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To study the prevalence of Ecto-parasites of dogs in Udaipur region

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Abstract
Among ectoparasites, ticks, mites, lice, flea and biting flies are commonly found on dogs. Their attachment on the dog may affect the health of the animal in several ways namely they harass, extract blood, induce hypersensitivity, introduce pathogens and deposit their offspring in living tissues (Georgi, 1992). *Demodex canis* is the mite, which lives in the hair follicle and sebaceous gland of skin and cause demodectic mange. It is an inflammatory skin disease. A study was carried out to know the prevalence of ectoparasites infesting dogs of Udaipur region, Rajasthan. A total of 250 dogs with the history of skin problems were presented to the hospitals of Udaipur region and they were screened for different ectoparasites. The ticks, fleas were collected, processed and identified based on morphological characters. The skin scrapings were also collected from the affected dogs and processed for identification of mites. Out of 250 dogs examined, 176 (71.0%) harboured ectoparasites. Among 176 infested pet dogs, 58 (32.95%) were positive for tick, 28 (15.90%) for fleas, 27 (15.34%) for fly, 21 (11.93%) for demodectic mange, 16 (9.09%) for sarcoptic mange, 12 (6.81%) for maggot and mixed 14 7.95%) conditions. The flea identified was *Ctenocephalides canis* 28 (15.90%). The ticks species were identified as *Rhipicephalus sanguineus*. The mite species infesting dogs were identified as *Demodex canis* and *Sarcoptic scrabei* based on the morphological characters. The prevalence of ectoparasites was more in stray and adult dogs compared to pet dogs and puppies respectively. The present study indicates to take care of ectoparasitic infestation in order to minimise the health-related condition of dogs.

Keywords: Ecto-parasites, pathogens, prevalence, *Demodex canis*

Introduction
It is known that global dog population of India is estimated to be 900 million and rising and 17–24% of dogs live as pets in the developed countries. Population of pet dogs in India is amounted for around 19.5 million (2018). According to 19th livestock census dog population in Rajasthan was estimated approximately 5,28,780 and in Udaipur region dog population was estimated approx. 43,838. There is a well-known proverb that "dog is man's best friend". Dogs do suffer from different kinds of skin diseases, of which parasitic skin diseases contribute significantly. Of the different parasites causing skin diseases, contribution by ectoparasites is very conspicuous. Clinical manifestation of ectoparasitic infestation can be through different cutaneous symptoms. Dogs are at more risk of infectious causes include parasites, bacteria, fungi and virus. These organisms stay alive on the outside of skin alongside different skin extremities like hair follicles, sebaceous and sweat organs of the ectoparasites infestation in dogs are very devastating and difficult to control and require long term of treatment. Dogs are usually infested with many ecto-parasites making them miserable due to consistent scratching, intense itching, irritation and reduction of health and wellbeing of dogs through their blood sucking behaviors resulting to severe anaemia, dermatitis which can lead to lifestyles threatening allergy.

Most of the ectoparasites live on, feed on and inhabit the external body surfaces of the dogs, including dogs. They have considerable pathogenicity and may even cause death, according to parasitism intensity, nutritional status and the host's immunological condition. They can also act as vectors for a wide variety of infectious agents such as: *Babesia spp., Ehrlichia spp., Anaplasma spp., Rickettsia, Borrelia spp.* and *Yersinia pestis* and/or as intermediate hosts of filarids and cestodes, which cause serious diseases in dogs and people in contact with them.

Among various ectoparasites ticks are the most important arthropods which transmit diseases to dogs and humans and cause paralysis, the condition caused by toxins found in the saliva of ticks. Fleas leads to dermatologic disease called flea allergic dermatitis.

It is an immunologic and hypersensitive state produced due to the injection of antigenic material from the salivary glands of fleas. Blood consumption by fleas can produce iron deficiency anaemia (Blagburn and Dryden 2009) [3].

Some louses like *Heterodoxus spiniger* act as effective intermediate host of *Dipylidium* tapeworms and blood sucking lice *Linognathus setosus* are known to cause anaemia in dogs. Biting lice cause skin irritation and sucking lice cause erythematous patches and blood loss.

Mange is yet another important skin disease caused by different mites of different genera. *Demodex canis* is the mite, which lives in the hair follicle and sebaceous gland of skin and cause *demodectic* mange. Clinically the external feature of *demodicosis* is manifested by alopecia, erythema, edema, papule, pustule, seborrhoea and pruritis etc. ultimately leading to concomitant bacterial and fungal infection leading to Demodex complex. *Demodicosis* is the most obstinate, persistent and problematic disease. Though number of acaricides are available, variable responses, side effects and recurrence even after clinical recovery of lesions fail to satisfy the clinicians. Human beings can contract a transient form of *sarcoptic* mange from *Cheytiella spp*. through intimate with affected dogs. *Demodex folliculorum* and *Demodex brevis* are non-transmissible from man to dog.

Materials and Methods

The samples were collected from dogs showing clinical and subclinical symptoms of ectoparasite infection and approached for treatment at TVCC, C.V.A.S. Navania, from nearby villages, farms and as well as from polyclinics and private clinics of nearby areas of Udaipur, (Rajasthan) during the period from April 2022 to November 2022. Dogs presented to the department with clinical signs suggestive of dermatological problems were included in the study. Information such as history, clinical signs, age, sex etc. was recorded. Analysis of collected data was done to determine occurrence of various skin disorders in dogs. Skin scrapings suspected for mite infestation was collected from the dogs and examined by the method of Soulsby (1982) [11]. The scrapings were also collected from the 'recently rubbed' or 'appeared raw' lesions. Examination of skin scrapings for detection of the mite were done by direct method or by using 10% potassium hydroxide solution.

Ectoparasites collection and processing

Clinical material for the present study were collected included flea comb, blood, peripheral blood smears, flea dirt, skin scrapings, hair, acetate tape impression smears, glass slide impression smears. Other chemicals utilised included, 10% potassium hydroxide (KOH), ascending grades of alcohol *viz*., 50%, 70%, 90% and absolute alcohol, lactophenol clearing agent, DPX or Canada balsam.

Skin scrapings

Skin scrapings were collected from dogs by placing a drop of mineral oil /liquid paraffin on the sampling instrument and or directly on the skin site. Multiple scrapings of affected skin area were performed in the direction of the hair growth, the skin should be squeezed during or between the scrapings to extrude the mites from the deep follicles to surface. The skin was scrapped until capillary bleeding occurs, which indicated that the scraping instrument has reached sufficient depth. Skin scrapings along with debris were collected and transferred on to a glass slide, mixed with mineral oil or liquid paraffin and examined with a cover slip under microscope at low power magnification 10x and 40x. If the sample was found negative for mites by this method, the remaining material was placed in a warm 10% KOH for 20 min. The mix was stirred and centrifuged after centrifugation the material from the sediment was taken on to a slide and examined under microscope after placing a cover slip.

Results and Discussion

During the present investigation 250 dogs were examined, of them 176 (70%) dogs suffered from different dermatological affections. Khurana *et al*., 2016 [6] reported 21.34% cases affected with skin diseases during a study period of 5 years whereas Shyma and Vijayakumar (2012) [10] reported 12% dermatological problems in one year in dogs. Scott *et al*., 2001 [8] and Hill *et al*., 2006 [5] reported the prevalence of skin disorders ranging from 15-25% in dogs. Increasing trend of dermatological disorders discovered during this study might most likely result to updated information in identification and diagnosis of skin diseases, increasing population of pets, hyperbolic awareness among pet house owner because of amendment in climate conditions. The higher prevalence of dermatological disorders could also be because of season, environmental conditions factors and management factors adopted in a very explicit space as expressed by Sharma *et al*., (2008) [9].

Among the various ectoparasite infection in dogs highest overall prevalence was *R. sanguineus* in 58(32.95%), followed by *C. canis* in 28(15.90%), *Hippobosca capensis* in 27(15.34%), *Demodex canis* in 21(11.93%), *Sarcoptes scabei* in 16(9.09%), maggots in 12(6.81%), mixed in 14(7.95%).

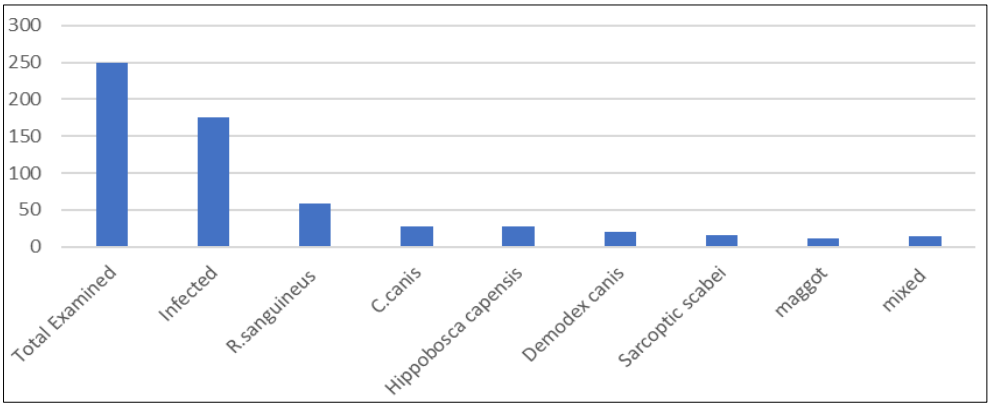

Fig 1: Overall prevalence of ectoparasite infection of dogs

Out of a total of 250 samples examined, 80 was examined in summer season, 110 in rainy season and 60 in winter season. Out of 250 sample examined, 176 (70%) were found to be infected with ectoparasites. Almost throughout the year dermatological disorders were recorded but more cases were recorded in rainy season followed by summer, autumn and then winter. Dimri and Sharma (2004) [4] and Kumar *et al.*, 2006 [7] also reported maximum cases of skin diseases during summer and rainy months of the year. Among 176 samples 46 (57.50%) were infected during summer season, 99 (90.00%) in rainy season and 31 (34.44%) during winter season. Among the various ectoparasite infections highest prevalence was of *Rhipicephalus sanguineus* 10 (21.73%), followed by *Hippobosca* 9 (19.56%), *C. canis* 8 (17.39%), *Sarcoptic scabiei* 7 (15.21%), *Demodex canis* 5 (10.86%), maggot 4 (8.69%), mixed 3 (6.52%) were recorded in summer. In rainy season similarly *Rhipicephalus sanguineus* 28 (28.28%) was highest followed by *Hippobosca* 21 (21.21%), *C. canis* 20 (20.20%), Maggot 10 (10.10%), mixed 9 (9.09%), *Demodex canis* 7 (7.07%), *Sarcoptic scabiei* 6 (6.06%) was recorded. In winter season also *C. canis* 9 (29.03%), followed by *Hippobosca* 7 (22.58%), *Rhipicephalus sanguineus* 6 (19.35%), *Sarcoptic scabiei* 3 (9.67%), *Demodex canis* 3 (9.67%), maggot 1 (3.22%), mixed 1 (3.22%) were recorded. In rainy mixed infection was highest 9 (9.09%) followed by summer 3 (6.52%) and winter season 1 (3.22%) animals. Environmental conditions can affect the survival and multiplication of ectoparasites. It has been established that the availability of vegetation during the rains provide a favourable environment for ectoparasites, especially ticks which drop off their host to moult after which they position themselves on leaf blades to infest other potential host that they come in contact with during movement or grazing. The high temperature (45.45 °C), which exists during summer, might be the reason for low infestation, whereas a warm humid climate prevailing during post-monsoon might be the cause for spurt in the prevalence of ectoparasitism in pet animals.

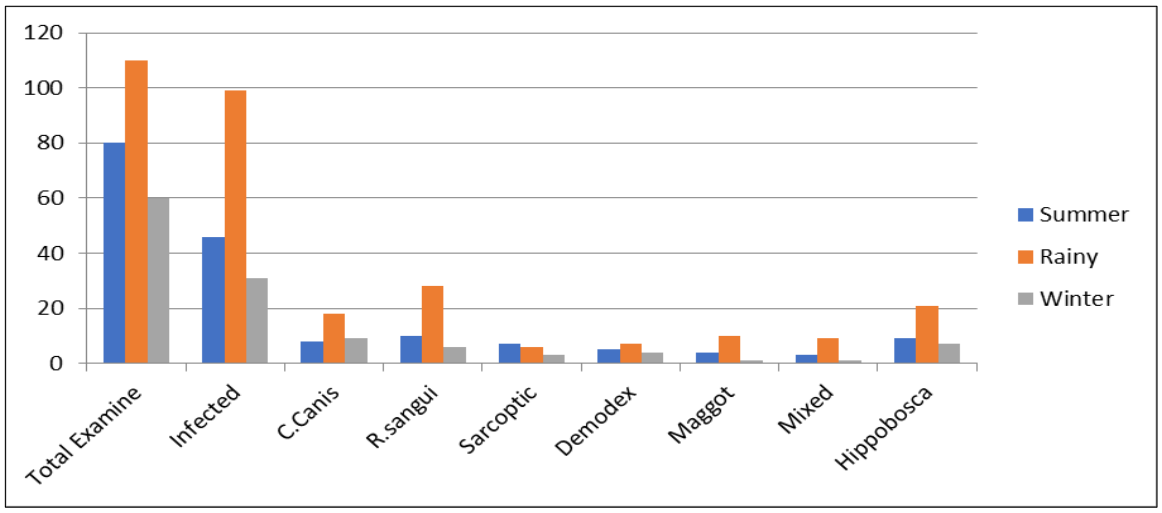

Fig 2: Season wise prevalence of ectoparasite in dogs

In age wise prevalence two groups were classified as less than 1 year and more than 1 year with 100 and 150 number of animals examined respectively. Highest prevalence of ectoparasite infection was noted in age group of less than 1 year 53 (53%) followed by more than 1 year 124(82.66%). The managemental conditions, immunity for infestation in dogs of younger age is good than adults.

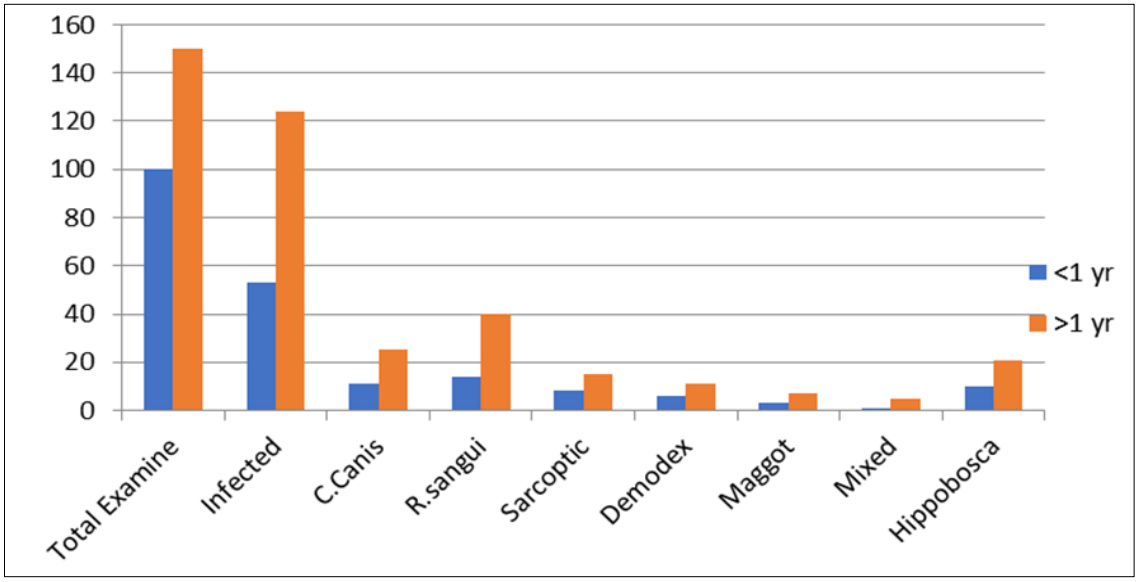

Fig 3: Age wise prevalence of ectoparasite in dogs

Out of a total 250 sample examined, 22 were examined from April month, 32 from May month, 26 from June month, 27 from July month, 38 from August month, 45 from September month, 32 from October month, and 28 from November month. In April month out of 22 samples examined, 10(45.45%) were found to be infected. In May month out of 32 examined, 19(59.37%) were infected, in June month out of 26 examined, 17(65.38%) were infected, in July month out of 27, 24(88.88%) were infected, in August month out of 38 examined, 34(89.47%) were infected, in September month out of 45 examined, 41(91.11%) were infected, in October month out of 32 examined, 20(62.50%) were infected, in November month out of 28 examined, 11(39.28%) were found to be infected.

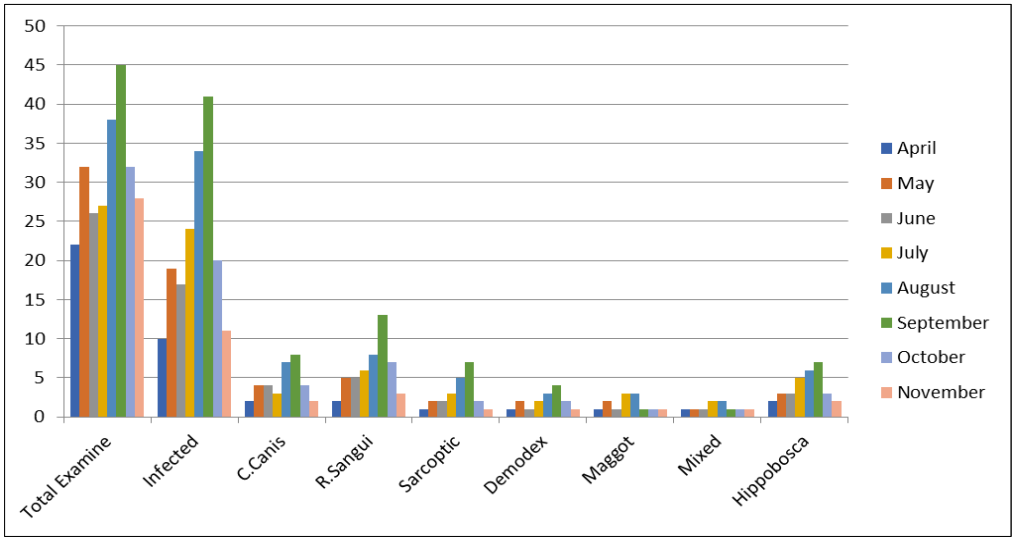

Fig 4: Month wise prevalence of ectoparasite in dogs

Conclusion

The present study revealed that the infection status by the various species of ectoparasites is very high. The overall percentage of ectoparasite infection was found to be (70%) with mixed infection (15.34%). The overall prevalence of *R. sanguineus* (32.95%), *C. canis* (15.90%), mixed (15.34%), *Demodex canis* (11.93%), *Sarcoptic scabiei* (9.09%), *Hippobosca capensis* (7.95%), maggot (6.81%). Season wise analysis revealed maximum prevalence of ectoparasite infection during rainy season (90.00%), followed by summer season (57.50%) and winter season (34.44%) in dog. Highest prevalence of gastrointestinal parasites was in >1 years ago (82.66%) of dog followed by <1 years age (53%). Month wise prevalence of ectoparasite infection was highest in September month (91.11%), followed by August month (89.47%), July month (88.88%), June month (65.38%), October month (62.50%), May month (59.37%), April month (45.45%), November month (39.28%). Various clinical manifestations observed were like, Alopecia (81.25%), dermatitis (75%), itching (66%), red skin (54.28%), pruritis (56%). The study also revealed that maximum ectoparasite infection was observed environmental conditions can affect the survival and multiplication of ectoparasites. The present study highlights the prevalence of ecto parasites of dogs from Udaipur region and deals with appropriate treatment and control strategies which further needs to be exploited.

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