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# Prevalence and Distribution of Ectoparasites in Domestic and Stray Cats in Sokoto State, Nigeria: A Cross-Sectional Study

Hassan AY<sup>1\*</sup>; Lawal MD<sup>2</sup> and Usman M<sup>2</sup>

<sup>1</sup> Department of Veterinary Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto.

<sup>2</sup> Department of Veterinary Parasitology and Entomology, Usmanu Danfodiyo University, Sokoto.

\*Corresponding Author: Abubakar Yahaya Hassan

ORCID ID: 0009-0003-5949-2783

## ABSTRACT

Ectoparasites are a significant cat health concern, particularly in regions with varying environmental and management conditions. This study assessed the prevalence and distribution of ectoparasites in domestic and stray cats in Sokoto State, Nigeria, with a focus on *Rhipicephalus sanguineus*, the brown dog tick. A cross-sectional study was conducted examining 30 cats, comprising 15 domestic and 15 strays. The presence of ectoparasites was determined through visual inspection and identification. The study identified *Rhipicephalus sanguineus* as the sole ectoparasite, with an overall prevalence of 13.3%. All infestations occurred in stray cats (26.7%), while no ectoparasites were found in domestic cats. The prevalence was significantly higher in females (25.0%) than in males (0.0%), and in adults (21.05%) than in juveniles (0.0%). The findings highlight a notable disparity in ectoparasite prevalence between domestic and stray cats in Sokoto State. The higher prevalence among stray cats, particularly females and adults, underscores the need for targeted control measures and public education to effectively manage ectoparasite infestations.

**Keywords:** Ectoparasites; *Rhipicephalus sanguineus*; Prevalence; Cats; Sokoto State; Nigeria.

## INTRODUCTION

Ectoparasites pose a serious threat to both domestic and stray animals, significantly affecting their welfare and resulting in several health problems. Animals with skin and fur infestations from parasites, including lice, fleas, and mites, may experience allergic reactions, skin irritation, and itching [1,2]. Animals that have ectoparasites may experience extreme discomfort and anguish, which may result in overgrooming and hair loss [3]. Ectoparasites not only have an immediate negative impact on the health of the host animal, but they can also spread serious zoonotic diseases to humans, including ehrlichiosis, rickettsiosis, tularemia, and Lyme disease [4, 5]. Several ectoparasites, such as lice (*Felicola subrostratus*), mites (*Demodex cati*, *Notoedres cati*), and fleas (*Ctenocephalides felis*), can infect cats in particular [6]. By inducing stress and compromising the immune system, ectoparasites can also have unintended consequences for an animal's health, increasing susceptibility to other illnesses [7]. Because they are present in the environment, ectoparasites also indirectly affect human health [8]. Increased rates of vector-borne illness transmission have been linked to high ectoparasite populations in communities, especially in locations with inadequate sanitation and hygiene standards [9]. Ectoparasite abundance, for example, is frequently associated with socioeconomic factors, such as overcrowding and substandard housing conditions, which favour their spread [10].

Public health problems may be made worse by this scenario, especially for disadvantaged groups with little access to healthcare. A tropical wet-and-dry climate characterises Sokoto State, situated in the far northwest of Nigeria. This has important implications for the occurrence of ectoparasites [11]. The state is bordered to the north by the Niger Republic, to the west by Kebbi State, and to the east by Zamfara State. Its total area is estimated to be 27,825 km<sup>2</sup>. There are two seasons in the climate: a dry season from November to April and a wet season from April to October, with a peak in August. The region experiences 300–800 mm of rainfall on average each year, with April recording the highest temperatures of 40.6°C and December the lowest of 12.8°C [12]. Sokoto's climate, characterized by high temperatures, low humidity, and unpredictable rainfall, makes it difficult for animals to survive [12]. The lifespan and survival rates of ectoparasites can be influenced by these circumstances, which may result in increased infestations during the wet season when humidity levels rise. Furthermore, the region's primarily rainfed agricultural methods may affect the availability of hosts for ectoparasites, thereby further influencing the incidence of these parasites [13]. The majority of ectoparasite research conducted in similar regions has focused on the effects of these organisms on agricultural

productivity and livestock health. Research has shown that ectoparasites, such as fleas and ticks, are common across a range of livestock species and play a substantial role in the spread of diseases that can negatively impact animal health and production [30]. The majority of prior studies on ectoparasites in dogs, small ruminants, poultry, and cattle have left a large knowledge vacuum on the incidence of ectoparasites in cats [31]. The objective of this research is to determine the different types and distribution of ectoparasites in domestic and stray cats in Sokoto State, Nigeria.

## METHODOLOGY

### Study Area

Sokoto State, which is in Nigeria's northwest, is bounded to the north by the Niger Republic, to the east by Katsina State, to the south-east by Niger State, to the south by Kwara State, and to the west by the Benin Republic. It occupies an area of roughly 62,000 km<sup>2</sup> and is located between latitudes 10°N and 13°58'N and longitudes 4°8'E and 6°54'E [14]. The Inter-Tropical Convergence Zone (ITCZ) regulates the interaction between the warm tropical marine air mass from the Atlantic Ocean and the dry, dusty tropical continental air mass from the Sahara Desert, thereby affecting the climate [14].

### Collection and Identification of Ectoparasites

A total of thirty cats, fifteen domestic and fifteen stray, were randomly sampled for ectoparasites. The Usmanu Danfodiyo University Veterinary Teaching Hospital provided domestic cats, while stray cats were sampled in Sokoto city. Cats were enticed with fried fish and confined for analysis. Cats must be at least 2 months old to meet the inclusion criterion. The identification of domestic cats was based on customer interviews, whereas strays were classified based on the lack of ownership indicators such as collars or surgical scars [15,16]. The age and sex of every cat were noted.

### Collection and Processing of Ectoparasites

Employing a fine-toothed flea comb and a thorough body search, ectoparasites were collected [15]. Similarly, after fleas and lice were discovered in the comb, ticks were manually extracted with blunt forceps and collected. Out of the thirty cats that were inspected throughout the harmattan season, only four ectoparasite specimens were found. Ticks were kept in specimen vials with 5% glycerol and 70% alcohol. The ectoparasites were examined and identified using stereomicroscopy at the Parasitology and Entomology Laboratory, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto.

**Identification of Ectoparasites**

Tick specimens were identified based on their morphological characteristics using identification keys and guides provided by [16] and [17]. The identification process involved comparing specimen morphology to known characteristics documented in these guides.

**Data Analysis**

The prevalence of ectoparasite infestation was calculated using the formula provided by [18]. The Chi-square tests were used to analyse the differences in prevalence across various age groups, sexes, and between domestic and stray cats [19]. Statistical analysis was conducted using STATA statistical software (StataCorp. Stata

Statistical Software: Release 14. College Station, TX: StataCorp LLC).

**RESULTS**

A total of 30 cats were examined for ectoparasites. The only ectoparasite identified was the brown dog tick, *Rhipicephalus sanguineus*, with an overall prevalence of 13.3%. The prevalence was significantly higher in stray cats (26.7%) compared to domestic cats, where no cases were found (Tables 1 and 2). Additionally, the prevalence was notably higher in adult cats (21.1%) compared to juveniles (0.0%) (Table 4.3). Female cats also showed a higher prevalence (25.0%) than males (0.0%) (Table 4.4).

Table 1: Overall Prevalence of Ectoparasites in Cats in Sokoto

Cat type	Juvenile	Adults	Total
Domestic	11 (73.3%)	4 (26.7%)	15 (100%)
Stray	3 (20.0%)	12 (80.0%)	15 (100%)
Total	14 (46.7%)	16 (53.3%)	30 (100%)

Table 2: Prevalence of Ectoparasites in Cats by Type, Age, and Sex

Variable	Level	Negative	positive	Total	$\chi^2$ (DF)	P-values
<b>Cat type</b>	Domestic	15 (100%)	0 (0.0%)	15 (100.0%)	4.6154 (1)	0.032
	Stray	11(73.3%)	4 (26.7%)	15 (100.0%)		
	Total	26 (86.7%)	4 (13.3%)	30 (100.0%)		
<b>Age</b>	Adult	15 (78.9%)	4 (21.1%)	19 (100.0%)	2.6721 (1)	0.102
	Juvenile	11 (100.0%)	0 (0.0%)	11 (100.0%)		
	Total	26 (86.7%)	4 (13.3%)	30 (100.0%)		
<b>Sex</b>	Female	12 (75.0%)	4 (25.0%)	16 (100.0%)	4.0385 (1)	0.044
	Male	14 (100.0%)	0 (0.0%)	14 (100.0%)		
	Total	26 (86.7%)	4 (13.3%)	30 (100.0%)		

Ectoparasites were found exclusively in stray cats (26.7%), with no infestation detected in domestic cats; the difference was statistically significant ( $p=0.032$ ), indicating a higher risk among stray cats. Although adult cats had a higher prevalence of ectoparasites (21.1%) than juveniles (0.0%), the

difference was not statistically significant ( $p=0.102$ ). Additionally, female cats had a significantly higher prevalence (25.0%) than male cats, which were entirely free of infestation ( $p=0.044$ ), suggesting a possible sex-related difference that warrants further investigation.



Figure 1: *Rhipicephalus sanguineus* as seen under a stereomicroscope (x20 magnification).

## DISCUSSION

This study investigated the prevalence and distribution of ectoparasites in domestic and stray cats in Sokoto State, Nigeria, with a focus on *Rhipicephalus sanguineus*, the brown dog tick. The overall prevalence of ectoparasites (ticks) was 13.33%, with all infestations occurring exclusively in stray cats. None of the domestic cats examined harboured ectoparasites, indicating a significant difference between the two cat populations. The absence of ectoparasite(s) in domestic cats contrasts with findings from [32], who found that (95.5%) cats in Ekiti state, Nigeria, were infected with two or more ectoparasites. In addition, it contrasts with studies in other regions, where domestic cats have been reported to have higher prevalence rates, such as 37.1% in the United States [6] and 23.7% in the northeastern United States [23]. This difference could be attributed to better care and regular ectoparasiticide use among domestic cats in Sokoto State, or it might reflect a lower environmental burden of ectoparasites in the areas where these cats are kept.

The study found that stray cats had a significantly higher prevalence of ectoparasites

(ticks) (26.67%) compared to domestic cats. This aligns with previous studies that found stray or free-roaming cats are more susceptible to ectoparasite infestations due to increased exposure to outdoor environments and a lack of regular veterinary care [20, 6]. The significantly higher prevalence in stray cats underscores the need for targeted ectoparasite control measures within this population. Interestingly, all ectoparasite-positive cats were female, while none of the male cats were infested. This finding is consistent with some previous studies [24, 25] that suggest sex may play a role in susceptibility to ectoparasite infestations. The reasons behind this gender disparity could include hormonal differences, behavioural factors, or differences in grooming habits between male and female cats. However, it is worth noting that other studies have found no significant difference in ectoparasite prevalence between males and females [26, 27].

Age also appeared to be an important factor, with adult cats showing a higher prevalence of ectoparasites (21.05%) compared to juveniles (0.00%). This result is consistent with findings by [28] and [24], who identified age as a critical risk

factor for ectoparasite infestation, likely due to the increased exposure and broader range of environments frequented by adult cats over time.

The limited presence of only *Rhipicephalus sanguineus* in this study contrasts with other research that has identified a wider variety of ectoparasites in cats, including fleas and lice [29, 21]. This could be due to geographical differences, the specific environmental conditions of Sokoto, or the limited sample size in this study.

The findings of this study showed the importance of addressing ectoparasite infestations in stray cats, particularly through community-based interventions and public education. The absence of ectoparasites in domestic cats suggests that regular veterinary care and the use of ectoparasiticides are effective preventive measures. However, the study's small sample size and focus on a single ectoparasite species may limit the generalizability of the results.

### CONCLUSION

This study reveals a significant difference in ectoparasite prevalence between stray and domestic cats in Sokoto State, with stray cats being more heavily infested. The higher prevalence among female and adult cats highlights specific risk factors that could inform future control measures. Further research with a larger sample size and a broader focus on different ectoparasite species is recommended to develop a more comprehensive study of ectoparasite distribution in the region.

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### DECLARATION OF COMPETING INTERESTS

The authors declare no competing financial interests or personal relationships that could have influenced the work reported in this paper.

### AUTHOR CONTRIBUTIONS

**Abubakar Yahaya Hassan:** Conceptualization, Data Collection, Methodology, Resources, Validation, Writing, Original Draft, Writing, Review & Editing.

**Mohammed Dalhatu Lawal:** Conceptualization, Methodology, Resources, Supervision, Validation, Writing, Review & Editing.

**Usman Mahmud:** Supervision, Validation, Writing, Review & Editing.

### DATA AVAILABILITY

Data will be made available upon reasonable request.

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