

Ticks Infestation on Mongrels (Local Dogs) in Wamba Local Government Area of Nasarawa State, Nigeria



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Abstract

Ticks infestation ultimately results in the transmission of pathogenic infections which are major obstacles to animal health and production in the tropics. Therefore, this research assessed ticks infestation in mongrels (local dogs) in Wamba Local Government Area of Nasarawa State, Nigeria from April to July 2021. Two hundred and fifty-two (252) dogs which included 51 puppies, 26 juveniles and 175 adults were randomly examined for the presence of ticks. Among the 252 dogs checked, 199 (79.0%) were infested with ticks, with ticks infesting over 70% of each age category of dog, and the observed trend was that adult dogs were the most parasitized 81.1% (142/175), followed by puppies 74.5% (38/51), and juveniles 73.1% (19/26). The abundance of tick infestation in relation to age groups, on the other hand, showed no significant difference ($\chi^2 = 0.47888$, $df = 2$, $P = 0.7871$). A total of 648 ticks were collected from the infested dogs which are represent by two tick species, *Rhipicephalus sanguineus* 576 (88.9%) and *Rhipicephalus (Boophilus) decoloratus* 72 (11.1%). There was a high significant difference ($p < 0.001$) in abundance between the two tick species infesting dogs. Also, ticks infestation in relation to predilection sites varied significantly ($P < 0.001$). A high significant difference ($p < 0.001$) was observed in the distribution of ticks between the locations the dogs were resident. This study hereby recommends that dog owners should maintain good hygiene conditions and weekly inspect their dogs for tick infestation.

Keyword: Ticks; Infestation; Mongrels; Predilection sites; Wamba

Introduction

Ticks are worldwide in distribution [1]. They thrive well in warm climates with high humidity which enables them to metamorphose [2]. The family Ixodidae (hard tick) and Argasidae (soft tick) are found in the tropical and sub-tropical regions of the world while the Nuttalliellidae is common only to East and Southern Africa [3].

Ticks find their host through the host animal breath, body odor or by sensing body heat, moisture and vibrations. Ticks assume a position known as "questing" in order to get to a susceptible host, the questing height correlates with the susceptible or desired host. Nymphs quest close to the ground where they may encounter small mammals or bird hosts. But to encounter larger hosts, the adults climb into vegetation higher up to the tips of the leaves. Some ticks however lurk near the resting place of the host and on receiving a stimulus (odour or heat) they simply crawl or run across the distance towards the host [4].

Typical ticks of domestic animals include Ixodid ticks e.g., *Ixodes* species, *Amblyomma* sp. and *Rhipicephalus* sp. [5]. The

argasid tick includes *Ornithodoros* species. The *R. sanguineus* is the only *Rhipicephalus* species that feeds on dogs. The global economic loss due to tick infestation is estimated to be in billions of dollars [6]. To this end, this study surveyed ticks infestation on mongrels (local dogs) in Wamba Local Government Area (LGA) of Nasarawa State, Nigeria.

Materials and Methods

Study Area

The study was conducted in Wamba LGA of Nasarawa State, Nigeria with latitude 8°56'35.55"N and longitude 8°36'8.37"E. Wamba LGA is located in Nasarawa State, in Nigeria's North-Central geopolitical zone. The LGA's headquarter is at Wamba, and the LGA is made up of cities and villages such as Wamba, Mama, Ukolo, Sisinbaki, kado, Wuji, Nakere, Konwah, and Ragga. Wamba LGA has an estimated population of 203,561 residents. Wamba LGA occupies a total area of 1,156 square kilometres and has an average temperature of 31°C. The LGA lies close to the popular Farin Ruwa falls with the area also hosting several hills [7].

Sample Collection

Houses were selected randomly and screened for availability of ticks on dogs in the homesteads visited from April to July 2021. Two hundred and fifty (252) mongrels (local dogs) of all ages were examined for tick infestation. Ticks were collected from any available dog based on the dog owner's consent using forceps [8]. Dogs were examined for all stages of ticks (larva, nymph, adult). The predilection sites (head, neck, inguinal region, ear, interdigital region, thoracic region, thigh, tail, scrotal region (males), perineum and breast regions (female) were examined carefully for tick infestation. Ticks were collected and kept in aerated containers. All ticks collected from a particular site of the body were put separately in clean specimen bottles and labeled against the site of collection [9] and thereafter transported for sorting and morphological identification in the Department of Zoology Laboratory of the Federal University of Lafia, Nasarawa State, Nigeria.

Morphological Identification

Ticks collected from sampled dogs were examined under a dissecting microscope and identified using taxonomic keys as described by Soulsby [10], Fleck and Mody [11] and Adejoh et al. [4]. The identified ticks were well preserved for further processing.

Statistical Analysis

Data obtained was analyzed using R Console software version 4.4.1. Pearson's Chi-square test was used in comparison of ticks infestation on dogs in relation to age groups, tick species, predilection sites as well as the locations the dogs were resident in, respectively. The level of significance was set at $P < 0.05$.

Results

Ticks infestation in mongrel dogs

Table 1: Population of dogs infested by ticks and ticks abundance across age groups.

Age (Months)	No. examined	No. infested (%)	No. of ticks collected (%)
Puppy (0 - 6)	51	38 (74.5)	89 (13.7)
Juvenile (7 - 12)	26	19 (73.1)	86 (13.3)
Adult (> 12)	175	142 (81.1)	473 (73.0)
Total	252	199 (79.0)	648

Ticks infested 199 (79.0%) of the 252 dogs checked, with over 70% population of each age category of dogs infested, and the observed pattern was that adult dogs (>12 months) were the most parasitized 81.1% (142/175) vulnerable to 473 ticks, followed by puppies (7 - 12 months) 74.5% (38/51) infested by 89 ticks, and juveniles (≤ 6 months) 73.1% (19/26) fed by 86 ticks as shown in Table 1. However, there was no significant variation in tick infestation between age groups ($\chi^2 = 0.47888$, $df = 2$, $P = 0.7871$).

Table 2 shows that a total of 648 ticks were collected which cuts across two tick species *Rhipicephalus sanguineus* 576 (88.9%) and *Rhipicephalus (Boophilus) decoloratus* 72 (11.1%). The difference in abundance between the two tick species recorded varied significantly ($\chi^2 = 392$, $df = 1$, $P < 0.001$).

Abundance of tick species in relation to predilection sites.

Table 2: Checklist of tick species infesting dogs in Wamba LGA, Nasarawa State, Nigeria between April and July 2021.

Species	No. of ticks collected (%)
<i>Rhipicephalus sanguineus</i>	576 (88.9)
<i>Rhipicephalus(Boophilus)decoloratus</i>	72 (11.1)
Total	648 (100.0)

The interdigital region was the most preferred predilection site by the ticks followed by the ear while the least preferred is the tail region as shown in Table 3. Therefore, there was a significant difference ticks abundance in relation to predilection sites examined ($\chi^2 = 80.253$, $df = 10$, $P < 0.001$). Out of the 252 dogs screened, the highest infestation was by *R. sanguineus* 160 (78.8%) and *R. (B). decoloratus* 43 (21.2%) were reported in the interdigital regions whereas a very low tick population of *R. sanguineus* was recorded at the tail region 5 (0.8%) and no *R. (B). decoloratus* 0 (0.0%) was seen on the tail site.

Distribution and Composition of ticks infesting dogs in relation to locations

From Table 4, the population distribution of ticks on dogs sampled from the ten (10) communities was highest in Wamba West 175 (27.00%) individuals followed by Wamba East 87 (13.42%) ticks while a very low number of ticks 35 (5.40%) was recorded in dogs from Kwarra area. Hence, the distribution of ticks in relation to the locations were sampled dogs are resident showed a very high significant difference ($\chi^2 = 39.098$, $df = 9$, $P < 0.001$).

Species wise composition, dogs from Wamba West recorded the highest number of *R. sanguineus* 162 (28.13%) followed by Wamba East with 83 (14.41%) while dogs from Mangar had the least number of *R. sanguineus* 24 (4.17%) but had the highest number of *R. (B). decoloratus* 17 (23.61%) followed by Wamba West with 13 (18.10%) individuals whereas no *R. (B). decoloratus* infested the dogs from Kwarra area.

Discussion

The result of this study shows that a predominant population of the dogs (79%) in Wamba LGA are a host to ticks. This may be due to favorable ticks breeding conditions in the area. Interestingly, the dogs in the communities are owned but not confined in any manner, a behavior that to a large extent guarantees availability of host for dog ticks thereby making infestation endemic. The dog tick that thrives very well in the area is of the genus *Rhipicephalus*. Our

finding is in conformity with the work of Opara et al. [12] whose investigation on ticks of dogs in the Federal Capital Territory (FCT) Abuja, Nigeria revealed the presence of *Rhipicephalus* as the only tick on dogs in the area.

Table 3: Occurrence of ticks in relation to predilection sites in dogs.

Predilection site	No. of dogs infested	Abundance of tick species		Total number of ticks collected (%)
		<i>R. (B.) decoloratus</i> (%)	<i>R. sanguineus</i> (%)	
Head	13	8 (27.6)	21 (72.4)	29 (4.5)
Neck	16	12 (35.3)	22 (64.7)	34 (5.3)
Inguinal region	29	16 (39.0)	25 (61.0)	41 (5.3)
Ear	86	38 (37.6)	63 (62.4)	101 (15.6)
Inter digital region	106	43 (21.2)	160 (78.8)	203 (31.3)
Thoracic region	48	35 (40.7)	51 (59.3)	86 (13.3)
Thigh	16	8 (34.8)	15 (65.2)	23 (3.6)
Tail	2	0 (0.0)	5 (100)	5 (0.8)
Scrotal region	28	2 (5.6)	34 (94.4)	36 (5.6)
Perineum	14	14 (29.2)	34 (70.8)	48 (7.4)
Mammary gland	24	15 (35.7)	27 (64.3)	42 (6.5)
Total (%)		191 (29.5)	457 (70.5)	648 (100)

Table 4: Composition of ticks infesting dogs in relation to locations in Wamba LGA, Nasarawa State.

Location	Abundance of tick species		Total number of ticks collected (%)
	<i>R. (B.) decoloratus</i> (%)	<i>R. sanguineus</i> (%)	
Wamba East	4 (5.56)	83 (14.41)	87 (13.42)
Gitta	4 (5.56)	43 (7.47)	47 (7.30)
Nakere	5 (6.94)	78 (13.54)	83 (12.80)
Kwarra	0 (0.00)	35 (6.07)	35 (5.40)
Konvah	7 (9.72)	44 (7.63)	51 (7.90)
Arum	3 (4.16)	34 (5.90)	37 (5.70)
Wamba West	13 (18.10)	162 (28.13)	175 (27.00)
Mangar	17 (23.61)	24 (4.17)	41 (6.33)
Wayo	8 (11.11)	42 (7.29)	50 (7.71)
Jimiya	11 (15.27)	31 (5.38)	42 (6.50)
Total	72 (100.0)	576 (100.0)	648 (100.0)

Ticks have no preferred dog age group rather all ages are potential host, there are no barriers in terms of abundance of ticks and age of dog. All the age groups of dogs were infested. This is in agreement with the report of Uade et al. [13] indicating high prevalence of infestation on dogs of all ages. In this study, dogs of ages above 12 months (adults) had the highest infestation. This concurs with the finding of Opara et al. [12] who reported that all age groups of the local breed of dogs showed no significant difference in infestation, but the adult had a higher summation figure. On the other hand, Konto et al. [8] reported that dogs aged 0 - 6 months (puppies) to be the group with the highest abundance of ticks. The low burden recorded in young dogs (0 - 6 months) in this study could be due to a lot of factors among which is the smaller body surface of younger animals compared to adults.

The bigger adults with their larger surface areas provide more contact opportunities for tick attachment. This is due to the body size principle according to which smaller animals permit fewer parasites (in this case engorging ticks) per unit of body surface and bigger animals permit more parasites due to the larger body surface area to mass ratio [14].

The high occurrence of *R. sanguineus* in the area may possibly be due to the high population of cattle in Wamba area which helps in maintaining such tick population that are sometimes found on cattle. This agrees with the finding of Adejoh et al. [4] in Lafia who reported the presence of *R. sanguineus* infestation in over 62% of the cattle population examined. The adaptability of *R. sanguineus* to live in open environment and in dog kennel and home of humans

at all of its developmental stages has enabled the prevalence of the tick species. Also, Opara et al. [12] found *R. sanguineus* as the most abundant tick in dogs in the FCT area. Similarly, previous report of Ogo et al. [15] indicated *R. sanguineus* as the most abundant tick species on dogs in Nigeria. The research in Zaria by Okubanjo et al. [16] reported that *R. sanguineus* was the tick with the highest abundance. Dantas-Torres [17] revealed the brown dog tick *R. sanguineus* as the most abundant tick on dogs thus agreeing with this study. On the contrary, Konto et al. [8] reported *Boophilus* ticks as the predominant ticks on dogs in Maiduguri, Borno State, Nigeria followed by *R. sanguineus*. Walker et al. [1] reported *R. (B.) decoloratus* in regions with savanna climate typically in grassland used as cattle pasture. This accounts for the reason why *R. (B.) decoloratus* was second to *R. sanguineus*.

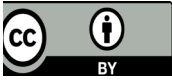
Tick abundance in the interdigital predilection site could be traced to period this survey was done which was at the beginning of the rainy season in which short grasses grow and when dogs walk or stand among the grasses the ticks get onto their foot and crawl into the interdigital region. This is because the paws are easily reachable by the ticks. This is in line with the study of Konto et al. [8]. Also, the tall grasses and shrubs provide the needed questing heights that give the ticks the opportunity to attach on the ears, the second most preferred predilection site. Agreeably the interdigital region and the ear provide soft parts of the skin where it is easier for the tick to penetrate the skin and reach the areas rich in blood vessels. Preference of ticks to the ear predilection site is also due to the optimum temperature and variations of the microhabitat being most suitable in comparison with the other parts of the body [18,19]. However, Konto et al. [8] in non-conformity reported the perineum as the most infested predilection site. The observed variation recorded in tick abundance in relation to the various locations the dogs are resident could be due to variability in microclimatic conditions between the locations.

Conclusion

Seventy-nine percent (79.0%) of the dogs' population in Wamba LGA are infested by two hard tick species, *Rhipicephalus sanguineus* and *Rhipicephalus (Boophilus) decoloratus*. Ticks infestation cuts across all age groups. The dominant tick species of dogs in the area was *R. sanguineus*. The most preferred predilection site by ticks was the interdigital region. Ticks abundance across locations where dogs are resident showed a high variation. Owners of dogs should consciously take good care of their dogs due to the rise in the number of travelling dogs from one region to the other which may pose high risk of possible introduction of ectoparasites to a new place. Lastly, dog owners should handpick ticks from their infested dogs as well as trim down tall grasses.

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