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Research Article

PREVALENCE OF DEMODECTIC MANGE IN CANINES OF KATHMANDU VALLEY HAVING SKIN DISORDER AND ITS ASSOCIATED RISK FACTORS

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Abstract

Very little information is available regarding the demographics of the demodicosis in canines of Kathmandu valley and in Nepal as a whole. In this study, we determined the prevalence of the demodicosis and its associated risk factors from 110 canines of Kathmandu valley including both sheltered and free-roaming. The skin scrapping collected was dissolved in 10% KOH for the microscopic diagnosis of the mites. The overall prevalence of demodectic mange was found to be 29.1%. There was significant difference ($p < 0.05$) between the prevalence rate among puppy (49.0%), adult (6.9%) and senior (33.33%). Whereas, there was no significant difference ($p > 0.05$) between the prevalence rate among female (22.9%) and male (36.7%). Similarly, there was no significant difference ($p > 0.05$) between the prevalence rate among short hair (40.7%), medium (25.67%) and long hair (28.5%). The association between the prevalence rate among good health status (10.7%) and poor health status (55.5%) is significant ($p < 0.05$). Similarly, there was significant difference ($p < 0.05$) between the prevalence rate among the free-roaming (48.9%) and the owned dogs (13.1%). At last, there was no significant association ($p > 0.05$) between the prevalence rate among the pure breed (27.7%), cross (25.9%) and mongrel (37.5%). This study shows that demodectic mange is somewhat serious skin infection in canines of Kathmandu valley. The high significant association of age, health status and management with its prevalence suggests that the disease is more common in dogs which are left uncared and whose immune system is disturbed. Whereas, sex, breed and type of the hair of the dog did not have such significant relation with its prevalence. As demodicosis is a huge problem in street dogs, concerned organizations and authorities should develop proper planning for street dog management and their health care.

Keywords: Demodectic mange; prevalence; risk factors; 10% KOH.

Background

Demodicosis is one of the major skin problems of dog caused by the mites of various *Demodex species*. Generally, three types of Demodex mites are found in dogs namely *Demodex canis*, the long-bodied *Demodex injai* and the short bodied mite (Mueller *et al.*, 2012). Though, they are the normal cutaneous microfauna of healthy dogs, overpopulation and other multiple predisposing factors lead to this serious disease. *Demodex canis*, which inhabits on the hair follicle, is mainly responsible for canine demodicosis than others (Plant *et al.*, 2011; Ravera *et al.*, 2013). However, the factors which allow the development of demodectic mites are not understood well but are thought to be associated with cell mediated immunity defects (Corbett *et al.*, 1975).

Canine demodicosis appears in two forms; localized or generalized form. Localized form is characterized by discrete patches of alopecia, erythema, and comedones. This is more encountered in young dogs and resolves

spontaneously (Paradis, 1999). Generalized form is however, characterized by number of areas of localized disease or even infection in entire skin areas (Shipstone, 2000). Generalized demodicosis can be severe, often complicated with secondary bacterial infection and life threatening (Mueller *et al.*, 2012; Kuznetsova *et al.*, 2012).

The clinical presentations of demodicosis are local or diffuse alopecia, erythema, scale or crusts associated with popular or pastular dermatitis (Kuznetsova *et al.*, 2012). The condition progresses until large areas of the body is affected and the animal shows alopecia and thickened and wrinkled skin with a 'mousy' odor (Soulsby, 1982).

Management of demodicosis is one of the major challenges in canine practices. Besides the veterinarian, it also bothers owners as it involves more time and money in its cure. So, it is important to understand the predisposing factors associated with canine demodicosis so that necessary preventive measures can be taken. There are limited

information available on canine demodicosis in Nepal. So, this study is carried out with the objective of determining the prevalence of demodectic mange in dogs of Kathmandu valley of Nepal and understanding the associated risk factors. These informations can be helpful to canine practitioners as well as dog owners concerned.

Methodology

Study Design

This cross-sectional study was carried out from March 2014 to May 2014 in Kathmandu valley in three districts namely Kathmandu, Bhaktapur and Lalitpur. Four study sites were chosen as per the accessibility; (i) Central Veterinary Hospital, Tripureshwor (ii) Kathmandu Animal Training Centre (KAT), Budhanilkantha (iii) Bhaktapur Animal Welfare, Bhaktapur and (iv) Animal Nepal, Chovar. Purposively the samples were collected from as many dogs as possible having skin disorders like dermatitis, alopecia, crusting, dandruff, pruritus, scaling and different patches on body. A set of the questionnaire was developed to record the general characteristics of the dog including age, sex, breed and hair type. Also the management whether the dogs are housed or free roaming was included. For accessing health status, the parameters like color of mucous membrane, dehydration percentage, ocular or nasal discharge, body condition and status of vaccination and deworming were included.

Sample Collection

A total of 110 samples were collected from suspected dogs from the area showing the lesions, mainly from limbs, periorbital region, back, muzzle and neck region. At first the site was either clipped or the hair was removed with scissors and then with the help of thumb and index finger of left hand, the skin was squeezed so as to facilitate the removal of the mites. Now with the help of scalpel blade dipped in mineral oil, the skin was scraped in the direction of the hair growth until there was capillary bleeding. The scrapings were placed in the sealable plastic bags and then promptly taken to the laboratory for further processing and examination of the mite.

Sample Processing

Samples were processed in 10% KOH (w/v) solution to remove skin debris and hair. KOH pellets marketed by Nike Chemicals, India were used for preparation of KOH (10%) solution. The scraping was placed in the test-tube and 10% KOH was added until it was totally above the sample. Then, the solution was gently heated (near upto the boiling) with frequent shaking for about 5-10 minutes until all the debris were digested. After that the solution was allowed to cool for some time and was allowed to centrifuge at 2000rpm for 10 minutes. Supernatants were discarded and remaining

sediments were transferred to slide and covered with a cover slip. The sediment was observed for mites with the help of compound (10x) microscope. The mites were identified according to the keys and descriptions described by Soulsby (Soulsby, 1982).

Statistical Analysis

Data entry, management and analysis were done using program Microsoft Office Excel 2007. Different risk factors and the prevalence rate of demodectic mange were compared statistically by a Chi-square (χ^2) analysis using commercial software PHStat version 2.5 with significance level defined at the $p < 0.05$. Descriptive statistics such as simple frequency, percentage and mean were used to analyze the data.

Results

Overall Prevalence

Out of 110 samples collected, Demodex mites were isolated in 32 samples which suggest for the prevalence of 29.1% (Fig. 1).

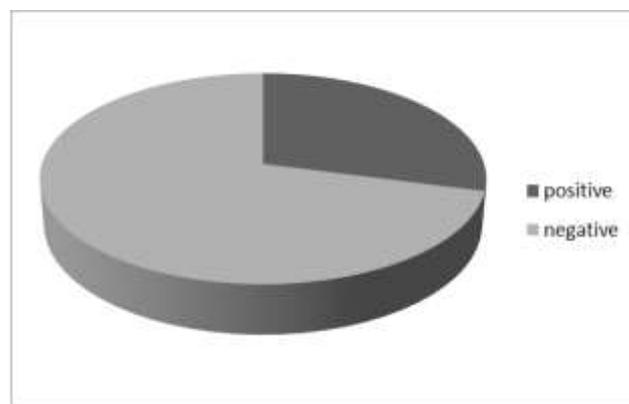


Fig. 1: Proportion of Demodicosis positive and negative samples

Age-Wise Prevalence of Demodicosis

Total samples collected were divided into three groups namely: puppy (up to 2 years), adult (3-8 years) and older (over 8 years). 51 samples were from puppy, 43 from adult and 14 from older dogs. In puppy, out of 51 samples, 25 samples (49%) were found to be positive. Similarly, in adult 3 samples (6.9%) and in seniors 4 (33.3%) samples were found positive. The prevalence rate was significantly associated ($p < 0.01$) with the age of the animal (Table 1).

Sex-Wise Prevalence of Demodicosis

Out of total sample collected, 49 samples were from male and the remaining from female. 18 samples from male (36.7%) and 14 samples from female (22.9%) were found to be positive. There was no significant difference between the prevalence rate of demodicosis regarding male and female ($p > 0.05$) (Table 1).

Table 1: Prevalence of canine demodicosis based on various parameters

Parameters		Sample number	Test result positive (%)	p value
Age (years)	Puppy(upto 2)	51	25 (49)	0.00042
	Adult(2-8)	43	3 (6.9)	
	Older(8+)	16	4 (33.3)	
Sex	Male	49	18 (36.5)	0.1136
	Female	61	14 (22.9)	
Breed	Pure	36	10 (27.7)	0.273
	Mix	34	7 (25.9)	
	Mongrel	40	25 (37.5)	
Hair type	Short	27	11 (40.7)	0.465
	Medium	74	19 (25.7)	
	Long	9	2 (28.5)	
Health status	Good	65	7 (10.7)	0.0000037
	Poor	45	25 (55.5)	
Management	Free roaming	49	24 (48.9)	0.0000385
	Housed	61	8 (13.1)	

Breed-Wise Prevalence of Demodicosis

For analysis of breed wise prevalence, the total number of canine was divided into 3 groups i.e. pure breed, cross breed and mongrel, each of which contributed 36, 34 and 40 samples respectively. 10 samples from pure breed (27.7%), 7 samples from mix breed(25.9%) and 15 samples from mongrel(37.5%) were found to be positive. It was found that there was no significant difference ($p>0.05$) between the prevalence of demodicosis and breed of canines (Table 1).

Prevalence Based on Hair Type of the Canines

Dogs were divided into three groups namely short haired, medium haired and long haired each contributing 27 samples, 74 samples and 9 samples respectively. Eleven samples from short haired (40.7%), 19 samples from medium haired (25.67%) and 2 samples from long haired (28.5%) were found to be positive. Prevalence rate wasn't significantly ($p>0.05$) related to the type of hair of the animal (Table 1).

Prevalence Based on Health Status of the Dogs

The health status of the dog was categorized as good and poor. 65 dogs had good health condition out of which 7 dogs (10.7%) were found positive. Similarly, forty five dogs had poor health condition, out of which 25 dogs (55.5%) were found positive. It was found that there is significant difference ($p>0.01$) between the prevalence rate and the health condition of the dog (Table 1).

Prevalence Based on the Management

Among the samples collected, 49 were from free roaming dogs and the remaining 61 were from the housed ones. 24(48.9%) were found to be positive in free roaming dogs and 8(13.1%) were found to be positive in housed dogs. There was significant ($p>0.05$) difference between the prevalence among the free roaming and housed dogs (Table 1).

Discussion

In this study we found overall prevalence of canine demodicosis in Kathmandu valley to be 29.1%. One previous study had shown that out of 120 samples collected, 51 samples (42.5%) were positive for Demodex mites and thus, demodicosis to be the major mite infestation (Bindari *et. al.*, 2012). This finding is close to that found by Solanki *et. al.*, which was about 25.4% in India (Solanki *et. al.*, 2006). Similarly, this finding is also close to that of Choi, who found the prevalence rate around 25% in Korea (Choi *et. al.*, 2000). However, this finding is far higher than the finding of Gunaseelan *et al.*, who conducted a retrospective study in 3055 samples from 1998 to 2006 in Chennai city, India and the prevalence rate was found to be 10.5% (Gunaseelan *et. al.*, 2011). This report is close to the reports of Kalyan *et al.* in Aizawl who reported 35.7% for demodectic mange (Kalyan *et. al.*, 2005). Whereas, this report was found far higher than the report of Chee *et al.*(2008), who reported 4.9% for Demodexcanis in Gwang-ju City, Republic of Korea (Chee *et. al.*, 2008). The

finding of this report is however close to the result of Ali et al. who found the prevalence rate in stray dogs to be 35.4% in Dinajpur municipality of Bangladesh (Ali *et al.*, 2011). Several epidemiological factors, such as weather, seasonal variations, geographical location, and differences in sample collection technique and data collection might be the attributing factors for such differences. Nevertheless, these data indicate canine demodicosis is a big problem in Nepal.

We found that, prevalence rate is higher in stray dogs as compared to the owned dogs. This might be due to poor management, poor body condition, lack of health treatment and improper nutrition. The prevalence rate in free roaming or stray dogs (49.9%) is far higher than that of owned dogs (13.1%) which is also supported by the finding of Bindari *et al.* (Bindari *et al.*, 2012). Since the stray dogs remain in frequent contact with one another, they might transmit disease and microorganism to one another leading to immunosuppression which makes them more prone to skin disease. Islam et al. had also shown higher (65%) prevalence of demodicosis in stray dogs in Bangladesh (Islam *et al.*, 2013). Higher prevalence was found in puppies and the aged dogs compared to older dogs. Islam *et al.* also reported similar findings where 71.42% of positive cases were of less than 1 year age (Islam *et al.*, 2013). Rodriguez-Vivaset al. also reported 45.7% prevalence in dogs of age up to 1 year (Rodriguez *et al.*, 20037). Ali et al. also found dogs of age 1-2 years are more susceptible for mite infestation than adults of higher age (Ali *et al.*, 2011). In another study, Mahato et al. also reported higher demodectic infestation in dogs of age less than 2 years (Mahato *et al.*, 2005). The reason behind might be the underdeveloped immune system in young dogs compared to older ones.

Though statistically non-significant, higher prevalence was found in male (36.7%) than female (22.9%). Nayak et al. have also shown similar results where prevalence was 51% in male and 49% in female (Nayak *et al.*, 1997). Demodicosis was higher in male dogs (55.5%) compared to bitch (44.5%) in another study done in India by Mahato *et al.* (Mahato *et al.*, 2005). There might be some hormonal influences behind for higher susceptibility of males compared to females. As suggested by Roberts *et al.*, increased parasitism is often associated with elevated plasma testosterone level (Roberts *et al.*, 2004). However, there are reports showing higher prevalence in females than males as well. Islam et al. has reported 72.73% prevalence in females and only 55.56% prevalence in males (Roberts *et al.*, 2004). These suggest, sex might not be associated for susceptibility of dogs for demodicosis. We found higher prevalence (55.5%) in dogs with poor health condition than dogs with good health condition (10.7%). This is reasonable as the health status is directly associated with nutritional status and malnourished ones become immunosuppressed and susceptible for any kind of infection including parasitism (Lapage, 1962). Previous report of Ali et al. also

showed similar result where dogs of poor body condition had higher infestation rate (75.7%) as compared to normal body conditioned (33.3%) ones (Ali *et al.*, 2011).

Our study showed higher prevalence of demodicosis in mongrels (37.5%) than pure and cross breed dogs, but not statistically significant. Bindari *et al.* (2012) also reported similar findings (Bindari *et al.*, 2012). Mongrels owing to less care paid to their management practices including nourishing, they have high prevalence rate. We also found higher prevalence rate in short haired dogs (40.7%) as compared to medium and long haired ones. Sissons and Grossman have suggested that short haired dogs might have higher frequency of disease owing to their better developed sebaceous glands (Sisson and Grossman, 1938). Sheard and Hardenbergh further suggested that, since the skin temperature of short haired dogs is higher than long haired ones, it might favor mite activity (Sheard and Harenbergh, 1927). However, in our study there was no statistically significant difference in canine demodicosis with hair type.

Conclusion

This study shows demodicosis is one of the major problems in dogs of Kathmandu valley. Prevalence was higher in younger dogs than older; in males than females; in mongrel than pure and cross breeds; in short haired than long haired ones; in dogs with poor health status; and in stray dogs than the owned dogs. However, only the age of dog, general health status and management (owned or free roaming) had statistically significant relation with canine demodicosis. The higher prevalence in street dogs than owned dogs suggests that canine demodicosis is a disease that results from poor care of animals like lack of regular grooming and lack of proper nutrition. Contact with infected dogs also spreads this disease as that happens in street dogs more often than the owned dogs. Demodicosis is highly prevalent in dogs whose immune system is disturbed or not well developed. So, it is highly recommended that emphasis on proper nourishment, immunization, deworming and care of dog should be given to avoid skin disorders like demodicosis. As demodicosis is a huge problem in street dogs, concerned organizations and authorities should develop proper planning for street dog management and their health care.

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