	14-22	Jan-44	2.27	2.27
	Mixed	03-Aug	F	13-21	Feb-44	4.55	4.55

Table 2: Demography and prevalence rates of infected dogs.

Upon analysis, it was found that pug dogs are most susceptible to demodex mites (M=15.91%, F=13.64%). The second most infestation is seen in "Pointer" male dogs and "Dobraman" male dogs (6.82%). The lowest incidence rates has been recorded in "Boxer", "Terrier" and "Labrador" (2.27%) (Table 2). At the meantime, all age groups are found susceptible to demodex canis infestation.



G.SH= German Shepherd

Graph 1: Demodicosis prevalence rates with respect to dog breeds and gender.

Hematology of various breeds of dog						
Parameters	**Control**	**Pugs**	**Pointer**	**Bull**	**Ger.Shep**	**Boxer**
TLC (10^3/mm^3)	11.18±0.63	19.38±0.42	18.36±0.62	20.38±0.42	19.08±0.19	21.03±1.11
TEC (10^3/mm^3)	6.03±0.54	5.47±0.61	5.97±0.21	5.67±0.31	5.97±0.35	5.87±0.81
Hb (g/dl)	13.97±0.46	9.31±0.71	11.22±0.61	9.61±0.80	9.33±0.41	9.42±0.57
MCV (fl)	71.27±1.17	68.48±1.56	69.58±1.16	69.43±1.16	66.12±1.05	68.78±1.13
MCH (pg)	21.19±0.56	27.18±0.94	24.18±0.91	27.09±1.64	26.04±0.83	27.14±0.44
MCHC (g/dl)	32.19±1.02	36.19±1.82	33.02±0.56	35.06±1.02	37.13±1.22	36.19±0.94
PCV (%)	38.39±0.51	27.08±0.46	36.18±0.36	28.08±0.33	28.8±0.45	25.18±0.26
Lymphocytes(10^3/mm^3)	17.28±0.61	15.04±0.53	15.04±0.53	16.14±1.36	14.14±0.45	14.10±0.38
Monocytes (10^3/mm^3)	1.02±0.21	2.28±0.13	2.29±0.33	2.35±0.16	2.48±0.15	2.89±0.18
Eosinophils (10^3/mm^3)	1.12±0.13	2.39±0.16	2.86±0.17	2.77±0.25	2.67±0.14	2.65±0.20
Neutrophils (10^3/mm^3)	79.06±1.56	66.19±1.13	65.19±1.03	67.16±1.19	64.20±1.03	68.12±0.86
Basophils (10^3/mm^3)	0.00±0.00	1.51±0.13	1.54±0.14	1.62±0.43	1.23±0.13	1.53±0.18

Table 3: Hematological manifestations of various breeds i.e. Pugs, Pointer, Bull, German shepherd and Boxer dogs along with control.

Hematology of various breeds of dog						
Parameters	**Control**	**Terrier**	**Pitbull**	**Labrador**	**Dobraman**	**Mixed**
TLC (10^3/mm^3)	11.18±0.63	19.38±0.42	14.38±0.32	21.32±0.42	19.59±0.79	19.29±0.39
TEC (10^3/mm^3)	6.03±0.54	5.47±0.61	5.88±0.26	5.97±0.61	4.64±0.71	5.47±0.61
Hb (g/dl)	13.97±0.46	9.31±0.71	9.61±0.61	11.31±0.42	9.11±0.59	9.31±0.71
MCV (fl)	71.27±1.17	68.48±1.56	68.48±1.56	68.49±1.11	69.18±1.23	70.29±1.20
MCH (pg)	21.19±0.56	27.18±0.74	24.18±0.44	23.03±0.80	23.17±0.37	23.18±0.94
MCHC (g/dl)	32.19±1.02	36.19±1.12	33.69±1.82	33.19±1.02	37.13±1.32	33.19±1.39
PCV (%)	38.39±0.51	27.08±0.46	30.08±0.26	36.88±0.36	25.08±0.39	37.08±0.46
Lymphocytes(10^3/mm^3)	17.28±0.61	15.04±0.73	15.04±0.40	15.04±0.53	14.14±0.33	15.02±0.49
Monocytes (10^3/mm^3)	1.02±0.21	2.28±0.13	2.58±0.17	2.38±0.19	2.98±0.13	2.12±0.13
Eosinophils (10^3/mm^3)	1.12±0.13	2.39±0.16	2.79±0.16	2.21±0.24	2.46±0.64	2.39±0.19
Neutrophils (10^3/mm^3)	79.06±1.56	66.19±1.13	78.19±1.03	73.28±1.39	61.38±1.36	66.19±1.13
Basophils (10^3/mm^3)	0.00±0.00	1.51±0.13	1.52±0.10	1.33±0.27	1.23±0.34	0.78±0.21

Table 4: Hematological manifestations of various breeds i.e. Terrier, Pitbull, Labrador Dobraman, Mixed dogs along with control.

Biochemistry of various breeds of dog						
Parameters	**Control**	**Pugs**	**Pointer**	**Bull**	**Ger.Shep**	**Boxer**
Total protein (g/dl)	6.08±0.33	9.01±0.52	9.91±0.32	9.11±0.78	9.23±0.76	7.11±0.32
Albumin (g/dl)	3.13±0.15	3.17±0.61	3.98±0.52	3.89±0.31	3.16±0.61	1.96±0.26
Globulin (g/dl)	2.95±0.22	5.81±0.71	5.93±0.52	5.22±0.71	6.07±0.71	5.21±0.71
A/G ratio	1.11±1.08	0.67±1.56	0.61±1.06	0.68±1.16	0.72±1.28	0.69±1.56
AST (IU/l)	13.13±0.29	29.18±0.59	29.02±0.29	29.88±1.13	29.15±0.39	28.06±0.49
ALT (IU/l)	11.65±0.78	18.57±0.38	19.07±0.33	19.07±0.58	17.67±0.32	19.71±0.34
BUN (mg/dl)	19.00±0.45	19.93±0.58	20.91±0.38	19.95±0.26	20.29±0.39	19.93±0.42
Creatinine (mg/dl)	1.02±0.51	0.80±0.58	0.89±0.51	0.86±0.38	0.69±0.45	0.78±0.14

Table 5: Biochemical manifestations of various breeds i.e. Pugs, Pointer, Bull, German shepherd and Boxer dogs along with control.

Biochemistry of various breeds of dog						
Parameters	**Control**	**Terrier**	**Pitbull**	**Labrador**	**Dobraman**	**Mixed**
Total protein (g/dl)	6.08±0.33	9.21±0.52	7.91±0.52	10.01±0.42	9.01±0.52	7.12±0.31
Albumin (g/dl)	3.13±0.15	3.16±0.31	3.32±0.61	4.11±0.39	3.17±0.61	3.17±0.61
Globulin (g/dl)	2.95±0.22	6.05±0.42	3.87±0.11	5.89±0.64	5.81±0.71	5.81±0.71
A/G ratio	1.11±1.08	0.72±0.16	0.67±1.56	0.81±0.72	0.67±1.56	0.67±1.56
AST (IU/l)	13.13±0.29	30.18±0.32	14.18±0.18	29.18±0.79	29.18±0.59	17.18±0.29
ALT (IU/l)	11.65±0.78	19.57±0.48	13.52±0.38	18.49±0.82	18.57±0.38	17.27±0.38
BUN (mg/dl)	19.00±0.45	18.93±0.58	19.96±0.24	18.98±0.54	19.93±0.58	20.23±0.78
Creatinine (mg/dl)	1.02±0.51	0.90±0.45	0.80±0.58	0.87±0.16	0.80±0.58	0.80±0.58

Table 6: Biochemical manifestations of various breeds i.e. Terrier, Pitbull, Labrador Dobraman, Mixed dogs along with control.

Hormonal values of various breeds of dog						
Parameters	**Control**	**Pugs**	**Pointer**	**Bull**	**Ger.Shep**	**Boxer**
Total cholesterol (mg/dl)	82.08±0.53	127.04±0.92	128.04±0.72	129.11±0.42	128.07±0.48	121.04±0.62
Total T4 (µg/dl)	2.59±0.21	2.76±0.13	2.96±0.14	2.44±0.15	2.79±0.15	2.79±0.15
Free T4 (ng/dl)	1.47±0.28	2.17±0.71	2.37±0.31	2.18±0.22	2.18±0.81	2.39±0.17

Table 7: Hormonal manifestations of various breeds i.e. Pugs, Pointer, Bull, German shepherd and Boxer dogs along with control.

Hormonal values of various breeds of dog						
Parameters	**Control**	**Terrier**	**Pitbull**	**Labrador**	**Dobraman**	**Mixed**
Total cholesterol (mg/dl)	82.08±0.53	131.08±1.02	88.04±0.62	90.04±0.92	127.04±0.92	85.04±0.92
Total T4 (µg/dl)	2.59±0.21	2.78±0.10	2.35±0.13	2.76±0.13	2.76±0.13	2.76±0.14
Free T4 (ng/dl)	1.47±0.28	2.18±0.91	2.18±0.42	2.17±0.41	2.17±0.71	2.39±0.39

Table 8: Hormonal manifestations of various breeds i.e. Terrier, Pitbull, Labrador Dobraman, Mixed dogs along with control.

Discussion

Generalized demodicosis is life threatening disease if not properly treated. It can be more severe disease due to itching, folliculitis, skin inflammation and excessive proliferation of the causative agent (Perego et al. 2019). Demodex mites are commensal organism of both animals as well as humans and also induce uncomfortable body condition [5]. The current study was conducted to find out the prevalence of demodex canis in Lahore, Punjab, Pakistan. The diagnosis of demodex canis is dependent on microscopic identification by deep skin scraping method [10,11]. The prevalence rate of demodex canis among various breeds of dogs ranged from 2.2-15%. The similar findings have been presented by Sharma S, et al. [12] and Khurana R, et al. [13]. The cumulative prevalence of demodex canis among various breeds have been found 44%. It was a value among apparently suspected positive animals for demodex canis. Khurana R, et al. [13] and Chen YZ, et al. [14] agreed with our findings and said that prevalence rate can reach 40-53% in the summer or raining season.

Investigation related to age has showed that canine demodicosis occurs in all age groups. Demodex canis was identified both in pups and adult of these breeds. The findings of the study were parallel with Thakur M, et al. [15]. Various hematological parameters were compared and evaluated using significant value of 0.05 ($p \leq 0.05$). Upon statistical analysis, total leukocytes count, basophils and neutrophils has showed significant differences among all breeds of dogs when compared with their control group. TEC and lymphocytes were found in decreasing trend in the infected dogs but they remained non-significant among all breeds of dogs. The total leukocyte count, hemoglobin, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, pack cell volume, monocytes, basophils and neutrophils were recorded in an increasing trend among all breeds of dog. Extended antigenic stimulation and hypersensitivity reaction subsequent to Demodex infestation in tissues causes elevated leukocytes and eosinophils. The findings were similar with Kumar P, et al. [16] and Reddy BS, et al. [17]. At the same time, total erythrocytes count, hemoglobin, mean corpuscular volume and lymphocytes count were observed in a decreasing fashion. The findings of the study were similar with the findings of Reddy BS, et al. [17] and Salem N, et al. [18].

In the current study, total protein, globulin, aspartate aminotransferase and alanine aminotransferase were increased when demodicosis canine group was compared with control group [18]. The albumin levels were slightly decreased but no-significant deference was seen between normal and diseased group. The findings were coincided with Martinez-Subiela S, et al. [19]. The globulin level were found elevated with normal protein. The albumin levels are decreased due to destruction of albumin from the skin. The outcomes of the study were coincided with Salem N, et al. [18] and Gortel [20]. The globulins level was elevated due to cutaneous pyoderma and parasitism including one of the major causes was demodicosis [21]. The elevated level of globulin between diseased and normal group was recorded significant and the findings were alike as presented by Werner LL, et al. [21]. AST and ALT were also found elevated while BUN and creatinine were recorded as slightly decreased or unaltered among various breeds of dog. It can be suggested due to general stress, demodicosis or due to weather condition. The findings of our study were alike as concluded by Okayama YJCDTI [22].

The results of hormonal levels showed statistical difference only in the cholesterol level of healthy and diseased dogs.

The elevated level of cholesterol is seen significant among all breeds except in mixed breeds. It could be due to less influence of native harsh environment on the mixed breeds. It could be due to less infestation of demodex mites on mixed breeds. At the same time, the level of total T4 and free T4 were slightly increased in the demodicosis group. However, no-statistical difference was recorded in total T4 and Free T4 values between both normal and diseased group. The findings are coincided with [17].

Conclusion

The present study concluded that demodicosis can infect all dogs irrespective of age, gender and breed. However, pug and pointer breed were more susceptible to demodicosis compared to other studied breeds. Demodicosis induces many hematological, biochemical and hormonal changes. The current study was a little contribution for pet owners and pet practitioners in which we have checked the prevalence of canine demodicosis in Lahore. The present study revealed a 44% prevalence of canine demodicosis in Lahore. Demodicosis has severe economic and public impact on owners and it can be life threatening disease if not properly treated.

Suggestion

The present study suggests owners that owners and practitioners should detect Demodex species on time and treat it as soon as possible. The study also suggests avoiding dog breeds that are more susceptible to canine demodicosis or should have done skin scraping to rule out Demodex mite infestation. A prompt diagnosis at the first visit will allow available funds to be targeted correctly and not wasted on ineffective symptomatic treatments. The study also suggests a large scale epidemiological study, so that demodex prevalence rate could be more authenticated.

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