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Tick infestations presented to veterinary clinics in lafia, Nasarawa State, Nigeria

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Abstract
Ectoparasites are parasites that live externally on their host. Their association with companion animals is known to cause damaging effects such as life-threatening anemia, pruritic and non-pruritic skin disorders to their hosts. The abundance and distribution of ticks and tick-borne diseases have been extensively reported. Herein, we examined tick infestation in dogs around Lafia L.G.A. Nasarawa state. Forceps were used to grip the tick firmly over its sputum and mouthparts as closely to the host skin as possible, and then pull strongly and directly out from the skin. Lice and fleas were collected by brushing through the bases of the hairs with grooming brushes and examine microscopically using a light microscope, identifications were made through Laboratory Identification of Arthropod Ectoparasites by Blaine A. Mathison and Bobbi S. Pritt (2014) [18]. A total of 17 dogs breeds and Sex were examined in four veterinary hospitals within Lafia metropolis between May and August 2019 using purposive sampling 14(82.4%) were infested with ticks. Among the four different veterinary clinics that were sampled, clinic A recorded the highest infestation rate (35.7%), followed by clinic C (28.6%) and clinic B (21.4%). Clinic D had the lowest infestation rate with a percentage 14.3%, therefore the result shows that, this was statistically significant across the clinic sampled (X^2=10.196, DF=3, p-value=0.01697**).** Male dogs were more infested than the Females with percentage prevalence of 54.3%. The prevalence of tick infestation in this study was 82.4% with the head region being the most predilection site of attachment of ticks. *Rhipicephalus sanguineus was* the most common tick infesting dogs. Dogs domiciled in Lafia were observed to be at risk of tick infestation. Continuous prophylactic and biosecurity measures could be strategically used in preventing tick infestation in this tropical region.

Keywords: Arthropod, ectoparasites, prophylactic, infestation, *Rhipicephalus sanguineus*

1. Introduction
The domestic dog (*Canis lupus familiaris or Canis familiaris*), is a member of genus Canis (canines) that forms part of the wolf-like canids [1]. Dog is the most widely abundant carnivore [2, 3], selectively bred over other animal due to its various capabilities such as behavioural, sensory and physical attributes [4, 5]. It is estimated that three-quarters of the world's dog population live as village or community dogs and only a few kept as pets [6]. In tropical and subtropical regions of the world, vector-borne diseases commonly occur in various species of animals [7, 8]. Globally, dogs have been documented to be infected by different haemoparasites such as bacteria, viruses and eukaryotic parasites, which are transmitted through different arthropod vectors such as ticks and mosquitoes causing huge morbidity and mortality [9] Furthermore, the geographical expansion of tick vectors, influenced by the climatic changes and movement of humans together with their pets increase the vulnerability of dogs to infections [9, 10]. These groups of diseases cause huge economic losses to both live- stock and pet animal owners due from mortality, hospital bills and loss in productivity. For many areas in the tropics, the challenge for understanding infestation patterns of dogs and other domestic animals with parasites is therefore twofold: Basic inventories of which species of ectoparasites infest dogs, and how ectoparasite diversity may differ across (bio geographical) regions, still need to be completed and, further, predicting possible gradients in parasites and disease risk under changing environmental conditions needs fundamental quantitative work. This study is aimed at providing a current data for ectoparasitic infestation in dogs living in Lafia Local Government Area, Nassarawa state, Nigeria.

2. Materials and Methods

2.1 Study Area

This study was carried out in Lafia Local Government Area of Nasarawa State. Nasarawa state is located in the middle belt region of Nigeria. It lies between Latitude 80 34 13, 8544 N and Longitude 80 18 31, 8388 E the state shares boundary with Benue state and Kogi state at the South. It shares the North boundary with Kaduna state. The West boundary it shares with the Federal Capital Territory Abuja and the East boundary it shares with Taraba state and Plateau state. The ectoparasites samples was collected from various veterinary clinics within Lafia. The major occupation of the people in this area is farming.

2.2 Duration of Study

This study was carried out within the period of four months from May to August, 2019.

2.3 Sample Collection and Examination

Samples were collected from 5 veterinary clinics, information on the age and gender is to be obtained from clinical records. A total of 100 dogs were examined for ectoparasites. The dogs were properly restrained and thoroughly examined for tick, fleas and lice. To remove ticks from host skin whilst retaining their good condition for identification use good quality steel forceps. These should be of medium size with blunt points and serrated inner surfaces. The forceps is used to grip the tick firmly over its scutum and mouthparts as closely to the host skin as possible, and then pull strongly and directly out from the skin. Lice and fleas were collected by brushing through the bases of the hairs with grooming brushes. Ectoparasites will be collected from different body regions and after collection they were transferred into labelled plastic containers with stoppers and brought to the Zoology laboratory of Federal University Lafia. Samples were mounted on a light microscope and properly examined. Identification of ectoparasites will be done using Laboratory Identification of Arthropod Ectoparasites by Blaine A. Mathison and Bobbi S. Pritt (2014) [18].

2.4 Statistical Analysis

The statistical analysis was done using the chi square test method.

3. Results

3.1 Tick infestation in relation to study site

A total of four veterinary clinics were sampled and 17 dogs were examined for ticks. Out of the 17 dogs that were examined, 14(82.4%) was infested with ticks. The findings also showed that out of the four different veterinary clinics that were sampled, clinic A recorded the highest infestation rate (35.7%), followed by clinic C (28.6%) and clinic B (21.4%). Clinic D had the lowest infestation rate with a percentage 14.3%, therefore the result shows that, this was statistically significant across the clinic sampled (X^2=10.196, DF=3, p-value=0.01697) as seen in Table 1 below.

Table 1: Checklist of tick infestation on different breed of dogs

Breed	No. of breeds sampled	No. of ticks sampled	Species of ticks (%)			
			Dermacentor spp.	*Rhipicephalus sanguineus*	*Rhipicephalus Appendiculatus*	*Amblyoma variegatum*
German shepherd	2	10	6 (60%)	4 (40%)	0 (0%)	0 (0%0
Bull mastiff	2	13	3 (23.1%)	10 (76.9%)	0 (0%)	0 (0%)
Mongrel	1	5	0 (0%)	1 (20%)	4 (80%)	0 (0%)
Cane corso	3	10	3 (30%)	5 (50%)	0 (0%)	2 (20%)
Rotweiller	1	8	0 (0%)	0 (0%)	0 (0%)	8 (100%)
Pit bull	3	21	3 (14.3%)	9 (42.9%)	5 (23.8%)	4 (19%)
Caucasian	5	12	0 (0%)	7 (58.3%)	5 (41.7%)	0 (0%)
	1	79	15 (19%)	36 (45.6%)	14 (17.7%)	14 (17.7)

3.2 Tick infestation in relation to breed of dogs

Seven different breeds of dogs were examined which include German Shepherd, Bull Mastiff, Mongrel, Cane Corso, Rottweiler, Pit Bull and Caucasian. Pit Bull recorded the highest rate of infestation 26.6%, followed by Bull Mastiff and Caucasian with the percentage of 16.5% and 15.2% respectively. German shepherd and Cane Corso had the same percentage of infestation 12.7%, followed by Rottweiler with a percentage of 10.1% and Mongrel which had the lowest percentage of infestation 6.3%. The infestation rate between the different tick species was, however statistically significant. Four different tick species, which includes *Dermacentor spp, Rhipicephalus sanguineus, Rhipicephalus appendiculatus, Amblyoma variegatum* (Plate 1, 2, 3 and 4) were collected from 14 dogs. *Rhipicephalus sanguineus* had the highest percentage of prevalence 45.6%, followed by *Dermacentor spp* which had 19%. *Rhipicephalus appendiculatus and Amblyoma variegatum* had the lowest percentage of prevalence 17.7%. (X^2=17.042, DF=6, P-value=0.00913) as shown in Table 2 below.

Table 2: Tick infestation in relation to predilection sites

Predilection sites	No. of ticks examined	Species of ticks identified (%)			
		Dermacentor spp.	*Rhipicephalus sanguineus*	*Rhipicephalus appendiculatus*	*Amblyoma variegatum*
Head	7	3 (42.9%)	2 (28.6%)	1 (14.3%)	1 (14.3%)
Neck	12	0 (0%)	5 (41.7%)	4 (33.3%)	3 (25%)
Back	8	2 (25%)	5 (62.5%)	1 (12.5%)	0 (0%)
Ears	13	4 (30.8%)	6 (46.2%)	0 (0%)	3 (13.1%)
Abdomen	10	2 (20%)	7 (70%)	0 (0%)	1 (10%)
Hind limbs	7	0 (0%)	5 (71.4%)	0 (0%)	2 (28.6%)
Fore limbs	11	0 (0%)	3 (27.3%)	6 (54.5%)	2 (18.2%)
Tail	11	4 (36.4%)	3 (27.3%)	2 (18.2%)	2 (18.2%)
	79	15 (19%)	36 (45.6%)	14 (17.7%)	14(17.7%)

3.3 Tick infestation in relation to gender

Out of the total number of dogs examined, 11 were males while 6 were females. Infestation rate was higher in male dogs with percentage infestation rate of 54.3% in 9 dogs while the female had 35.7% infestation rate in 5 dogs as shown in Table 3 below. However, there is a statistical significance in the prevalence of tick in relation to the Gender. (X7 = 3.844, DF = 1, P-value = 0.04992).

Table 3: Tick infestation in relation to sex

	Number of dogs sampled	Number of infested dogs (%)
Male	11	9 (81.8%)
Female	6	5 (83.3%)
	17	14 (82.4%)

3.4 Tick Infestation in Relation to Predilection Sites

Ticks were picked from 8 predilection sites which include Head, Neck, Back, Ears, Abdomen, Hind limbs, Forelimbs, and Tail. The Ear region recorded the highest rate of infestation (16.5%) followed by the Neck (15.2%). The Forelimbs and Tail had percentage of infestation (13.9%), Abdomen (12.7%) and Back (10.1%). The Head and Hind limbs regions recorded the lowest infestation rate (8.9%). However, there is no statistical difference in the infestation in relation to predilection sites. (X2 = 4.7431, DF = 7, p-value = 0.6913).

Table 4: Tick infestation in relation to veterinary clinics sampled

Veterinary clinics	No. of dogs examined	No. of dogs infested (%)
Vet world M/Quarters	5	5 (100%)
GVC Doma Road	6	3 (50%)
Your pet, Your health Bukan sidi	4	4 (100%)
Shabu veterinary clinic Shabu	2	2 (100%)
	17	14 (82.4%)

4. Discussion

The study showed a high rate of tick infestation of 82.4% in the study site sampled. This finding agrees with Adetayo, *et al*. [1] who recorded high percentage prevalence 56.2%. It also agrees with Kachala [12] who recorded a prevalence of 58.1% in both exotic and local dogs and Jehan, *et al*. [13] who recorded a prevalence of tick infestation 61% in dogs. This finding is in contrast with Dantas-Torres [14] who recorded a low percentage prevalence of ticks 33.6%. Clinic A has the highest infestation rate while Clinic D holds the lowest infestation rate, therefore it shows a statistically significant in relation to the sampled site, which means that prevalence rate is site specific. This is in contrast with Adetayo, *et al.* [11]. Who record no significant difference in tick infestation in relation to geographical location? Results of the prevalence of ticks in relation to breeds showed that Pit bull recorded the highest rate of infestation 26.6%. This finding agrees with Abunna *et al*. [15] who recorded high percentage prevalence 31.0% but, it disagrees with the findings Dantas-Torres [14] who recorded low percentage prevalence 17.4%.

Mongrel had the lowest percentage of infestation this also degrees with Adetayo *et al.* [11]. Who recorded 20.8% significance, this means that infestation is breed specific. High prevalence observed can be associated to poor hygiene or management of the dogs. *Rhipicephalus sanguineus* had the highest percentage prevalence 45.3% among the species found. This agrees with Elelu *et al.* [16] who recorded a percentage prevalence of 61.82% for *Rhipicephalus sanguineus.* However, it disagrees with the findings of Gumel *et al.* [17] who recorded 43.3% occurrence and *Amblyoma variegatum* had the lowest percentage prevalence. The infestation rate between the different tick species, however, was statistically significant.

Tick infestation in relation to predilection sites, showed a high prevalence 16.5% in the ear regions of the dogs. This finding agrees with the findings of Adetayo, *et al.* [11] who recorded (71.2%), prevalence on the head region especially inside ear. However, there is no statistical difference in the infestation in relation to predilection sites. This means that they have preference to all predilection sites. The ticks showed less preference in both the head and hind limbs. The presence of ticks in these sites could be probably due to their exposure to the questing ticks as the dog roam about also due to the concentration of blood accessing tissues jugular veins) in the ear region.

Prevalence of infestation in relation to gender indicates that the male breeds are more infested than female breeds with a percentage prevalence of 54.3%. This finding agrees with Shitta, *et al.* [18] who recorded high percentage prevalence 61.1%. However, it disagrees with the findings of Adetayo *et al.* [11] who recorded percentage prevalence on female dogs. However, there is a statistical significance in the prevalence of tick in relation to the gender. It therefore, means the ticks are gender specific. Hormonal factors might be playing some role which predisposes male dogs more to tick infestations in this area.

5. Conclusion

The present work was conducted in order to determine the prevalence and the intensity of infestation of ticks on dogs in Lafia Local Government of Nasarawa state. The examined dogs were found to be infested with four species of ticks, and the most abundant infesting species were *Rhipicephalus sanguineus*. The prevention for these ticks has to be based on hygienic conditions and eradication of ticks in the host environment and prevention of re-infestation in the environment.

6. Recommendation

The finding from this study forms a baseline study on tick infestation of dogs and is of public health importance in the transmission of tick-borne infection to humans, Therefore, I recommend that

1. Dog owners should pay more attention to the management of their dogs and also make sure that the environment is always neat.
2. The government should create/give awareness to people or dog owners on the dangers of ticks to the dogs and even the owners.
3. Further work should be done to determine which viruses these tick vectors may be harboring and there is also a need to institute a proper mechanism for both disease and vector control.

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