RESEARCH ARTICLE

High Prevalence of Ixodidae Ticks in Dogs Across Diverse Agro-Climatic Zones of Western Maharashtra

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ABSTRACT

This research work highlights the alarming prevalence of Ixodidae ticks infesting dogs across four distinct agro-climatic zones of Western Maharashtra. A total of 220 dogs were screened, resulting in 100 tick samples identified through rigorous methods. Findings revealed a concerning overall prevalence of 45.5% (100/220) of Ixodid ticks in the region, with *Rhipicephalus sanguineus* as the predominant species, comprising 53% (53/100) of the samples. Remarkably, dogs aged 1 to 3 years showed the highest infestation rate at 49.4% (38/77). Male dogs were disproportionately affected, with a prevalence of 52% (53/102). Stray dogs emerged as particularly vulnerable hosts, exhibiting an alarming infestation rate of 57.4% (39/68). Among breeds, the Greyhound demonstrated the highest prevalence at 63.3% (19/30). Moreover, skinny dogs faced the most significant tick burden, with a striking 70% (7/10) infestation rate. The ear was identified as the most common attachment site for ticks, accounting for 43% (43/100) of occurrences. This comprehensive study emphasizes the urgent need for targeted interventions to combat tick infestations in dogs across Western Maharashtra.

Key words: Ixodidae, *Rhipicephalus sanguineus*, Tick prevalence, Western Maharashtra.

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Introduction

Ticks are notorious blood-sucking parasites that play a pivotal role in transmitting a myriad of pathogens, including protozoa, viruses, bacteria, rickettsia, and fungi, to dogs and other animals. The economic impact of ticks and tick-borne diseases (TTBDs) is staggering, with global losses estimated between US$ 13.9 and 18.7 billion annually. In India, the financial burden of controlling TTBDs reaches a staggering US$ 498.7 million per year (Ghosh and Nagar, 2014). These voracious feeders extract 0.5 to 2 mL of blood per tick each day, causing irritation, redness, swelling, and itching of the skin, which can lead to self-inflicted trauma. In severe cases, manifestations such as tick paralysis, tick toxicosis, and moist eczema frequently occur.

Among the various tick species, *Rhipicephalus sanguineus* is a widespread dog tick globally (Dantas-Torres, 2010) and is the most common species parasitizing dogs in India (Raut *et al.,* 2006; Abd Rani *et al.,*2011; Sahu *et al.,*2013). This tick is a significant vector for numerous zoonotic diseases that pose serious threats to both dogs and humans, including borreliosis, ehrlichiosis, Rocky Mountain spotted fever (RMSF), *R. conorii* infections, and tick-borne encephalitis.The regions in given study provides ideal climatic conditions conducive to the proliferation of ticks and tick-borne parasites. It is crucial to identify the various types of ticks that infest dogs and to assess their rates of infestation, as this will yield valuable baseline information for monitoring future changes in tick prevalence and distribution patterns. This study elucidated the life stages and diversity of dog ticks, as well as their distribution across different agro-climatic zones in Western Maharashtra.

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Materials and Methods

The study was conducted from November 2023 to February 2024 at Krantisinh Nana Patil College of Veterinary Sciences,

Shirwal, and College of Veterinary Sciences, Parbhani, Maharashtra following ethical approval No. IAEC/08/23/KNPCVS/2024. A total of 220 dogs were meticulously screened, and 100 tick samples were collected from four distinct agro-climatic zones of Western Maharashtra: the Western Ghat Zone, Sub-Mountain Zone, Western Maharashtra Plain Zone, and Western Maharashtra Scarcity Zone.

Ticks from the animal body were collected with precision and care. Head of the tick was firmly gripped and turned lonto its backby using forceps. The tick was then pulled out sharply, perpendicular and away from the skin to ensure a complete extraction without leaving any mouthparts embedded. Ticks from the surroundings were also collected from various environmental sources. This involved a thorough search of cracks and crevices in doghouses, as well as from the surrounding areas and cages. Special attention was given to humid, discarded materials around the doghouses, where ticks are likely to thrive.

The collected tick samples were treated with 10% KOH to facilitate processing. Following this, they were dehydrated using ascending grades of alcohol and mounted in DPX for further examination. Identification was carried out based on the morphological features (Fig. 1, 2) outlined by Soulsby (2012). The prevalence of Ixodid ticks was recorded alongside various factors, including age, sex, breed, body condition score, and tick location on the body. Data were analyzed using SPSS-20 software.

Results and Discussion

The primary focus of the given study was to record the prevalence of Ixodidae ticks *Rhipicephalus sanguineus* infesting dogs in Western Maharashtra. The key findings are presented in Table 1.

Table 1: Dog tick prevalence in Western Maharashtra according to zone, age, sex, home type and dog breed

Factor	Criteria	Total animals screened	Positive animals	% prevalence	Chi-square value	P value
Agro-climatic zones	Western Ghat Zone	55	25	45.5	0.378	0.945
	Sub Mountain Zone	57	25	43.9		
	Western Maharashtra Plain Zone	57	25	43.9		
	Western Maharashtra Scarcity Zone	51	25	49.0		
Age group	<1 yr	76	33	41.9	0.726	0.696
	1-3 yr	77	38	49.4		
	>3 yr	67	29	44.9		
Sex	Male	102	53	52.0	3.247	0.072
	Female	118	47	39.8		
Type of dog	Pet	152	61	40.1	5.620	0.018*
	Stray	68	39	57.4		
Breed type	German Shepherd	31	10	32.3	7.647	0.177
	Golden Retriever	23	8	34.8		
	Greyhound	30	19	63.3		
	Labrador Retriever	56	24	42.9		
	Lhasa Apso	13	6	46.2		
	Non-Descript (ND)	67	33	49.3		
Total		220	100	45.5	--	--

*Significant at p<0.05, **Highly Significant at p<0.01.

The overall prevalence of tick infestation across all four zones was found to be 45.5% (100/220). The Western Maharashtra Scarcity Zone exhibited the highest prevalence at 49.0%, followed closely by the Western Ghat Zone at 45.5%. Both the Sub-Mountain Zone and the Western Maharashtra Plain Zone showed an identical tick infestation rate of 43.9% (Table 1), likely due to similar climatic conditions, although this result was statistically non-significant. Notably, the overall prevalence of dog tick infestation recorded in the Solapur district of the Western Maharashtra Scarcity Zone was 68.66% (Adsule and Gavhane, 2022). This prevalence was lower than the reported rates of 63.70% (Melo *et al.*, 2011), 74.76% (Diniz *et al.*, 2010), and 100.00% (Bhadesiya and Modi, 2015). Variations in tick infestation rates may be attributed to differences in seasonal and climatic factors, as well as the level of awareness among pet owners regarding grooming and maintenance.

In this study, dogs aged 1 to 3 years exhibited the highest prevalence of tick infestation at 49.4%. Adult dogs over 3 years showed a moderate infestation rate of 44.9%, while puppies under 1 year had the lowest prevalence at 41.9% (Table 1).

Similar findings were reported by Arong *et al.* (2011), Boruah *et al.* (2021), and Adsule and Gavhane (2022), indicating that adolescent dogs are more susceptible to tick infestations than puppies. In contrast, Sahu *et al.* (2013), Hadi *et al.*(2016), and Zeb *et al.*(2023) reported differing age-related infestation patterns.

Tick infestation was more prevalent in male dogs (52.0%) compared to female dogs (39.8%). This disparity may be attributed to increased roaming behaviour in males and hormonal influences (Sahu *et al*., 2013). Similar trends have been noted by Hadi *et al*. (2016), Laxmi Bai (2019), and Boruah *et al.* (2021). However, some studies, such as those by Adetayo *et al*. (2021), Modu *et al.* (2021), and Zeb *et al.* (2023) reported a higher prevalence in female dogs.

Among the 152 pet dogs screened, 61 (40.1%) showed tick infestation, while 39 (57.4%) of the 68 stray dogs were infested. The lower infestation rate in pet dogs may be attributed to better living conditions and regular acaricide treatments. This result was statistically significant ($p<0.05$). In line with our findings, Sahu *et al.*(2013) reported a lower prevalence in pet dogs compared to stray dogs.

The highest prevalence of tick infestation was observed in Greyhounds at 63.3%, likely due to their outdoor living conditions and use for racing. Non-descript breeds had a prevalence of 49.3%, while Lhasa Apso showed a rate of 46.2% (Table 1). Labrador Retrievers, often housed in pakka homes with access to open areas, exhibited a tick prevalence of 42.9%. Interestingly, despite their longer coats, both Golden Retrievers and German Shepherds had the lowest prevalence rates of 34.8% and 32.3%, respectively, due to better grooming and care. These findings aligned with the reports from Boruah *et al.* (2021) and Modu *et al.* (2021), which noted higher infestation rates in local non-descript dogs compared to exotic breeds. However, these results contradict findings with Bhadesiya and Modi (2015), Hadi *et al.* (2016), and Adetayo *et al.* (2021), who reported higher tick prevalence in breeds like Labrador Retrievers and German Shepherds.

Table 2: Dog tick prevalence according to tick spp., body score and body location

Factor	Criteria	No. screened	Infested animals	% prevalence	Chi-square value	P value
Tick species	*R. sanguineus*	100	53	53.0	220.00	0.000**
	Hyalomma spp.	100	7	7.0		
	Mixed	100	40	40.0		
Body score-wise	Very thin	10	7	70.0	8.217	8.217
	Underweight	47	27	57.4		
	Ideal	113	49	43.4		
	Overweight	48	16	33.3		
	Obese	2	1	50.0		
Body location-wise	Interdigital	100	12	12.0	220.00	0.000**
	Ears	100	43	43.0		
	Back	100	11	11.0		
	Neck	100	34	34.0		

*Significant at $p<0.05$, **Highly Significant at $p<0.01$.

Among the 100 tick-infested dogs, *Rhipicephalus sanguineus* was the most prevalent tick species, affecting 53.0% of the dogs. Mixed infestation involving *R. sanguineus* and *Rhipicephalus microplus* noted in 40.0% of cases, while only 7.0% were infested with *Hyalomma* spp. *R. sanguineus* is recognized as a globally widespread dog tick (Dantas-Torres, 2010) and the most common tick species infesting dogs in India (Raut *et al.,* 2006; Abd Rani *et al.,* 2011; Sahu *et al.,* 2013). This tick prevalence was found to be statistically highly significant ($p<0.01$). In contrast, Beck *et al.* (2014), Eichenberger *et al*. (2015), and Abdullah *et al*. (2016) reported *Ixodes ricinus* as the most common tick infesting dogs, followed by *Ixodes hexagonus*. The distribution and abundance of dog tick species can be influenced by various factors, including climatic conditions, the presence of other domestic and wild animals, and environmental factors.

The study indicated that debilitated dogs classified as "very thin" had the highest rate of tick infestation at 70.0 %, followed by underweight dogs at 57.4%. Obese dogs exhibited a tick infestation rate of 50.0%. The prevalence in dogs with an ideal body score was 43.4%, while overweight dogs showed a rate of 33.3% (Table 2). Raghvan *et al.* (2007) reported no significant relationship between a dog's body score and the severity of tick infestation, suggesting that body weight does not present a linear risk pattern.

In the present study, the ears were identified as the most frequently infested area, with a prevalence of 43.0%, followed by the neck at 34.0%. Interdigital spaces showed an infestation rate of 12%, while the back region had a tick prevalence of 11.0%. This data was statistically significant ($p = 0.000$). Similar findings were reported by Beck *et al.* (2014), Hadi *et al.* (2016), Adetayo *et al.* (2021), and Adsule and

Gavhane (2022). The higher prevalence in the ear area may be attributed to its thinner skin and greater access to superficial blood vessels. Conversely, the back region showed the least infestation, likely due to greater exposure to environmental factors and easier detection and removal by dog owners.

Conclusion

The study unequivocally reveals a significant prevalence of Ixodidae ticks in dogs across Western Maharashtra, with an alarming infestation rate of 45.5%. Stray dogs, particularly those in weakened health, displayed the highest susceptibility to tick infestations. Notably, male dogs aged 1-3 years emerged as the most affected demographic, highlighting a critical area for targeted intervention. The ears and neck were identified as the primary regions of infestation, emphasizing the need for vigilant monitoring in these areas. Furthermore, *Rhipicephalus sanguineus* was identified as the predominant tick species, predominantly affecting Greyhound and non-descript breeds. This underscores the urgent need for increased awareness and preventive measures to protect our canine companions from these pervasive parasites.

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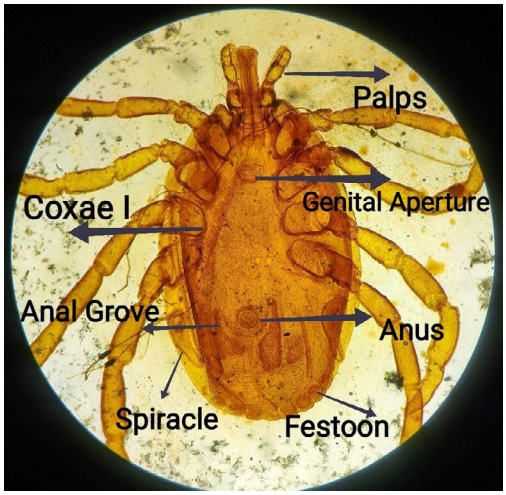

Fig. 1: Male tick of *Hylomma* spp.

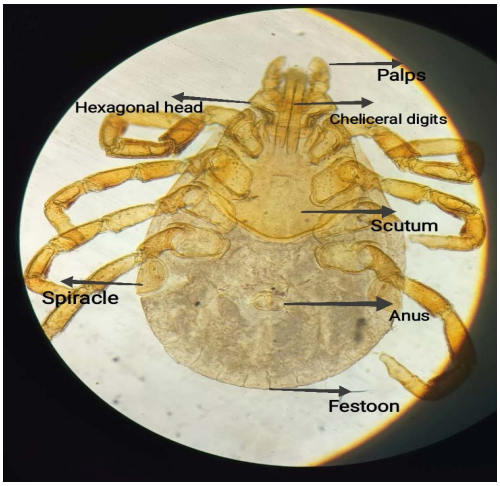

Fig. 2: *Rhipicephalus sanguineus* (Female)

References

Abd Rani, P.A.M., Irwin, P.J., Coleman, G.T., Gatne, M., & Traub, R.J. (2011). A survey of canine tick-borne diseases in India. *Parasites & Vectors, 4*(1), 1-8.

Abdullah, S., Helps, C., Tasker, S., Newbury, H., & Wall, R. (2016). Ticks infesting domestic dogs in the UK: A large-scale surveillance programme. *Parasites & Vectors,* 9(1), 1-9.

Adetayo, O.A., Makinde, O.E., Odeniran, P.O., & Adetayo, C.O. (2021). Prevalence and risk factors of tick infestation in dogs in Ibadan, Nigeria. *African Journal of Biomedical Research, 24,* 135.

Adsule, N.D., & Gavhane, U.V. (2022). Prevalence and distribution of hard ticks (Acari: Ixodidae) in domestic animals from Solapur District, Maharashtra, India. *International Journal of Zoological Investigations, 8*(2), 874-884.

Arong, G.A., Shitta, K.B., James-Rugu, N.N., & Effanga, E.O. (2011). Seasonal variation in the abundance and distribution of ixodid ticks on mongrel, Alsatian and mixed breeds of dogs (Canisfamiliaris) in Jos, Plateau State, North-Central Nigeria. *World Journal of Science and Technology, 1*(4), 24-29.

Beck, S., Schreiber, C., Schein, E., Krücken, J., Baldermann, C., Pachnicke, S., & Kohn, B. (2014). Tick infestation and prophylaxis of dogs in northeastern Germany: A prospective study. *Ticks and Tick-borne Diseases, 5*(3), 336-342.

Bhadesiya, C.M., & Modi, D.V. (2015). Correlation of epidemiology of Rhipicephalus sanguineus and canine Ehrlichiosis in nine different localities of middle Gujarat. *International Journal of Agricultural Science and Veterinary Medicine, 3*(1), 2320-3730.

Boruah, D., Barua, A., Das, B.C., Lahkar, D., Kr, M., Nath, K.B., & Dutta, R. (2021). A study on prevalence of tick infestation in dogs in Guwahati, Assam. *Journal of Entomology and Zoology Studies, 9(5),* 232-235.

Dantas-Torres, F. (2010). Biology and ecology of the brown dog tick, Rhipicephalus sanguineus. *Parasites & Vectors, 3*(1), 1-11.

Diniz, P.P.V., Beall, M.J., Omark, K., Chandrashekar, R., Daniluk, D.A., Cyr, K.E., & Breitschwerdt, E.B. (2010). High prevalence of tick-borne pathogens in dogs from an Indian reservation in northeastern Arizona. *Vector-Borne and Zoonotic Diseases, 10*(2), 117-123.

Eichenberger, R.M., Deplazes, P., & Mathis, A. (2015). Ticks on dogs and cats: A pet owner-based survey in a rural town in northeastern Switzerland. *Ticks and Tick-borne Diseases, 6*(3), 267-271.

Ghosh, S., & Nagar, G. (2014). Problem of ticks and tick-borne diseases in India with special emphasis on progress in tick control research: A review. *Journal of Vector Borne Diseases, 51*(4), 259-270.

Hadi, U.K., Soviana, S., & Pratomo, I.R.C. (2016). Prevalence of ticks and tick-borne diseases in Indonesian dogs. *Journal of Veterinary Science and Technology, 7*(3), 1-7.

Laxmi Bai, (2019). Rhipicephalus sanguineus tick prevalence in Ehrlichia canis infected dogs. *Journal of Entomology and Zoology Studies, 7*(1), 1516-1518.

Melo, A.L., Martins, T.F., Horta, M.C., Moraes-Filho, J., Pacheco, R.C., Labruna, M.B., & Aguiar, D.M. (2011). Seroprevalence and risk factors to Ehrlichia spp. and Rickettsia spp. in dogs from the Pantanal Region of MatoGrosso State, Brazil. *Ticks and Tick-borne Diseases, 2*(4), 213-218.

Modu, K.A., Babagana, M., Kyari, F., & Modibbo, L.M. (2021). Assessment of tick infestation rate among local and exotic dog breeds in Kano Municipal, Kano State, Nigeria. *International Journal of Veterinary Sciences and Animal Husbandry, 6*(2), 35-38.

Raghavan, M., Glickman, N., Moore, G., Caldanaro, R., Lewis, H., & Glickman, L. (2007). Prevalence of and risk factors for canine tick infestation in the United States, 2002-2004. *Vector-Borne and Zoonotic Diseases, 7*(1), 65-75.

Raut, P.A., Maske, D.K., Jayraw, A.K., & Sonkusale, V.G. (2006). Ectoparasitism in dogs from the eastern zone of Maharashtra state. *Journal of Parasitic Diseases, 30*(2), 138-141.