

Prevalence of ectoparasites in pet animals in Palpa, Nepal

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ABSTRACT. Pet animals (dog, cat and rabbit) are kept for pleasure, enjoyment and companionship instead of their utility. They harbor many ectoparasites (tick, flea, mite) which have public health significance in developing countries. A cross sectional study was conducted to determine the prevalence of ectoparasites on pet animals of Tansen Municipality of Palpa, Nepal. A total of 134 pet animals (cats, dogs and rabbits) were screened for ectoparasites, and semi-structured questionnaire were asked to get information regarding management practices (knowledge, attitude and practice of ectoparasite infestation) by owner. The ectoparasites were collected by hand picking and preserved in labelled vials containing 70% ethanol. A total of ninety-two (68.7%) pet animals were found to be infested with one or more ectoparasites. Among the pet animals examined, 73.9% (65/88), 58.3% (21/36) and 60% (6/10) were dogs, cats and rabbits respectively were found infected with ectoparasites. Four ectoparasite species were detected, of which one was tick (*Rhipicephalus sanguineus*), two were fleas (*Ctenocephalides canis*, *C. felis*) and, one was louse (*Linognathus setosus*). Comparison of overall prevalence of ectoparasites among pet animals indicated that dogs were more susceptible to ectoparasite infestation. Only few of the respondents knew about the ectoparasites and diseases caused by them. The present study determined that high prevalence of parasites, and the low level of public awareness is the fundamental reason behind pet related zoonotic disease. Extensive public education about pet related zoonoses is needed to create awareness in public and to reduce the risk of harboring zoonotic diseases of public health importance.

Keywords: pet animals, ectoparasites, public education

Introduction

A domesticated animal which is kept for pleasure rather than the utility is known as pet animal [1]. The popular species of pets are dogs, cats, fishes, birds, rabbits, hamsters and guinea pigs [2]. However, dogs and cats are the most common pet animals worldwide [3]. The benefits of having a pet animal are undisputed, yet they may harbour many parasites potentially transmissible to humans [4]. Ectoparasites inhabit the skin or outgrowths of the skin of another organism (the host) for various periods [5]. Many of these ectoparasites (lice) are host specific, while others (ticks) parasitize a wider range of hosts.

Ectoparasites, such as tick, flea, lice, and mite live on domestic dogs. Species as *Ctenocephalides canis*, *C. felis*, *Pulex irritans* and *Echidnophaga gallinacea* (from poultry) are usually reported in dogs [6]. Different tick species infest dogs depending on the geographical area; however, one

of the most widely distributed is *Rhipicephalus sanguineus* [7]. Dogs can be infested by lice including the chewing lice *Heterodoxus spiniger* and *Trichodectes canis*, as well as the sucking louse *Linognathus setosus* [8]. Mites found in dogs are *Demodex canis*, *Sarcoptes scabiei* var. *canis*, *Otodectes cynotis* [9]. Likewise, the cat flea, *C. felis*, is one of the most important ectoparasite of cat [10]. Cats can also be infested with ticks, *Rhipicephalus sanguineus*, *R. turan*, *Haemaphysalis adleri* as well as with mites such as *Notoedres cati*, *Cheyletiella blakei* and *Otodectes cynotis* which causes direct damage to the infested animal [11].

Similarly, *C. canis* or *C. felis* are the usual fleas found on pet rabbits. *Sarcoptes scabiei* var. *cuniculi* and *Psoroptes cuniculi* are most common mites in rabbits [12].

Ectoparasites are important cause of skin diseases in pet animals. It causes life threatening anaemia in young and weakened animals [13]. Flea of pet animals can cause dermatitis and transmit

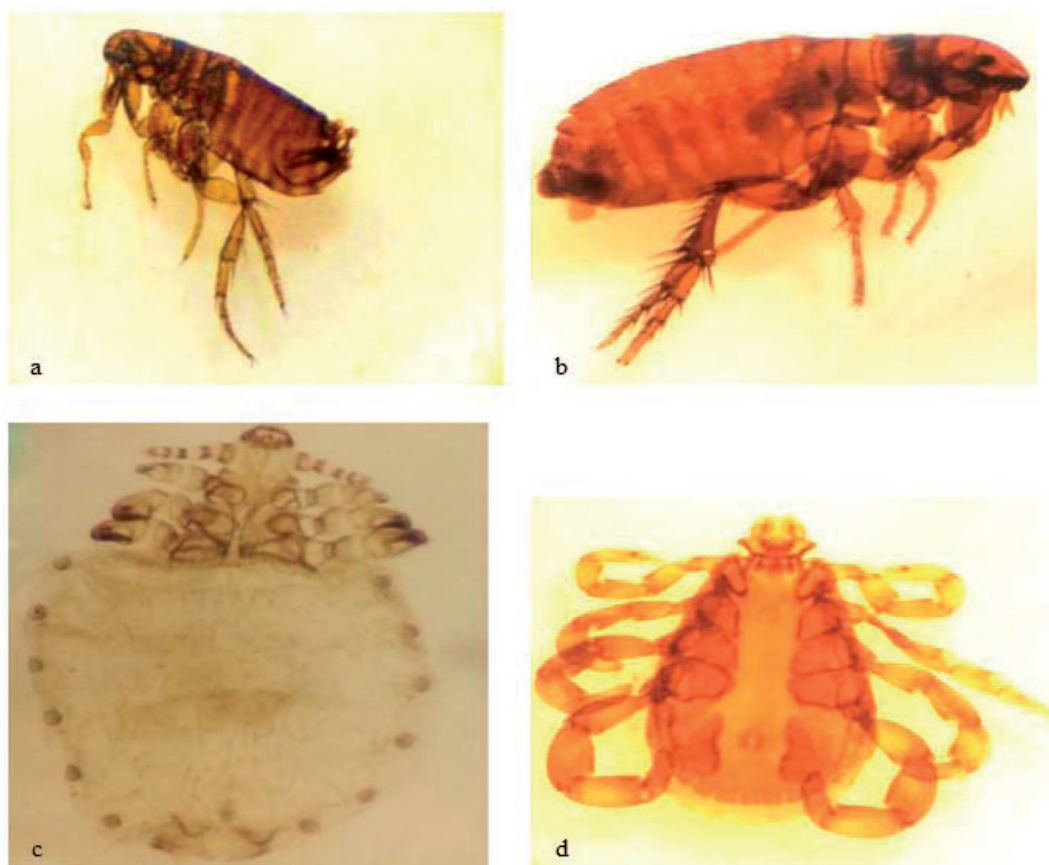


Figure 1. Identified ectoparasites. a. *Ctenocephalides canis* ($\times 40$), b. *Ctenocephalides felis* ($\times 40$), c. *Linognathus setosus* ($\times 40$), d. *Rhipicephalus sanguineus* ($\times 40$)

vector borne diseases to humans [14].

In Nepal, there is little or no information about presence of ectoparasites in pet animals. The present study was undertaken to determine the prevalence of ectoparasites in cats, dogs and rabbits, and analyze the “knowledge, attitude and practice” (KAP) among owners about ectoparasites in Tansen, Palpa, Nepal.

Materials and Methods

Study area

The study was conducted from June to August, 2019 in Tansen Municipality, Palpa, Nepal. It lies at an altitude of 1372 meters and coordinates $27^{\circ}52'0''\text{N}$ and $83^{\circ}33'0''\text{E}$. The study was conducted in 6 wards (1, 2, 3, 4, 5, 13) of Tansen Municipality, Palpa, Nepal.

Data collection and analysis

A door-to-door screening of pet animals were conducted in randomly selected 68 houses. Pet animals were examined for ectoparasites with

cooperation of the owners. The entire body surface of pet animals was observed for ectoparasites, collecting them by handpicking. A total of 134 pet animals (88 dogs, 36 cats and 10 rabbits) were inspected. The obtained ectoparasites were kept in labelled vials containing 70% alcohol and transferred to laboratory for identification.

The collected ectoparasites were transferred to Petri-dish and counted. They were boiled in potassium hydroxide and dehydrated in ascending strength of alcohol series (30%, 50%, 70%, 90% and absolute). After dehydration, the specimens cleared by kept on xylene for 5–10 min, mounted in DPX on the clean glass slides and covered by cover slips. Specimens were identified with the help of published literature on morphology of ectoparasites [15].

Semi-structured questionnaires were set up to achieve the essential information from 68 pet owners. Questionnaires included knowledge about zoonosis, mode of ectoparasite transmission, lifestyle of pet, medical history, treatment measures of ectoparasites.

Table 1. Prevalence of ectoparasites in pet animals

Host	Ectoparasite species	No of infected animals (%)	χ^2	P-value
Dog (n=88)	<i>Rhipicephalus sanguineus</i>	37 (42.04)	30.429	<0.001
	<i>Ctenocephalides canis</i>	26 (29.54)		
	<i>C. felis</i>	28 (31.81)		
	<i>Linognathus setosus</i>	3 (3.4)		
Cat (n=36)	<i>Rhipicephalus sanguineus</i>	4 (11.11)	57.43	<0.001
	<i>Ctenocephalides canis</i>	2 (5.55)		
	<i>C. felis</i>	19 (52.7)		
Rabbit (n=10)	<i>Ctenocephalides canis</i>	1 (10)	26.66	<0.001
	<i>C. felis</i>	5 (50)		

The data were statistically analyzed by using Microsoft Excel 2010 and to show association between variables chi square test was used. In all the cases 95% confidence interval (CI) and $P < 0.05$ was considered for statistically significant difference.

Ethical approval

This study was approved by the institutional review committees of the Institute of Science and Technology, Tribhuvan University (IRC/IoST-27/077/078).

Results

Diversity and prevalence of ectoparasites

Among total pet animals examined, 92 (68.7%) were found to be infested with ectoparasites. Four species of ectoparasites were identified. One species of ticks, two species of fleas and one species of lice were identified (Fig. 1).

Among total examined, 65 (74%) dogs, 24 (67%) cats and 6 (60%) rabbits were positive for overall ectoparasite infestation which indicates that dogs were more susceptible to ectoparasites in comparison to cats and rabbits.

Dogs were found to be infested with 2 species of flea (*Ctenocephalides canis*, 29.54%; *C. felis*, 31.81%), one species of tick (*Rhipicephalus sanguineus*, 42.04%), and one louse species (*Linognathus setosus*, 3.4%) (Tab. 1). Similarly, cats were infested with two flea species (*C. felis*, 52.7%; *C. canis*, 5.55%) and one tick species (*Rhipicephalus sanguineus*, 11.11%). Rabbits had infestation with two flea species (*Ctenocephalides canis*, 10%;

Ctenocephalides felis, 50%). There is no significant difference in the distribution of these ectoparasites among pet animals, dog ($\chi^2=30.429$, $df=3$, $P < 0.001$), cat ($\chi^2=57.43$, $df=2$, $P < 0.001$) and rabbit ($\chi^2=26.66$, $df=1$, $P < 0.001$) (Tab. 1).

Knowledge, attitude and practice (KAP) of pet owner about ectoparasite infestation

The knowledge of pet owner's in the management of pet are presented at table 2. Most owners (47%) had secondary level of education. All the pet owners (100%) knew that diseases are transmitted from pet to human. A total of 71% pet owners were aware of rabies, while 29% were also aware of parasites, which was statistically significant ($P < 0.001$). More than half of the pet owners (69%) had gained information about diseases from friends and relatives, whereas 22% and 9% pet owners had gained information from veterinarians and media/internet, respectively (statistically insignificant $P < 0.001$). Few pet owners (29%) knew that ectoparasites may act as vectors of various important diseases.

More than half (75%) agreed that pet lifestyle may play a part in the likelihood of gaining external parasites. A total of 65% of the pet owner agreed that pets acquire ectoparasites when in contact with other infested animals, and 35% of the pet owner agreed that grass or bush can be responsible for transmission of ticks. A total of 71% of the pet owners had taken their pets to veterinarians on a regular basis (at least once a year). The percentage of pet owner who always and sometimes wash their hand after touching pet were 12% and 18%,

Table 2. Knowledge, attitude and practice of pet owners about ectoparasite infestation

Variables		Proportion
Zoonotic disease	Rabies	48(71%)
	Rabies and parasitic disease	20(29%)
Source of information about the diseases	Friends and relatives	
	Veterinarians	47(69%)
	Media/Internet	15(22%)
Ectoparasites act as vector of zoonoses	Yes	6(9%)
	No	20(29%)
Role of pet's lifestyle for external parasites	Yes	48(71%)
	No	51(75%)
Mode of transmission of ectoparasite	Infested animal	17(25%)
	Grass or bush	44(65%)
Time interval for checkup	Once a year	24(35%)
	Never	48(71%)
	Always	20(29%)
Hand washing after touching pet	Sometimes	8(12%)
	Never	12(18%)
Pet roaming	Inside the house only	48(70%)
	Within the compound only	28(41%)
Sleeping place of pets	In the living room	40(59%)
	Pet house	16(23%)
	In the living room and pet house	38(56%)
Bath interval of pets	Every two weeks	14(21%)
	Once a month	13(19%)
Products used for treatment	Never	36(53%)
	Soap and shampoo	19(28%)
	Neem and titepati	34(50%)
	None	15(22%)
		19(28%)

respectively. 59% of the pet owners revealed that their pets roamed within the compound only. According to the pet owners, the percentage of pets that sleep in the living room, pet houses and in both in living room and pet house were 23%, 56% and 21%, respectively. More than half (53%) of the pet owners gave bath to their pets once a month. 50% pet owner used shampoo and soap and 22% used neem and titepati treatment for ectoparasite control. The association was statistically significant with the product for treatment.

Discussion

Ectoparasites have a variety of direct and indirect effect on their host. Direct injury may be caused due to blood loss (anaemia and debilitation) by sucking blood, while indirect effects may be skin inflammation, pruritus and alopecia by mange mite, toxic and allergic responses by ticks. Ectoparasite either may act as a mechanical or biological vector [16].

High number of dogs and cats were infected with ectoparasites in present study which showed the

similar result in other study [17]. It is due to the presence of favourable climatic conditions important for survival, reproduction and development of various stages of ectoparasites of dogs and cats in the study area [18]. Dogs were found to be infested with more ectoparasite species than cat, as was also reported from China [17]. Cats have strong grooming behaviour which lowers number of ectoparasites [19]. Moreover, dogs have thicker, longer and denser fur that provides suitable environment with temperature and humidity, allowing the survival and development of different stages of ectoparasites [20]. Since, dogs are preferred hosts of *R. sanguineus*, its prevalence was higher than other ectoparasites, which matches with the findings of several studies [21].

Cats were infected with a smaller number of *Rhipicephalus sanguineus* which was supported by the other study [22,23]. *Rhipicephalus* spp. have short mouthparts, which allows cats to more successfully remove them during grooming [24]. The most common flea in dog was *Ctenocephalides felis* followed by the *C. canis*. which often coexist in the same geographical region and sometimes even on the same host individual [25].

Present study revealed that rabbits were infested with *C. felis* and *C. canis* which contrasts with another study [26] revealing *Spilopsyllus cuniculi* as ectoparasite causing infestation in rabbit. Due to the closeness with cat and dog in same environment rabbit may gain the infestation from *C. felis* and *C. canis*.

Hand washing after having direct contact with the pet was less practiced which contrast to the study carried in Ethiopia [27] where 78.8% of the pet owner washed their hand after direct contact with pet. Lesser number of respondents knew about parasites, while most knew about rabies only. In current study, all the respondents had information about pet-associated diseases, obtained either from friends or veterinarians or media. More than half of the respondents gave their pet a bath once a month where as 27% of the respondents gave their pet a bath every two weeks. Similar result was obtained in the study carried out in Nigeria [28]. Since procedures including pet housing, routinely visiting hospital, bathing, and treatment were reported to be carried out, the pet owner had medium to good awareness of pet animal care and its significance. When pets are allowed to roam freely and unrestrainedly, they run the risk of contaminating the environment. In the present study, most of the

pet owners kept their pets in a pet house which helps to reduce the burden of ectoparasites. This finding is an agreement with other studies carried out elsewhere [29,30].

In conclusion, this study provided the baseline information about the presence of ectoparasites in pet animals. It is concluded that pet animals in Nepal are infected with important zoonotic ectoparasites. Considering the level of awareness, pet owners should be educated on the zoonotic diseases and public health importance of the ectoparasites. Hence, adequate veterinary care should be given to control the ectoparasites. There is the need for public health intervention program in the communities, and further genetic research on biological agents carried by these ectoparasites.

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References

- [1] Rollin B.E., Rollin L. 2003. Response to "What is a pet?" *Anthrozoos* 16(2): 106–110. doi:10.2752/089279303786992242
- [2] Alderton D., Edwards A., Larkin P., Stockman M. 2011. The complete book of pets and petcare. 1st ed. Southwater, London.
- [3] Anderson P.K. 2003. A bird in the house: an anthropological perspective on companion parrots. *Society and Animals* 11(4): 393–418. doi:10.1163/156853003322796109
- [4] Irwin P.J. 2002. Companion animal parasitology: a clinical perspective. *International Journal for Parasitology* 32(5): 581–593. doi:10.1016/s0020-7519(01)00361-7
- [5] McNair C.M. 2015. Ectoparasites of medical and veterinary importance: drug resistance and the need for alternative control methods. *Journal of Pharmacy and Pharmacology* 67(3): 351–363. doi:10.1111/jphp.12368
- [6] Abdullah S., Helps C., Tasker S., Newbury H., Wall R. 2019. Pathogens in fleas collected from cats and dogs: Distribution and prevalence in the UK. *Parasites and Vectors* 12: article number 71. doi:10.1186/s13071-019-3326-x
- [7] Dantas-Torres F. 2008. The brown dog tick, *Rhipicephalus sanguineus* (Latreille, 1806) (Acari: Ixodidae): from taxonomy to control. *Veterinary*

- Parasitology* 152(3–4): 173–185.
doi:10.1016/j.vetpar.2007.12.030
- [8] Thamer N.K., Faraj K.B. 2019. A survey of ectoparasites infestation in stray dogs in Basrah Province/Iraq. *IOP Conference Series: Materials Science and Engineering* 571 (1): e012062. doi:10.1088/1757-899X/571/1/012062
- [9] Chee J.H., Kwon J.K., Cho H.S., Cho K.O., Lee Y.J., Abd El-Aty A.M., Shin S.S. 2008. A survey of ectoparasite infestations in stray dogs of Gwang-ju City, Republic of Korea. *Korean Journal of Parasitology* 46(1): 23–27. doi:10.3347/kjp.2008.46.1.23
- [10] Rust M.K., Dryden M.W. 1997. The biology, ecology, and management of the cat flea. *Annual Review of Entomology* 42: 451–473. doi:10.1146/annurev.ento.42.1.451
- [11] Salant H., Mumcuoglu K.Y., Baneth G. 2014. Ectoparasites in urban stray cats in Jerusalem, Israel: differences in infestation patterns of fleas, ticks and permanent ectoparasites. *Medical and Veterinary Entomology* 28(3): 314–318. doi:10.1111/mve.12032
- [12] Speight C. 2019. Endo- and ectoparasites in rabbits. *Veterinary Nurse* 10(2): 78–83. doi:10.12968/vetn.2019.10.2.78
- [13] Soulsby E.J.L. 1984. Helminths, arthropods and protozoa of domesticated animals. 7th ed. London: Baillière Tindall.
- [14] Bitam I., Dittmar K., Parola P., Whiting M.F., Raoult D. 2010. Fleas and flea-borne diseases. *International Journal of Infectious Diseases* 14(8): e667-76. doi:10.1016/j.ijid.2009.11.011
- [15] Bowman D.D. 2014. Georgis' parasitology for veterinarians. 10th ed. Saunders.
- [16] Wall R., Shearer D. 2008. Veterinary ectoparasites: biology, pathology and control. 2nd ed. Blackwell Science Ltd.
- [17] Kumsa B.E., Mekonnen S. 2011. Ixodid ticks, fleas and lice infesting dogs and cats in Hawassa, southern Ethiopia. *Onderstepoort Journal of Veterinary Research* 78(1): article number 326. doi:10.4102/ojvr.v78i1.326
- [18] Xhaxhiu D., Kusi I., Rapti D., Visser M., Knaus M., Lindner T., Rehbein S. 2009. Ectoparasites of dogs and cats in Albania. *Parasitology Research* 105: 1577–1587. doi:10.1007/s00436-009-1591-x
- [19] Eckstein R.A., Hart B.L. 2000. Grooming and control of fleas in cats. *Applied Animal Behaviour Science* 68(2): 141–150. doi:10.1016/S0168-1591(00)00095-2
- [20] Cañón-Franco W.A., Pérez-Bedoya J.L. 2010. Siphonaptera (Pulicidae) in dogs and cats of Colombia: clinical and epidemiological aspects. *Veterinary Parasitology* 173(3–4): 353–357. doi:10.1016/j.vetpar.2010.07.014
- [21] Szabó M.P., Cunha T.M., Pinter A., Vicentini F. 2001. Ticks (Acari: Ixodidae) associated with domestic dogs in Franca region, São Paulo, Brazil. *Experimental and Applied Acarology* 25(10–11): 909–916. doi:10.1023/A:1020433003028
- [22] Burroughs J.E., Thomasson J.A., Marsella R., Greiner E.C., Allan S.A. 2016. Ticks associated with domestic dogs and cats in Florida, USA. *Experimental and Applied Acarology* 69(1): 87–95. doi:10.1007/s10493-016-0019-4
- [23] Greay T.L., Oskam C.L., Gofton A.W., Rees R.L., Ryan U.M., Irwin P.J. 2016. A survey of ticks (Acari: Ixodidae) of companion animals in Australia. *Parasites and Vectors* 9: article number 207. doi:10.1186/s13071-016-1480-y
- [24] Thomas J.E., Staubus L., Goolsby J.L., Reichard M.V. 2016. Ectoparasites of free-roaming domestic cats in the central United States. *Veterinary Parasitology* 228: 17–22. doi:10.1016/j.vetpar.2016.07.034
- [25] Durden L.A., Judy T.N., Martin J.E., Spedding L.S. 2005. Fleas parasitizing domestic dogs in Georgia, USA: species composition and seasonal abundance. *Veterinary Parasitology* 130(1–2): 157–162. doi:10.1016/j.vetpar.2005.03.016
- [26] Pinter L. 1999. *Leporacarus gibbus* and *Spilopsyllus cuniculi* infestation in a pet rabbit. *Journal of Small Animal Practice* 40(5): 220–221. doi:10.1111/j.1748-5827.1999.tb03064.x
- [27] Kiflu B., Abdurahaman M., Alemayehu H., Tadesse Eguale T. 2016. Investigation on public knowledge, attitude and practices related to pet management and zoonotic canine diseases in Addis Ababa, Ethiopia. *Ethiopian Veterinary Journal* 20(1): 67–78. doi:10.4314/evj.v20i1.5
- [28] Abdulkareem B.O., Christy A.L., Samuel U.U. 2019. Prevalence of ectoparasite infestations in owned dogs in Kwara State, Nigeria. *Parasite Epidemiology and Control* 4: e00079. doi:10.1016/j.parepi.2018.e00079
- [29] Firew Tensay W. 2017. Household knowledge, attitudes and practices related to pet contact and associated zoonosis in Bishoftu, Ethiopia. *Global Veterinaria* 18(4): 277–285. doi:10.5829/idosi.gv.2017.277.285
- [30] Ojo G.A., Adekeye T.A., Awobode H.O. 2020. Prevalence of single and mixed parasitic infections of dogs in Egbeda communities, Ibadan, Oyo State, Nigeria. *Sokoto Journal of Veterinary Sciences* 17(4): 25–34. doi:10.4314/sokjvs.v17i4.4

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