Prevalence of ectoparasites in owned dogs in Kerman city, southeast of Iran

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Abstract The present study aimed to investigate the intensity and distribution of natural infestation of ectoparasites in owned dogs during June to November 2011 in Kerman city, southeast of Iran. One hundred two domestic dogs (63 males, 39 females) with age ranged between 45 days to 13 years were examined for ectoparasites infestation including (tick, lice, flea and mite) in Kerman city. Detailed questionnaire about grooming and bathing interval, keeping place (outdoor, indoor) and purpose of keeping were obtained from owners. After complete skin examination, animals hairs were combed and their skin rubbed with a piece of cotton soaked in alcohol to remove the ectoparasites in apparently normal cases, and deep skin scratching were prepared from all type of lesions in symptomatic dogs. A total number of 149 ectoparasites were collected. The most common ectoparasite was *Rhipicephalus sanguineus* tick, which infested 27 of the 102 dogs (26.47 %). *Ctenocephalides canis* was identified on two dogs (1.96 %) and 5 dogs infested with *Hippobosca* spp (4.9 %) that the highest infestation rate was seen in September (14.2 %). Studied samples were routinely checked for clinical symptoms. Itching and scratching lesions were the only reported signs which seen in flea infested dogs (6.4 %) and other infested dogs (93.5 %) had no clinical symptoms. Ectoparasites were significantly

higher in outdoor dogs in compare with indoor group and the most tick infested location was ear (61.3 %) ($P < 0.05$).

Keywords Ectoparasite · Owned dog · Kerman · Iran

Introduction

Arthropod ectoparasites constitute a diverse and highly adapted group of animals that inhabit the external body surfaces of vertebrates (Aldemir 2007). They may live permanently on their host, or they may occupy the host's nest and environment, and visit the body of the host periodically. The phylum Arthropoda includes many species of insects (class: Insecta), and mites and ticks (class: Arachnida; order Acarina) that are ectoparasitic to domestic animals. External parasites are major causes of distress and disease in dogs (Ettinger and Feldman 1995). Ectoparasites are a common and important cause of pruritic and non-pruritic skin disorders in dogs and cause hypersensitivity disorders (Ettinger and Feldman 1995). In addition, many species of arthropod are responsible for the transmission of disease to other animals or are vectors for some diseases that are transmitted to humans. They also may cause life-threatening anemia in young or debilitated animals (Araujo et al. 1998). Ticks are obligate hematophagous arthropods that parasitize every class of vertebrates in almost every region of the world (Parola and Raoult 2001). Infestation with these ectoparasites can cause in considerable discomfort and dermatological reactions as they affect their hosts directly by feeding blood and cause dermatitis, and other allergic reactions. Nonetheless, most dogs with ectoparasites have no clinical symptoms.

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Ticks after mosquitoes are the second most important arthropods that may transmit pathogens like viruses, bacteria including rickettsiae, protozoa, and filarial nematodes to other animals and humans. Ticks are also one of the major vectors of pathogens, such as *Babesia*, *Theileria*, and *Anaplasma* spp. to animals in the world (Razmi et al. 2007). The brown dog tick (*Rhipicephalus sanguineus*) is the most widespread tick in the world and a well-recognized vector of many pathogens affecting dogs and occasionally humans (Dantas-Torres 2010). Fleas are one of the most common ectoparasites of companion animals that feed on the blood of their hosts. They are responsible for the production and transmission of several diseases of humans and their pets. Various studies reported *Ctenocephalides felis*, *Ctenocephalides canis* and *Pulex irritans* as the most common flea species on dogs (Chee et al. 2008). However, the prevalence of these species varies in different geographic areas. Since dogs constitute a potential source of infection in human, the importance of controlling canine parasites is both relieve clinical symptoms in infected animals and minimize the zoonotic potential of ectoparasitic infection in human (Borji et al. 2011). The present study was aimed to determine the prevalence of ectoparasites infestation in owned dogs of Kerman, southeast of Iran.

Materials and methods

The study was conducted from June to November 2011 in Kerman city, southeast of Iran (Fig. 1). According to prevalence of owned dogs ectoparasites in different parts of Iran and detailed statistical calculations, the number of one hundred two owned dogs (63 males, 39 females), in different breeds with an age range of 45 days to 13 years were randomly selected and examined for ectoparasites. Detailed questionnaire about grooming and bathing interval, keeping place (outdoor, indoor) and purpose of keeping were obtained from owners. After complete skin examination, animals hairs were combed and their skin rubbed with a piece of cotton soaked in alcohol to remove the ectoparasites in apparently normal cases, and deep and superficial skin scraping were prepared from all type of lesions in symptomatic dogs. All specimens collected from each dog were transferred into labeled specimen bottles containing 70 % ethanol. In the laboratory, the specimens from each dog were identified, counted and recorded according to body regions. Areas of the skin with dermatologic lesions were moistured with mineral oil and scraped with a scalpel blade until capillary bleeding was visible. The scrapings were placed on glass slides with a drop of 10 % KOH solution and were examined microscopically for the presence of mites.

Fig. 1 Location of Kerman city in Iran

Deep ear swab specimens were obtained from both ears from all dogs. All ear swab specimens were examined microscopically with mineral oil for the presence of mites.

Statistics analysis

Dogs were grouped by age, sex, breed, and sampling time to determine whether these factors were associated with ectoparasite infestation, using Chi square analysis and Fisher's exact test. Statistical comparisons were carried out using SPSS 18.0 statistical software. Differences were considered significant at $P < 0.05$ level.

Results

Total prevalence and intensity of external parasite infestations recorded by body search, including whole body comb and examination of skin scrapings from suspicious skin areas are given in Tables 1, 2, 3, 4. Out of 102 tested dogs, 31(30.3 %) were positive for ectoparasites (fleas, ticks, and dog fly). The dominant ectoparasites were ticks, dog fly and fleas respectively. Twenty-seven dogs had ticks (*Rhipicephalus sanguineus*) (26.4 %), which were seen mostly in June. A total of 101 ticks (67.7 %) were recovered from 27 dogs. Out of 31 positive dogs, 2 (1.9 %) were

Table 1 Total ectoparasite frequency in owned dogs in Kerman city, Iran

Ectoparasite species	Frequency (%)
Fleas	
<i>Ctenocephalides canis</i>	40 (26.84)
<i>Ctenocephalides felis</i>	0
Ticks	
<i>Rhipicephalus sanguineus</i>	101 (67.78)
<i>Haemaphysalis lichi</i>	0
Fly	
<i>Hippobosca</i> spp	8 (5.36)
Total	149 (100)

Table 2 Occurrence of ectoparasites in owned dogs by age (year)

Age (years)	No. of examined dogs	No. of positive dogs	Prevalence (%)
<1	52	19	36.53
1–3	26	10	38.46
3–5	11	1	9.09
>5	13	1	7.69
Total	102	31	30.39

positive for fleas. A total of 40 fleas were found, all of them *C. canis* (26.8 %, n = 40) (Table 1). *C. canis* was the predominant species identified on any flea-infested dog, which was seen mostly in November. Five dogs had *Hippobosca* spp, (4.9 %), which was seen mostly in September (Table 3). Mixed infestations (*R. sanguineus* and *Hippobosca*) with two ectoparasites were detected on three dogs (2.9 %). Studied samples were routinely checked for clinical symptoms. Two positive dogs had itching (6.4 %) and 29 dogs (93.5 %) had no any clinical symptoms. The majority of examined dogs were mixed-breeds (27.4 %), and 8 (28.5 %) were infested with ectoparasites. Sixty-three out of 102 dogs (61.7 %) were males and 39 (38.2 %) were females. Age group (1–3 year) was more commonly affected than older dogs (Table 2). Small-sized dogs were more frequently affected than toy groups (71.4 %) (Table 4). Data on distribution of the ectoparasites in the body of the dogs were 27 (61.3 %) around the ear, 5 (11.3 %) on backside, 9 (20.4 %) around head and neck, 2 (4.5 %) on belly, and genital area, and 1 (2.2 %) on nose. However, there was no statistical significant difference observed between sex, age, weight and breed ($P > 0.05$).

Results also demonstrated that those dogs who were kept in soil or grass ground were more at risk for ectoparasite infection than those kept at home.

Table 3 Monthly prevalence of ectoparasites in the owned dog of Kerman city

Arthropod species	Month of the year	No. of examined dogs	Infested dogs	
			Number	Percentage (%)
<i>Rhipicephalus sanguineus</i>	June	17	13	76.4
	July	18	4	22.2
	August	26	6	23
	September	7	3	42.8
	October	23	1	4.3
	November	11	0	0
<i>Ctenocephalides canis</i>	Overall	102	27	26.4
	June	17	0	0
	July	18	0	0
	August	26	1	3.8
	September	7	0	0
	October	23	0	0
<i>Hippobosca</i> spp	November	11	1	9.0
	Overall	102	2	1.9
	June	17	1	5.8
	July	18	0	0
	August	26	1	3.8
	September	7	1	14.2
	October	23	2	8.6
	November	11	0	0
	Overall	102	5	4.9

Table 4 Occurrence of ectoparasites in owned dogs by body weight

Body weight (kg)	No. of examined dogs	No. of positive dogs	Prevalence (%)
<3	7	5	71.4
3–5	10	2	20
5–10	30	9	30
>10	55	15	27.2
Total	102	31	30.3

Discussion

The present study is the first study on the prevalence of ectoparasite infestations in companion dogs in Kerman city. The estimated prevalence in this survey (30.3 %) is considerably lower than reported prevalence in Brazil (70.4 %) (Dantas-Torres et al. 2009). Higher prevalence rate was recorded in Nigeria (98.5 %) by Agbolade et al. (Agbolade et al. 2008). Similar prevalence of ectoparasites in dogs was recorded in Turkey (43.75 %) (Aldemir 2007) and in Western parts of Iran (44.3 %) by Bahrami and Delpisheh (Bahrami and Delpisheh 2010). In this study, three species of arthropod ectoparasites were

identified which were common parasites of canines and in many areas of the world. In owned dogs, *R. sanguineus* was the most common species, followed by *C. canis*. These findings are similar to those found by other investigators (Felz et al. 1996). In a similar research in Afghanistan 31 of 105 dogs were infested with 5 species of ticks that *R. turnanicus* and *R. sanguineus* were the most common species (Le Riche et al. 1988). *R. turnanicus* was not observed on dogs in the present study. Linardi and Nagem (1973) reported that *R. sanguineus* was the most common tick observed on dogs in Belo Horizonte, Brazil (Linardi and Nagem 1973). It has been stated that feeding ticks on dogs has the highest activity in May and lowest activity in September in Warsaw, Poland (Zygner and Wedrychowicz 2006). Morales-Soto and Cruz-Vazquez reported a higher prevalence of *R. sanguineus* in April and a lower prevalence in February and December on dogs in the Morelos area of Mexico (Morales-Soto and Cruz-Vazquez 1998). In our study the higher prevalence was in June and the lower prevalence was in November. The dog flea, *C. canis*, was the most common flea found on the dogs in Kerman area, whereas no *C. felis* were found. These results are not consistent with previous studies that stated *C. felis* was the most common flea in dogs (Harman et al. 1987; Painter and Echerlin 1985). However, Fukase et al. reported that *C. canis* was more common than *C. felis* in Kanagawa, Japan (Fukase et al. 1987). Similar to our results, Le Riche et al. and Chukwu reported that *C. canis* was the most common flea in Afghanistan, and Nigeria (Chukwu 1985; Le Riche et al. 1988). *C. canis* and *C. felis* have been reported on various host species from different parts of Iran (Anvar et al. 1972). In research of Jafari Shoorijeh, the most common ectoparasite was *C. canis*, which infested 22 of the 160 dogs (Shoorijeh et al. 2008). Some studies reported, *C. felis* as the most prevalent species, with abundant values up to 92 % in Florida/USA (Harman et al. 1987), Virginia/USA (Painter and Echerlin 1985), Wisconsin/USA (Amin 1976), Egypt (Amin 1966) and Lima/Peru. Similar to other observations, *C. felis* was reported from several studies conducted in Germany (Beck et al. 2006; Visser et al. 2001), the United Kingdom (Bond et al. 2007) and Spain (Gracia et al. 2008). In our study, flea infestations on dogs were observed in August and November. The peak of flea infestation rate was 9.0 % observed in November and the June, July, September and October months infestation was 0 %. Results of this study are not in agreement with other authors who observed that peak flea infestations occurred during the annual warm months (Cruz-Vazquez et al. 2001). The present study showed that ectoparasite was more predominant in females than males; the reason for this discrepancy is unclear but may be in part related to the fact that females have longer life than males. Female abundant infestation has also been reported by

other researchers (Edwards 1969). Greater susceptibility which observed in female dogs than males in this study was in agreement with Feather et al. (Feather et al. 2010). This might be due to the fact that females kept were confined to avoid unwanted breeding and hormonal changes during reproduction period. *Hippobosca* were found on 5 of 102 dogs infested with ectoparasites in the present study (4.9 %) but it was more prevalent (23.8 %) in Kabul, Afghanistan (Le Riche et al. 1988).

The prevalence of ectoparasites infestation was higher among 1–3 years old dogs (38.4 %) in present study but in Afghanistan it was stated that dogs less than 1 year old are more susceptible to ectoparasite infestations owing to their constant exposure to carrier mothers (Chee et al. 2008). Dogs less than 3 kg body weight were more affected than heavier groups. This finding may be related to age, because most of the affected animals of this group were less than 1 year old.

To the best of our knowledge this is the first study conducted in southeast of Iran that examined the prevalence of ectoparasites in companion dog populations. However, this survey was limited to the Kerman area and additional studies are required to complete these findings and help veterinarians to prepare a complete program for the control of these parasite and their associated diseases.

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