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Copyright AJCEM 2020: <https://dx.doi.org/10.4314/ajcem.v21i1.10>**Short Communication****Open Access****Ectoparasitic infestations of cats and dogs in Izzi Local Government Area of Ebonyi State, Nigeria: brief communication for 'One Health' approach to control of potential zoonoses**

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*Correspondence to: michaelokpara147@gmail.com**Abstract:****Background:** Cats and dogs are important companion animals that paradoxically pose risks of zoonotic infections to their owners. This study determined the ectoparasitic infestations of cats and dogs in a semi-rural setting of Ebonyi State, so as to establish the prevalence of the ectoparasites among the companion animals for creation of public health awareness relevant to prevention of zoonoses in the area.**Methods:** One hundred dogs and 21 cats from Izzi Local Government Area of Ebonyi State, were examined for ectoparasitic infestations, using standard parasitological techniques. Systematic random sampling technique was employed in the study. Parasites were identified with standard identification guides. Data were analysed using aspects of Bush infection statistics and Chi-square. Statistical significance was established at $p < 0.05$.**Results:** Out of the 100 dogs examined, 80 (80%), 8 (8%), 6 (6%), 2 (2%) and 4 (4%) were infested with *Rhipicephalus sanguineus*, *Haemaphysalis longicornis*, *Ctenocephalides canis*, *Ctenocephalides felis* and *Sarcoptes scabiei* respectively. A significant association was observed between *R. sanguineus* and the dogs ($X^2=100.00$; $p=0.000$). Six (28.6%) of the 21 cats examined were infested with *C. felis*, with significant statistical association ($X^2=21.000$; $p=0.000$) and 2 (9.5%) were infested with *Otodectes cynotis* but no significant association ($X^2=5.526$; $p=0.063$).**Conclusion:** Based on the observed prevalence of ectoparasites among the animals, collaborative efforts of the medical and veterinary personnel are solicited in the spirit of 'one health' in order to protect the health of the pets and those of their owners.**Keywords:** Ectoparasitism, Cats, Dogs, Ebonyi State, Zoonoses

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Copyright 2020 AJCEM Open Access. This article is licensed and distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution and reproduction in any medium, provided credit is given to the original author(s) and the source.**Infestations ectoparasites de chats et de chiens dans la zone de gouvernement local d'Izzi, dans l'État d'Ebonyi, au Nigéria: communication succincte concernant l'approche «One Health» de la lutte contre les zoonoses potentielles**

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*Correspondance à: michaelokpara147@gmail.com**Abstrait:****Contexte:** Les chats et les chiens sont des animaux de compagnie importants qui, paradoxalement, présentent des risques d'infections zoonotiques pour leurs propriétaires. Cette étude a déterminé les infestations ectoparasites de chats et de chiens dans un cadre semi-rural de l'État d'Ebonyi, de manière à établir la prévalence des ectoparasites parmi les animaux de compagnie afin de sensibiliser la santé publique à la prévention des zoonoses dans la région.

Méthodes: Des infestations d'ectoparasites ont été examinées chez 100 chiens et 21 chats de la région du gouvernement local d'Izzi, dans l'État d'Ebonyi, à l'aide de techniques parasitologiques classiques. La technique d'échantillonnage aléatoire systématique a été utilisée dans l'étude. Les parasites ont été identifiés avec des guides d'identification standard. Les données ont été analysées à l'aide d'aspects des statistiques d'infection de Bush et du chi carré. La signification statistique a été établie à $p < 0,05$.

Résultats: Sur les 100 chiens examinés, 80 (80%), 8 (8%), 6 (6%), 2 (2%) et 4 (4%) étaient infestés par *Rhipicephalus sanguineus*, *Haemaphysalis longicornis*, *Ctenocephalides canis*, *Ctenocephalides felis* et *Sarcoptes scabiei* respectivement. Une association significative a été observée entre *R. sanguineus* et les chiens ($X^2=100,00$; $p=0,000$). Six (28,6%) des 21 chats examinés étaient infestés par *C. felis*, avec une association statistique significative ($X^2=21,000$; $p=0,000$) et 2 (9,5%) étaient infestés par *Otodectes cynotis* mais aucune association significative ($X^2=5,526$; $p=0,063$).

Conclusion: sur la base de la prévalence observée d'ectoparasites chez les animaux, des efforts de collaboration du personnel médical et vétérinaire sont sollicités dans l'esprit de «one health» afin de protéger la santé des animaux et de leurs propriétaires.

Mots clés: Ectoparasitisme, Chats, Chiens, Etat d'Ebonyi, Zoonoses

Introduction:

Cats and dogs are globally recognized as beneficial companion animals. Pet animals play tremendous social, emotional and psychological roles for their owners (1). In addition to being used as pets, they have been employed for hunting, security, sport and for the purpose of breeding (2,3). Cats are also involved in warding off rodents in households.

Zoonosis is a disease of animals that is transmissible to humans from its primary animal hosts (4). They can be transmitted directly through contact with infected animals, indirectly through contaminated animal environments, or by vertebrate-borne routes (arthropods such as the acarines, fleas, and other insects) (5). Despite the important roles played by companion animals in households, it is paradoxical that they are incriminated in the transmission of many zoonotic infections that are of significant public health importance (5). Certain groups of people including pregnant women, children, aged and immunocompromised individuals are at great risks of zoonotic infections.

Research findings have implicated wild life as an important zoonotic pool of novel pathogens from which the companion animals derive, elaborate and intensify the disease causing organism at homes (6). Globalizations, urbanization, climate change, population explosion among other factors, are reported to be responsible for the sustenance of emerging and re-emerging zoonotic infections and diseases (7). Desertification, deforestation and landscape alterations observed in Libya (8) and in some parts of Africa and the rest of the world have led to the liberation and migration of wild animals from their natural habitats to both human and domestic animal dwellings thereby making many known small wild animals to become synanthropic species.

Increase in pet ownership and expansion of pet definition by including new and exotic animals have been reported as factors making pet zoonoses emerging public health issues (7).

Ectoparasites are a wide range of parasitic arthropods that consist of ticks, mites, fleas, chewing and sucking lice (9). Zoonotic ectoparasitic infestations are common with varying signs and symptoms that depend on the causative agents and hosts involved (10). The role of ectoparasites in disease transmission is of great public health importance and cannot be over-emphasized (11). The fleas and ticks can infest humans causing dermatitis and tick-borne paralysis respectively (12, 13). Physical discomfort, irritation, itching, inflammation, self trauma, release of neurotoxins (may result in tick paralysis), systemic illness, and hypersensitivity reactions are some of the consequences of tick bite (14).

Tick and other parasitic infestations have been reported to be more prevalent among stray dogs than the pet ones (15). However, direct or indirect exposure by mingling of the pet dogs with the stray ones, aid frequent transmission of different parasitic infestations among the two classes of dogs (15). Other ectoparasitic infestations common among companion animals include canine demodicosis caused by *Demodex canis*, *Sarcoptes mange* caused by infestation with *Sarcoptes scabiei* var *canis*, and otocariosis cause by *Otodectes cynotis* (16). Mosallanejad *et al.*, (16) also reported other studies as having documented *Ctenocephalides felis*, *Ctenocephalides canis* and *Pulex irritans* as the three most common flea species that infest dogs.

The expanded definition of pet animals, the global snowball increase in acquisition of companion animals and their public health zoonotic impacts have informed this brief communication on zoonotic ectoparasitic

infestations on cats and dogs in Izzi LGA, a semi-rural setting of Ebonyi State, Nigeria.

Materials and method:

Study area

This study was conducted in Izzi Local Government Area of Ebonyi State, Nigeria. Ebonyi State lies within longitude $7^{\circ}30^1$ and $8^{\circ}30^1$ E and latitude $5^{\circ}40^1$ and $6^{\circ}45^1$ N in southeastern region of Nigeria (19,20). Farming and hunting form part of the economic livelihood of the inhabitants of the study area.

Sampling technique

Forty one (10%) out of the total 412 houses in Izzi LGA of Ebonyi State, were selected by systematic random sampling technique. The houses were first serially numbered with tags (1 to 412), and the interval of sampling of the houses for survey was based on the formula; sample interval (n^{th}) = total population divided by the sample size ($412/41=10$). The first 10 tags were removed from the houses and shuffled in a bowl, and one number (tag 8) was selected by simple random sampling. House to house survey therefore started with house number 8, and then every other 10^{th} house until the 41^{st} house (house number 408) was surveyed.

In the 41 households surveyed, 34 households had dogs (19 had 3 each, 11 had 2 each, 3 had 5 each and 1 had 6 dogs) and 16 households had cats (10 had 1 each, 5 had 2 cats each and 1 household had 1 cat). In all, a total of 21 cats and 100 dogs were selected.

Examination and specimen collection:

House to house screening and examination of cats and dogs was carried out among the selected households. A total of 21 cats and 100 dogs were examined for ectoparasites. Parasite specimen collection and preservation followed the methods described by ESCCAP (9) and Bhati et al., (21). The entire body surface of each animal was thoroughly examined for ectoparasites. The body surfaces of the animals were carefully combed with fine combs and brushes. Any present parasite was collected on a clean white cloth that was spread on the ground. A sterilized forcep was used to carefully remove the entire tick, including the mouthparts from the body of the animals. The recovered parasites were preserved in 70% alcohol.

Skin scrapings were made with the use of sterilized blunt knives. The scrapings were collected in Petri dishes with the edges smeared in vaseline gel. All the specimens

were transported to the Teaching and Research Laboratory of the Department of Medical Laboratory Science, Ebonyi State University, Abakaliki, Nigeria, for onward analysis.

Laboratory analysis

In the laboratory, hand lenses were used to examine the dorsal and ventral anatomy of the animals. Morphological features of the ectoparasites were used for proper identification. Further examination and clarification was carried out using the Olympus CX23 microscope (India) at magnification of 400x (10x primary and 40x secondary).

The scrapings from the skin were put in 10% KOH to dissolve debris and hair particles. Afterwards, the preparation was centrifuged 4 times and dehydrated in ascending grades (70%, 90% and 100%) of alcohol followed by clearing in xylene. DPX was applied to a portion of the sediment and examined under the microscope. Recovered parasites from the animals were identified using pictorials and guidelines (21, 22, 23, 24).

Statistical analysis

Data collected were analysed using mean intensity and mean abundance of infection statistics according to Bush *et al.*, (25) which states that mean intensity = number of parasites species in all infested hosts divided by the number of hosts infested by parasites, and mean abundance = number of a parasite species in all infested hosts divided by the number of hosts examined (infested and non-infested). The Chi square test was used to determine associations, and statistical significant values were established at $p < 0.05$.

Results:

Of the 100 dogs examined in this study, 80 (80%), 8 (8%), 6 (6%), 2 (2%) and 4 (4%) were infested by *R. sanguineus*, *H. longicornis*, *C. canis*, *C. felis* and *S. scabiei* respectively. A significant association was observed between *R. sanguineus* and the number of dogs infested ($X^2_4 = 100.00$; $p = 0.000$). However, no significant association was observed between other ectoparasitic infestations and the number of infested dogs ($p > 0.05$) (Table 1).

Table 2 depicts species-specific distribution of ectoparasites among the cats in the study area. Out of the 21 cats examined, 6 (28.6%) were infested with *C. felis* indicating a significant association between the infestation

Table 1: Species –specific distribution of ectoparasites among dogs in Izzi LGA of Ebonyi State

Parasites Species	Number Examined	Number Infested (%)	Number of Parasites	Mean Intensity	Mean Abundance	X ² value	p value
<i>Rhipiaphalus sarguineus</i>	100	80 (80)	148	1.85	1.48	100.000	.000
<i>Haemaphysalis longicornis</i>	100	8 (8)	16	2.00	0.16	2.174	0.704
<i>Ctenocephalides canis</i>	100	6 (6)	10	1.67	0.10	1.596	0.810
<i>Ctenocephalides felis</i>	100	2 (2)	2	1.00	0.02	0.550	0.973
<i>Sarcoptes scabiei</i>	100	4 (4)	5	1.25	0.05	1.042	0.903

Table 2: Species-specific distribution of ectoparasites among cats in Izzi LGA of Ebonyi State

Parasites Species	Number Examined	Number Infested (%)	Number of Parasites	Mean Intensity	Mean Abundance	X ² value	p value
<i>Ctenocephalides felis</i>	21	6 (28.6)	14	2.33	0.67	21.000	0.000
<i>Otodectes cynotis</i>	21	2 (9.5)	3	1.50	0.14	5.526	0.63

and the cat hosts ($X^2_2=21.00$; $p=0.000$). On the other hand 2 (9.5%) of the cats were infested with *O. cynotis* with no significant association between ectoparasitic infestations and the animals ($X^2_2=5.526$; $p=0.063$). No evidence of ectoparasitism was observed in 13 of the 21 (61.9%) cats

Discussion:

The study investigated the ectoparasitic infestations in cats and dogs in Izzi LGA of Ebonyi State, Nigeria in order to add more information on such studies for one health approach in controlling potential zoonoses that could arise from such infestations. The high prevalence of ectoparasites (especially due to *R. sanguineus*) observed in the dogs is a reflection of the level of the local environmental contamination and poor status of veterinary awareness and practices that prevail in the study area. The ectoparasites were more intense, abundant and diverse among the dogs in comparison with the cats. However, this observation might be attributed to the number of owned cats examined in the study area. The use of dogs for hunting that exposes them more to the wildlife might have accounted for this.

However, this may be attributed to the small sample size ($n = 21$) of the examined cats. In the study area, people utilize more of dogs than cats as companion animals because of their multipurpose usage.

C. felis was the least prevalent (2%) and least abundant (0.02) ectoparasite among the dogs. This report is in agreement with the findings of Elom *et al.*, (26) in their study in Ikwo and Ezza localities of Ebonyi State, Nigeria. However, the finding disagrees with Durden *et al.*, (27) and Tavassoli *et al.*, (28), who reported *C. felis* as the most abundant ectoparasites in their studies in the USA and Iran respectively. The disparity in abundance of *C. felis* could be attributed to environmental factors prevalent in the geographical areas as some of the studies were conducted in tropical areas where as others were carried out in temperate zones. In addition, survival of ectoparasites is dependent on availability of hosts. That *C. felis* was most prevalent in studies carried out in the USA and Iran could be attributed to more dense population of dogs as opposed to sparse population of dogs in the study area (Nigeria). This could be because more dogs are being utilized as companion animal in the USA and Iran than in Nigeria.

The nature of ectoparasitism observed

in this study is similar to that of Omonijo and Sowemimo (11) in their study in Ekiti State, Nigeria. However, the report of the present study differs from Omonijo and Sowemimo (11) by observing *Ctenocephalides* species infestation to be statistically high in cats only and not in both cats and dogs as reported in the previous study. The 28.6% infestation of cats with *C. felis* is similar with the documented report of 28.3% dog infestation with fleas in Jos, Plateau area of Nigeria (29).

Eighty percent of the dogs in this study were infested with *R. sanguineus*, which was the most prevalent ectoparasite; while the remaining 20% were infested with different species of ticks, fleas, and mites. This observation is similar to that of Abdulkareem *et al.*, (30), who reported greater than 80% overall ectoparasitic infestations of dogs in their study in Kwara State, Nigeria. However, the present study is not in conformity with Abdulkareem *et al.*, (30) by not observing multiple infestations on the animals. The rate for *R. sanguineus* infestation in this study is also similar to the previous report of 88.6% reported in Ethiopia (31) but lower than 98.5% reported in Southwestern Nigeria (32). The scabies mite has been reported to be highly communicable among dogs and may infest humans, but cats are known to be relatively resistant (5). The recognized resistance by cats might have been responsible for the absence of this infestation among the cats in the present study.

Although no co-infestation was observed in this study, it has been reported that companion animals and humans can be sequentially or simultaneously infected with more than one tick species and that a single tick has the potential to transmit more than one pathogen, leading to co-infestations in the infested hosts (5). The parasites reported in this study have been previously documented globally, with inter-regional differences in prevalence and density of infestation (33). It has also been reported that such differences could be strongly determined by changes in climate, host availability and vegetation which influence the microclimate (34).

Conclusion:

The high prevalence, intensity and abundance of some ectoparasites with zoonotic potentials were observed among cats and dogs from the study area. It is therefore pertinent that collaborative efforts of medical and veterinary practitioners, and public health officers, are established for 'one health'

approach in prevention and control of potential zoonoses.

Authors' contribution:

MOE was involved in conception, writing and reviewing of manuscript; NNO was involved in collection and analysis of data; AN was involved in editing and reviewing of manuscript; and VU was involved in literature search and writing of manuscript. All authors agreed to the final manuscript draft submitted.

Conflict of interest:

No conflict of interest is declared

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