

EPIDEMIOLOGICAL INSIGHTS INTO *Rhipicephalus sanguineus* INFESTATION IN DOGS IN EGYPT

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ABSTRACT

Ticks are blood-feeding ectoparasites that frequently infest dogs and pose significant concerns for animal health and welfare. This study aimed to investigate the prevalence of *Rhipicephalus sanguineus* infestation in dogs and identify its associated risk factors in Cairo Governorate, Egypt. A total of 100 dogs from veterinary clinics and shelters were examined during 2024. The overall prevalence was 47%, with stray dogs showing higher infestation rates (62%) compared to domestic dogs (32%). From 1-3 years old dogs and male dogs were more frequently affected, with a prevalence of 57.14% and 48.08%, respectively. Seasonality also played a role, as infestation was most common in summer (84%). Morphological identification confirmed the collected specimens as *R. sanguineus*. These findings provide essential baseline data on tick occurrence in dogs in Cairo, emphasizing the need for effective control strategies to improve canine health and limit ectoparasite burden.

Key words: Ticks, prevalence, risk factors, dogs, seasonality

INTRODUCTION

Ticks are blood-feeding ectoparasites that depend exclusively on vertebrate hosts and are considered highly competent disease vectors, with considerable significance for human and veterinary health. Their widespread occurrence allows them to transmit numerous pathogens between animals and humans, as they rely entirely on hosts for blood meals (O'Neill *et al.*, 2024).

During the process of blood feeding, ticks

can transmit multiple microorganisms and zoonotic agents, including viruses, bacteria, and protozoa, posing significant health risks to their vertebrate hosts (Abo Talep *et al.*, 2024).

Among them, *Rhipicephalus sanguineus*, commonly called the brown dog tick, is recognized as the predominant tick infesting dogs worldwide. This species is implicated in the transmission of numerous pathogens responsible for babesiosis, ehrlichiosis, hepatozoonosis, mycoplasmosis, and rickettsiosis, with most of them transmitted through the tick's bite (Do *et al.*, 2024). Canine hosts carrying these ticks and pathogens may display a spectrum of

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clinical symptoms, including elevated body temperature, weakness, pale mucous membranes, weight loss, swollen lymph nodes, bleeding disorders, hemoglobin in urine, petechial hemorrhages, jaundice, and, in severe cases, mortality (Hii *et al.*, 2015).

Tick-borne pathogens (TBPs) are among the primary causes of illness and death in dogs, and also present a growing public health challenge. The global rise in tick-borne diseases (TBDs) in both humans and animals is attributed to multiple factors, including climate change, alterations in land use, and declines in biodiversity (Hegab *et al.*, 2022).

Considering the implications of tick infestations for both animal health and zoonotic disease transmission, the present study was designed to investigate the risk factors associated with *R. sanguineus* infestation in dogs. Gaining deeper insight into these parasitic infections will aid dog owners and veterinarians in implementing effective preventive and therapeutic measures, reducing economic and health-related burdens, enhancing control strategies, and ultimately improving both canine well-being and public health.

MATERIALS AND METHODS

Study location and sampling Methodology

The study was conducted on 100 dogs in Cairo Governorate, Egypt, throughout 2024. Clinical signs associated with tick infestations were documented. The studied animals represented a broad age spectrum, ranging from 50 days to 10 years, with body weights between 1 kg and 45 kg. Their body temperature ranged from 38°C to 41°C, and body condition scores varied from emaciated to overweight, thereby reflecting a diverse canine population within the study sample.

Ticks Collection

Dogs were subjected to detailed skin and coat examinations to identify ectoparasitic lesions, and the distribution of infested sites was recorded. Complementary data such as sex, age, clinical history, and date of sampling were also registered. Dogs were randomly selected without prior knowledge of tick infestation status (Do *et al.*, 2024).

Ticks collected from the animals were extracted with great care. The detachment process involved a counterclockwise twist with gentle inward pressure, followed by removal using blunt-tipped, angled steel forceps. The collected specimens were then placed in clean, labeled tubes containing 70% ethanol, with details of age, breed, sex, and date of sampling recorded (Ghodrati *et al.*, 2024).

Parasitological study and Tick Identification

After preservation in ethanol, the collected specimens were thoroughly rinsed with distilled water and subsequently immersed in 10% potassium hydroxide (KOH) solution for 24 hours to eliminate residual chitinous material. Before mounting, the internal blood contents of ticks were evacuated through a ventral puncture using a fine syringe needle. The ticks were then repeatedly washed with distilled water, dehydrated through a graded ethanol series (30 minutes at each step), and immersed in clove oil to increase cuticular transparency. Clearing was performed with xylene. Finally, specimens were mounted on clean glass slides using Canada balsam, covered with coverslips, air-dried, and examined under an Olympus BX43F microscope (Tokyo 163-0914, Japan) (Kumar *et al.*, 2017; Ahmed *et al.*, 2025).

Ticks were identified following the taxonomic keys and descriptions provided by Soulsby (1982) and Walker *et al.* (2003).

Statistical Data Analysis

The collected data were statistically analyzed to examine the relationship between tick infestation and potential risk

factors, including habitat, sex, age, and season. Associations were evaluated using the Chi-square test, with all analyses performed in GraphPad Prism software. A P-value of ≤ 0.05 was considered statistically significant, following the guidelines outlined by Taddesse *et al.* (2024).

Ethical approval

This study was conducted in accordance with the ethical guidelines of the Institutional Animal Care and Use Committee (IACUC) of the Faculty of Veterinary Medicine, Egypt. Ethical approval was granted, ensuring that all experimental procedures complied with established animal welfare standards.

RESULTS

Clinical Presentation and Morphological Identification of *Rhipicephalus sanguineus*

The predominant clinical manifestations observed in infested dogs included poor body condition, weight loss, fever, pruritus, and inflammatory lesions. Ticks were visible to the naked eye on various body regions of the examined animals (Fig. 1). Adult ticks were identified as brown, oval-shaped arachnids with four pairs of legs. Females were comparatively bigger and more rounded than males. Morphometric measurements indicated that adult males ranged between 2.5 and 4.5 mm in length, while females could reach up to 9 mm. The capitulum of adult ticks showed a hexagonal base and barbed mouthparts. The female ticks are characterized by a scutum restricted to the anterior third of the dorsum, whereas in males, the scutum extends over the entire dorsal surface, displaying festoons along the posterior margin. (Fig.2).



Fig. 1: Distribution of ticks on various body regions of infested dogs, including the back and ears.

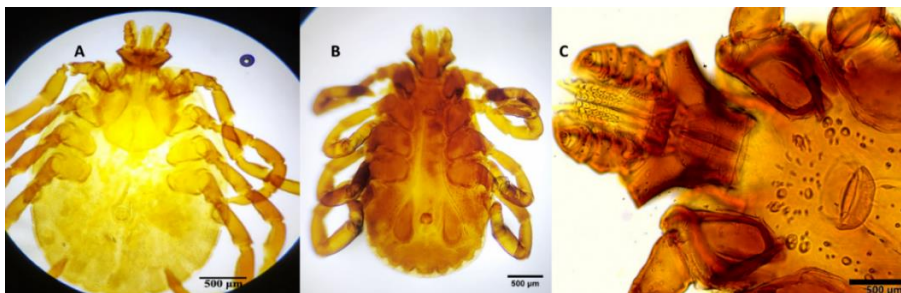


Fig. 2: Morphological features of *Rhipicephalus sanguineus* obtained from infested dogs: (A) Adult female (4×), (B) Adult male (4×), (C) Ventral view showing capitulum of adult *R. sanguineus* (40×).

Prevalence and potential risk factors affecting tick infestations in dogs

Table 1 and Fig.3. summarizes the prevalence of *R. sanguineus* infestations in relation to different risk factors, including

habitat, sex, age, and season. The total infestation with *R. sanguineus* was 47%. Infestation was more common in stray dogs (62%) compared to domestic dogs (32%). With respect to age, the lowest prevalence

was observed in dogs aged under 1 year (28.125%), whereas higher rates were recorded in those of 1-3 years (57.14%) and over 3 years (52.6%). Sex-related differences showed the infestation occurred in 45.83% of females, while a higher prevalence of 48.08% was observed in males. Seasonal variation indicated that Summer exhibited the highest prevalence

(84%), followed by spring and autumn (40% each), with the lowest rate in winter (24%). Statistical analysis revealed a highly significant association between infestation rates and habitat. Seasonal variation was also highly significant, while age showed significant variation. In contrast, sex exhibited no statistically significant association with infestation rates.

Table 1: Prevalence and potential risk factors affecting ticks' infestations in dogs

Risk factor	<i>Rhipicephalus sanguineus</i>	
	n	Prevalence (%)
Habitat	Domestic(N=50)	16 32%
	Stray(N=50)	31 62%
P. value		0.0027**
Sex	Male (N=52)	25 48.08%
	Female(N=48)	22 45.83%
p. value		0.8223
Age	under 1 y(N=32)	9 28.125%
	1-3y (N=49)	28 57.14%
	Above 3 y(N=19)	10 52.6%
p. value		0.0327*
Season	Spring(N=25)	10 40%
	Summer(N=25)	21 84%
	Autumn(N=25)	10 40%
	Winter(N=25)	6 24%
p. value		0.0002**
Total Infestation (N=100)		47 47%
Total non-Infested		53 53%

N: total number of examined dogs; **n:** the number of dogs infested; **(%):** proportion of infested dogs per category. * $P \leq 0.05$ was considered statistically significant, ** $P \leq 0.01$ was regarded highly significant, according to the Chi-square test of independence.

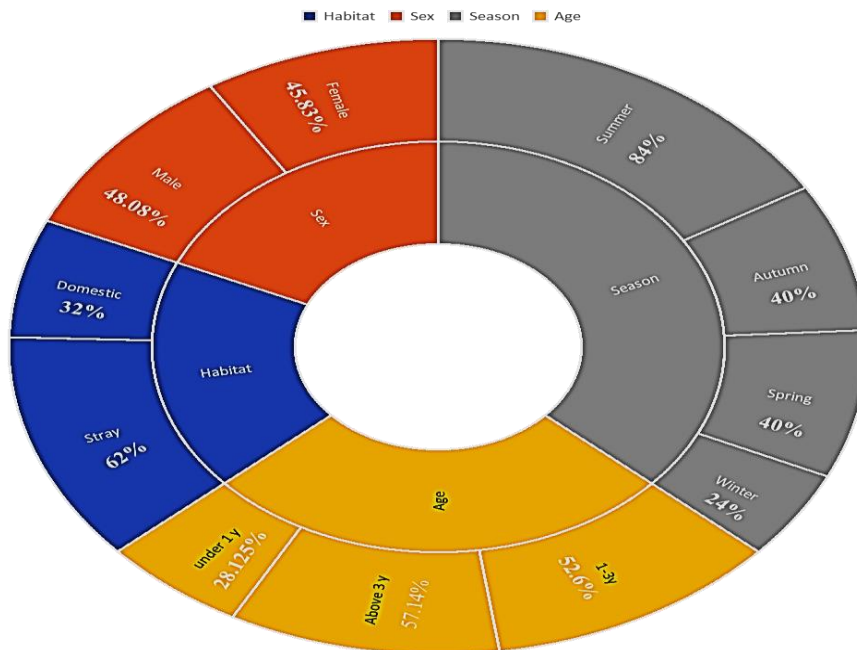


Fig. 3: Potential risk factors affecting tick infestation rates in dogs

DISCUSSION

Rhipicephalus sanguineus, the brown dog tick, is widely recognized as the most common tick infesting dogs and an important vector of multiple pathogens (Ogbu *et al.*, 2018). The current study investigated infestation rates and associated risk factors, providing baseline insights to support effective tick management in Cairo, Egypt.

The primary clinical signs observed in the examined dogs infested with ticks were hair loss, pruritus, erythema, weight loss, fever, and persistent itching. These manifestations align with the clinical patterns previously reported by Yan *et al.* (2024).

Examination of the collected specimens revealed that the adult ticks were characterized by a brown, oval body with four pairs of legs. Females were morphologically larger than males, with the scutum covering only the anterior third of the dorsal surface. These features are consistent with the morphological descriptions provided by Saleh *et al.* (2021) and Yousef *et al.* (2024).

The results of this study demonstrated that *R. sanguineus* infestation was detected in 47% of the examined dogs. This prevalence is consistent with previous reports, including Agu *et al.* (2020), who inspected 420 dogs in Nigeria and observed the infestation rate of ticks was 40.7%, and Shirzadfar *et al.* (2025), who examined 138 dogs in Iran and documented a 56.14% prevalence of ticks.

This study also assessed the prevalence of *R. sanguineus* in relation to risk factors such as habitat, sex, age, and season. The infestation rate was considerably higher in stray dogs (62%) compared to domestic dogs (32%). These findings are consistent with Sahu *et al.* (2013), who reported a greater infestation in stray dogs (50.83%) than in domestic dogs (23.20%) in

Bhubaneswar, India. Similarly, Abdel Aziz *et al.* (2017) in Egypt observed a higher prevalence in stray dogs (34.21%) compared to 10% in household dogs. In contrast, Zineldar *et al.* (2023) documented an opposite pattern in Egypt, where domestic dogs showed higher infestation rates (53.85%) than strays (15.38%).

With respect to sex, infestation was observed in 48.08% of male dogs and 45.83% of female dogs. These findings were similar to a study in Greece documented a prevalence of 43.53% in males versus 30.57% in females (Lefkaditis *et al.*, 2016). Similarly, Zineldar *et al.* (2023) reported higher infestation rates in males (61.54%), compared to females (38.46%). On the other hand, Abdel Aziz *et al.* (2017) in Sadat District, Egypt, noted a greater prevalence in females (53.10%) than in males (47.7%).

With regard to age, the highest infestation rate was recorded in dogs between 1-3 years (57.14%), followed by those older than 3 years (52.6%), while the lowest rate occurred in dogs under 1 year (28.125%). Similarly, Abdel Aziz *et al.* (2017) in Sadat District, Egypt, found that the prevalence was greatest in young dogs less than 6 months (45.88%), compared with 35.29% in those aged 6 months to 1 year and 19.49% in dogs above 1 year. Furthermore, Zineldar *et al.* (2023) in Egypt reported that adult dogs showed the highest prevalence (73.08%), whereas infestation was 15.38% and 11.54% in dogs under 1 year and old dogs, respectively.

The analysis of seasonal patterns revealed that tick infestation peaked in summer (84%), followed by spring and autumn (40% each), with the lowest prevalence observed in winter (24%). These findings are consistent with Mosallanejad *et al.* (2012) in Iran, who found the greatest infestation during summer and autumn (3 cases each), followed by spring (2 cases), and the lowest in winter (1 case) among 126 dogs examined. Similarly, Zineldar *et al.*

(2023) in Egypt reported that the highest infestation rates were in summer and autumn (34.62% each) and the lowest were in spring and winter (5.63% each).

Statistical analysis indicated a highly significant association between infestation rates and habitat, as well as with seasonal variation and age. Conversely, sex did not show a statistically significant relationship with infestation levels.

CONCLUSION

In conclusion, this study assessed the infestation rates and risk factors associated with *Rhipicephalus sanguineus* infestation among dogs in Cairo Governorate, Egypt. The findings indicated that stray dogs were more heavily infested than domestic dogs, and that habitat, age, and season significantly influenced infestation levels. Dogs aged 1–3 years were the most susceptible, males showed higher infestation levels than females, and the prevalence peaked during summer. Overall, these findings provide essential baseline data to inform effective control strategies to reduce tick infestations in the region.

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دراسات وبائية عن إصابة الكلاب بقراد *Rhipicephalus sanguineus* في مصر

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القراد من الطفيليات الخارجية الماصة للدم التي تصيب الكلاب بشكل متكرر وتمثل مصدر قلق كبير لصحة الحيوان ورفاهيته. هدفت هذه الدراسة إلى التحقيق في معدل انتشار وعوامل الخطورة لانتشار قراد الكلاب البني (*Rhipicephalus sanguineus*) في محافظة القاهرة، مصر. تم فحص عدد ١٠٠ كلب من العيادات والملاجئ خلال عام ٢٠٢٤ من خلال الفحص السريري وجمع القراد. بلغ معدل الانتشار الكلي ٤٧٪، حيث أظهرت الكلاب الضالة معدلات إصابة أعلى (٦٢٪) مقارنة بالكلاب المنزلية (٣٢٪). كما وُجد أن الكلاب في عمر ١-٣ سنوات والذكور كانت أكثر عرضة للإصابة بمعدلات بلغت ٥٧,١٤٪ و ٤٨,٠٨٪ على التوالي. وأظهرت النتائج أن للعامل الموسمي دورًا واضحًا، إذ كان معدل الإصابة الأعلى في فصل الصيف (٨٤٪). وقد أكدت الدراسة من خلال الفحص المورفولوجي أن العينات المجموعة تعود إلى نوع *R. sanguineus* وتوفر هذه النتائج بيانات أساسية مهمة حول انتشار القراد في الكلاب بمحافظة القاهرة، مما يبرز الحاجة إلى وضع استراتيجيات فعالة للسيطرة عليه بهدف تحسين صحة الكلاب والحد من عبء الطفيليات الخارجية.