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SEASONAL DYNAMICS OF CANINE EHRLICHIOSIS: EPIDEMIOLOGICAL PROFILE IN A VETERINARY TEACHING HOSPITAL IN NORTHWESTERN PARANÁ

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ABSTRACT

Canine monocytic ehrlichiosis (CME) is an infectious disease caused by the bacterium *Ehrlichia canis*, transmitted mainly by the tick *Rhipicephalus linnaei*. The disease affects blood cells, with varied clinical symptoms and difficult diagnosis due to its heterogeneous presentation. The prevalence of CME is high in several regions of Brazil, being a challenge for veterinarians, especially due to the relationship with environmental and biological factors, such as tick infestation. Considering the epidemiological relevance of the disease, the objective of this study was to analyze its prevalence associated with the diagnosis of *E. canis* in dogs treated at the University Veterinary Hospital of the State University of Maringá, Umuarama campus, from November 2022 to October 2024. A data survey was carried out in 2,503 clinical records of dogs, diagnosed by immunochromatographic tests or by visualization of intracytoplasmic morulae. The variables analyzed were prevalence, time of year, sex, age group, and history of tick infestation. The results showed a predominance of 7.83%, with a higher incidence in winter (33.7%), in disagreement with previous studies that point to summer as the period of highest prevalence. The research also showed that adult and elderly dogs were the most affected, while puppies had a low prevalence, which corroborates previous findings about the greater susceptibility of adults to the disease. In addition, the presence of ticks was observed in 63.8% of the cases, highlighting the strong correlation between ectoparasite infestation and the development of infection. CME has a high prevalence in dogs treated in the Umuarama region, with factors such as age group and tick infestation influencing the prevalence. The data suggest that tick control, more than seasonality, significantly impacts the primacy of the disease, highlighting the importance of parasite control throughout the year, especially before periods of higher incidence, such as winter and summer.

Keywords: Parasite control. *Ehrlichia canis*. Prevalence. *Rhipicephalus linnaei*. Seasonality.

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INTRODUCTION

Canine monocytic ehrlichiosis (CME) is a severe infectious disease caused by *Ehrlichia canis*, an obligate intracellular bacterium that infects hematopoietic cells such as monocytes, macrophages, and neutrophils (Matos; Rocha-Lima, 2021; Espino-Solís *et al*., 2023) and which has a high prevalence in different regions of Brazil (Cirino *et al*., 2021).

Its transmission occurs mainly during the blood meal of the tick *Rhipicephalus linnaei*, and can also occur transplacentally, blood transfusions, or the use of contaminated needles and instruments (Matos; Rocha-Lima, 2021; Zu *et al*., 2024). The infected animal may show mild to severe signs or even be asymptomatic, depending on the stage of the disease and the immunocompetence of the host. Some of the most observed clinical signs are apathy, anorexia, fever, lymphadenomegaly, weight loss, epistaxis, peripheral edema, and hypovolemic shock (Caxito *et al*., 2018; Matos; Rocha-Lima, 2021).

The diagnosis of canine ehrlichiosis is challenging due to its variable clinical presentation. Laboratory abnormalities are essential for an early diagnosis of the disease (Miranda; Souza; Martins, 2022). Among the laboratory results reported, thrombocytopenia, aregenerative anemia, and leukopenia stand out, and intracytoplasmic rickettsiae morulas may be found (Espino-Solís *et al*., 2023; Silva; Guimarães; Cunha, 2023) inside leukocytes. Some biochemical changes can be observed, such as hypoalbuminemia, alkaline phosphatase (ALP), alanine aminotransferase (ALT), and creatinine values above the reference, as well as serum urea concentration below the reference value (Carvalho et al., 2024). Definitive diagnosis requires the association of serological and molecular tests or the visualization of *E. canis morulas* (Sales *et al.,* 2015).

The disease has an epidemiological pattern influenced by climatic, behavioral, and biological factors. In Brazil, its incidence is higher during the summer, when hot and humid conditions favor the reproduction of the vector, resulting in an increase in the occurrence of cases (Babo *et al*., 2020; Matos; Rocha-Lima, 2021). However, the dynamics of the disease can be altered by different variables, such as climate, habitat, animal management, as well as epidemiological factors, such as the disposition of the vector, the way of life, and the age group of the affected population (Cirino *et al*., 2021). Regarding biological aspects, studies indicate that females are frequently affected by the disease compared to males, and adult animals, especially those without defined breed (SRD), have a higher prevalence of infection (Babo *et al*., 2020; M; Silva; Santo, 2021).

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CME is a disease frequently present in the routine care of the University Veterinary Hospital of the State University of Maringá, Umuarama campus. Although there are some studies on the disease, there are still limited studies that address the epidemiological profile associated with ehrlichiosis in the microregion of Umuarama. Therefore, the present study aims to analyze the epidemiological profile related to the diagnosis of the disease from November 2022 to October 2024 at the University Veterinary Hospital of the State University of Maringá, *Umuarama* campus.

METHODOLOGY

PATIENT SCREENING AND DATA COLLECTION

A data survey was carried out from November 2022 to October 2024, at the University Veterinary Hospital of the State University of Maringá (UEM), Umuarama campus. Data were collected from medical records recorded in the Vetwork® electronic system. Dogs of any age, breed, or sex that presented clinical signs compatible with CME and were diagnosed positive for *E. canis* by immunochromatographic testing (SNAP 4Dx Plus®, IDEXX; Ehrlichiosis Ac Test Kit®, Alere; Ehrlichia Ab ECO Vet, ECO Diagnóstica®) or by visualization of intracytoplasmic clusters suggestive of rickettsiae during blood smear analysis.

The data were categorized according to sex, age group (Puppies – up to 11 months of age; adults – from 12 months to 6 years; elderly – over 6 years), breed and presence and/or history of ticks. The date of the consultation was also collected to carry out an epidemiological profile, considering the time of year, with the objective of making inferences regarding seasonality. The observed information was recorded in a spreadsheet of the Microsoft Excel® software version 2019.

STATISTICAL ANALYSIS OF THE RESULTS

The variables were analyzed using descriptive statistics, with relative frequency analysis, and presented in graphs and tables, based on the patients diagnosed with the disease.

RESULTS AND DISCUSSION

In total, 2,503 files from the University Veterinary Hospital of the State University of Maringá, *Umuarama* campus, were analyzed from November 2022 to October 2024.

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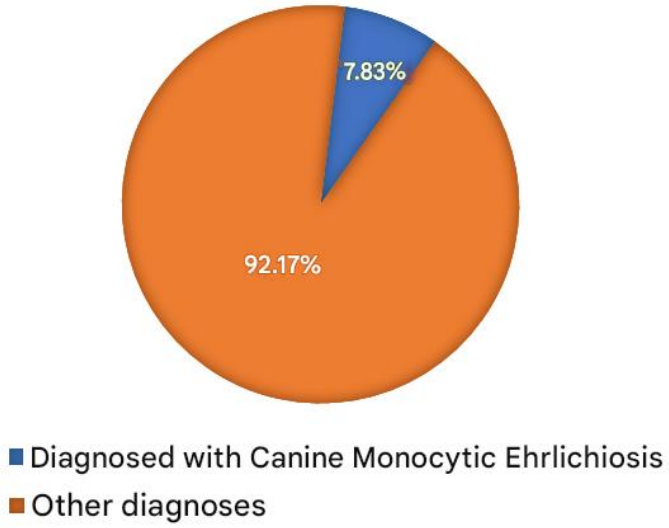
Among them, approximately 7.83% (196/2503) were positive for *E. canis* (Image 1).

Image 1. Diagnoses of *E. canis* at the UEM Veterinary Hospital in relation to the total number of attendances recorded in the period from November 2022 to October 2024.



Source: personal archive, 2024

A lower prevalence of ehrlichiosis infections was observed in the summer, with an incidence of 12.2% in this period (Table 1). The incidence increased to 26.5% in the fall, reaching its highest prevalence in the winter period, with 33.7%. These data contrast with the statements of authors such as Babo *et al*. (2020), Matos and Rocha-Lima (2021) and Espino-Solís *et al*. (2023), which indicate a higher frequency of ehrlichiosis in the summer, possibly associated with the distribution of the vector.

Image 2 shows a peak in the number of cases during the month of October, followed by a sharp reduction in the subsequent months, which may indicate a greater adoption of prophylactic measures by tutors. Thus, it can be inferred that the lower incidence observed in the summer is related to parasite control carried out in the months preceding this period.

Table 1. Distribution of frequencies of positive cases for *E. canis* by season diagnosed at the UEM Veterinary Hospital, Umuarama campus, from November 2022 to October 2024.

STATIONS	FA1 (N)	FR2
Spring		
2022	6	3,1%
2023	27	13,8%
2024	21	10,7%
	54	27,6%
Summer		
2023	10	5,1%
2024	14	7,1%

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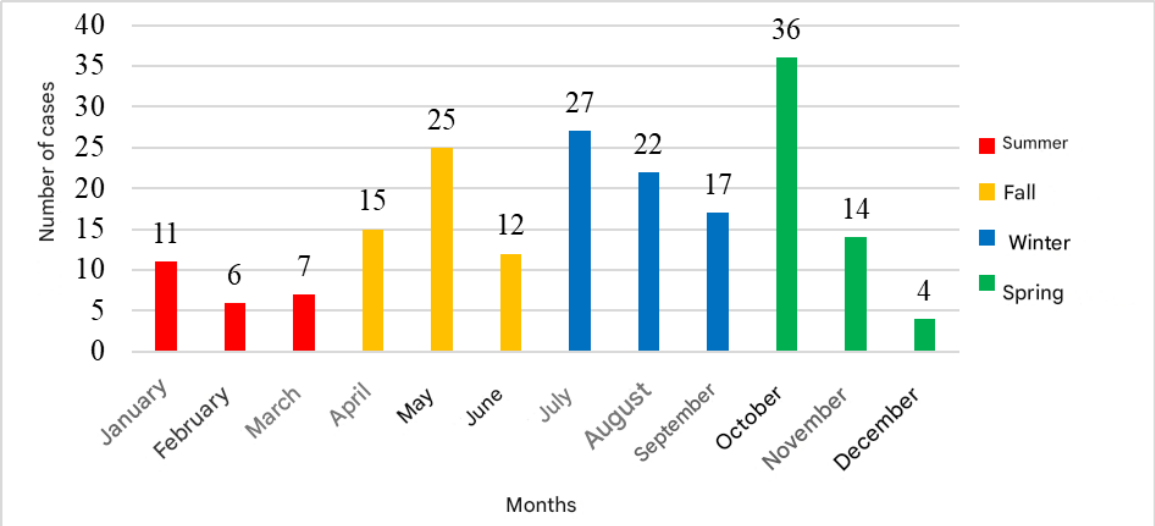
	24	12,2%
Autumn		
2023	15	7,6%
2024	37	18,9%
	52	26,5%
Winter		
2023	28	14,3%
2024	38	19,4%
	66	33,7%
TOTAL	196	100%

Legend: ¹Absolute Frequency; ²Relative Frequency
Source: personal archive, 2024.

Image 2. Monthly distribution of patients diagnosed with *E. canis* at the UEM Veterinary Hospital, from November 2022 to October 2024.



Source: personal archive, 2024.

As shown in Image 3, the temperature and average winter precipitation in Umuarama range between 14 °C to 26 °C and 81 mm to 137 mm, respectively (Climatempo, 2024). The observed temperature range is within the limits in which the vector can develop adequately, as evidenced by Dantas-Torres (2010), who highlights that the vector can thrive at temperatures ranging from 20 °C to 35 °C.

According to Monteiro (2017), the time required for egg laying until the larvae hatch depends on temperature and humidity conditions, and can vary between 20 and 60 days. Santos (2021a) states that, in drier periods, the parasite's egg laying intensifies, contributing to the growth in the number of ticks in the environment. Thus, a hypothesis that the present study allows us to consider is that, during the winter, a period of lower precipitation, tick infestations tend to be more frequent.

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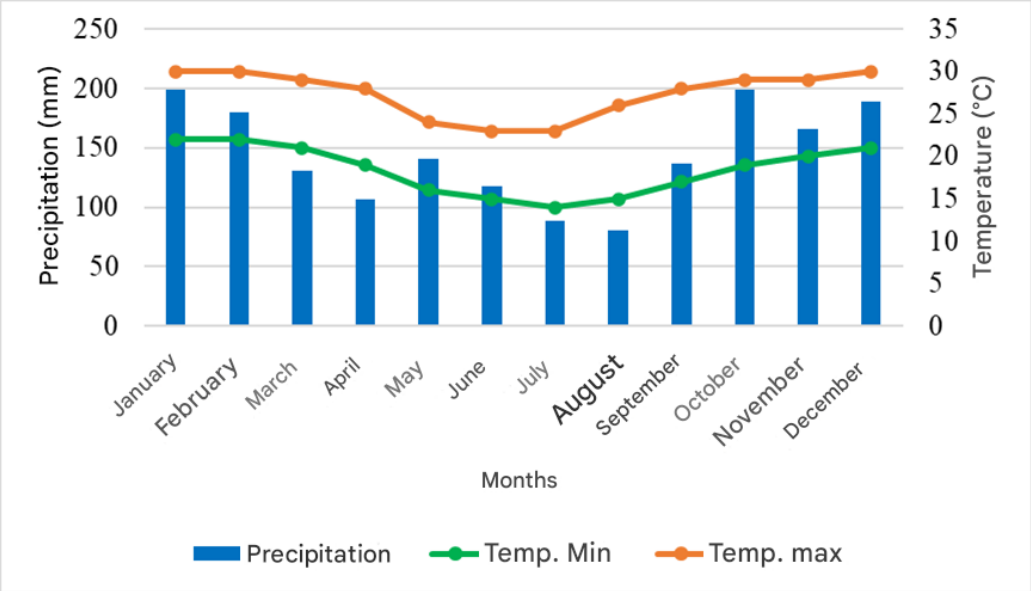
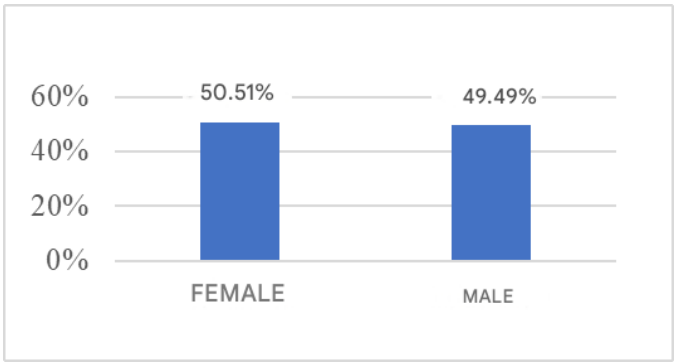
Image 3. Annual temperature and precipitation in Umuarama/PR.



Source: Climatempo, 2024.

Regarding gender, 99 animals (50.51%) were females and 97 (49.49%) were males (Image 4). This result did not show a clear predominance between the sexes, contrasting with the study by Silva, Guimarães and Cunha (2023), who observed that 56.25% of the dogs affected by the disease were females. Similarly, Babo *et al.* (2020) found a rate of 57% of females affected by the disease in their research. However, other authors, such as Cirino *et al*. (2021) and Maciel, Silva and Santo (2021), reported a higher prevalence of males, with 52.22% and 52.63%, respectively. The present study suggests, therefore, an equitable distribution of the disease between males and females in the region studied.

Image 4. Distribution of cases, by sex, diagnosed with *E. canis* at the UEM Veterinary Hospital, from November 2022 to October 2024.



Source: personal archive, 2024.

The age frequency is described in Image 5, categorized into puppies (0 to 11 months), adults (12 months to 6 years) and elderly (over 6 years). It was observed that only

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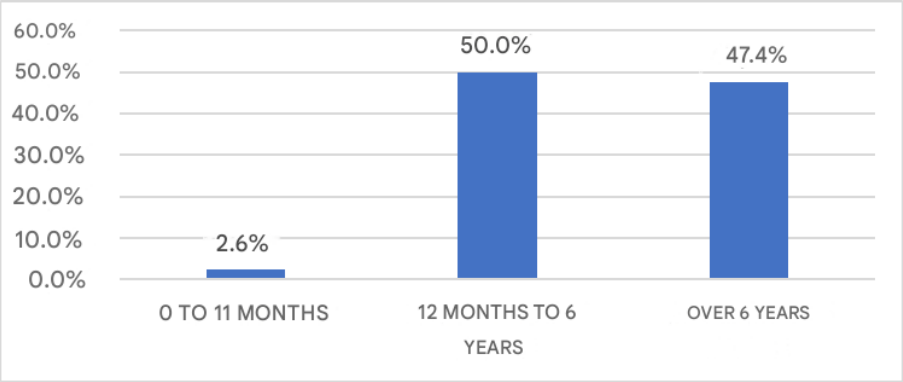
five puppies tested positive for ehrlichiosis, which corresponds to 2.6% of the total, while 98 adult dogs (50%) and 93 elderly dogs (47.4%) were diagnosed positive for *E. canis*. This result corroborates the findings of Maciel, Silva, and Santo (2021), who reported that 70.63% of the dogs positive for the disease were over 1 year old. On the other hand, in a study conducted by Babo *et al*. (2020), about 34% of dogs diagnosed with ehrlichiosis were puppies under one year old. However, according to Silva, Guimarães, and Cunha (2023), although puppies have greater susceptibility due to their developing immune system, less exposure to the external environment and the vector results in a lower prevalence in this age group.

Image 5. Distribution of cases, by age group, diagnosed with *E. canis* at the UEM Veterinary Hospital, from November 2022 to October 2024.



Source: personal archive, 2024.

The present survey found a variety of 22 different breeds (Table 2), with the highest prevalence observed among mixed-breed dogs (54.1%), followed by Shih-Tzu (7.7%), Pinscher (7.1%) and Pit bull (7.1%). Authors such as Babo *et al.* (2020), Maciel, Silva and Santo (2021) and Cirino *et al.* (2021), report that the dogs most affected by the infection are those of a defined breed, with the Poodle and Shih-Tzu breeds having the highest incidence. In this context, it is important to consider the socioeconomic reality of the tutors cared for at the Veterinary Hospital of UEM, whose indicators reveal reduced levels of education and lower purchasing power. In addition, the predominance of certain breeds in specific regions can also influence the predisposition to the manifestation of the disease.

Table 2. Distribution of breeds in patients diagnosed with *E. canis* at the UEM Veterinary Hospital, from November 2022 to October 2024.

RACES	FA1 (N)	FR2
American Bully	1	0,5%
Blue Heeler	3	1,5%
Border Collie	4	2,0%

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Boxer	2	1,0%
French Bulldog	2	1,0%
Chowchow	1	0,5%
Cocker Spaniel	1	0,5%
Golden Retriever	1	0,5%
Labrador Retriever	2	1,0%
Lhasa Apso	4	2,0%
Maltese	3	1,5%
Alsatian	5	2,5%
Pekingese	1	0,5%
Pinscher	14	7,1%
Pit Monster	2	1,0%
Pit bull	14	7,1%
Poodle	3	1,5%
Rottweiler	7	3,5%
Shih-Tzu	15	7,7%
German Spitz	1	0,5%
No Defined Breed	106	54,1%
Yorkshire Terrier	4	2,0%
Total	196	100,0%

Legend: ¹Absolute Frequency; ²Relative Frequency
Source: personal archive, 2024.

Image 6 showed that, of the 196 dogs diagnosed, 125 (63.8%) had a history of tick presence before or at the time of the consultation. On the other hand, in 71 dogs (36.2%) this data was not present or the report informed that there was no presence of ectoparasites in the patient prior to infection. According to Espino-Solís *et al.* (2023), tick infestation is correlated with the distribution and prevalence of hemoparasitosis, and in his study, it was observed that dogs with the ectoparasite are 113 times more likely to acquire CME.

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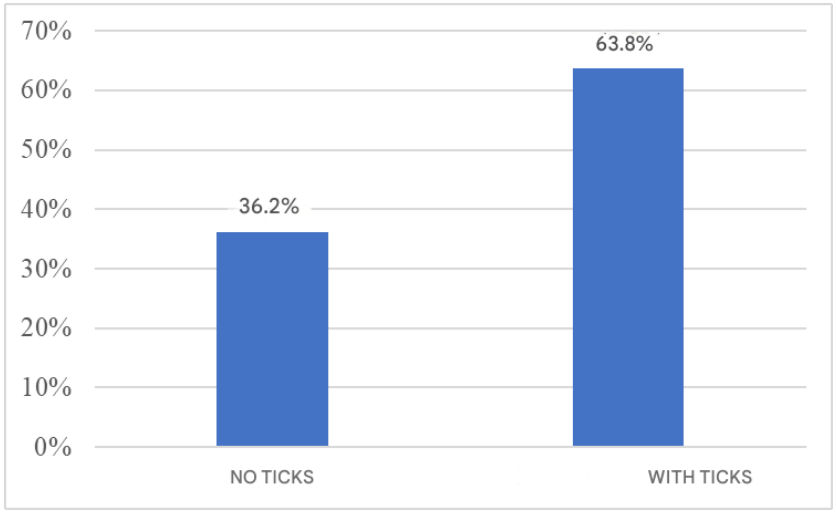
Image 6. History of tick infestation in patients diagnosed with *E. canis* at the UEM Veterinary Hospital, from November 2022 to October 2024.



Source: personal archive, 2024.

As observed by Almeida, Barbosa, and Alvarez (2024), many owners demonstrate a lack of knowledge regarding the risks associated with ectoparasites. This information deficit results in inadequate practices of prophylaxis methods, which involve the correct use of antiparasitic drugs and the maintenance of an appropriate interval between applications.

Santos (2021b) highlights this flaw by pointing out that, although many owners claim to perform flea and tick control, the frequency of these procedures varies significantly, with a considerable proportion of owners (37.7%) performing the control only every three months. This irregularity in control practices increases the risk of infection by vector-borne diseases, such as ehrlichiosis, since the inadequate interval between doses of antiparasitics compromises the effectiveness of prevention.

CONCLUSION

The present study demonstrated that CME has a significant prevalence at the Veterinary Hospital of the UEM, especially in adult and elderly dogs, and is strongly associated with a history of tick infestation. Unlike other studies, the data indicate that vector control, more than seasonality, may be related to disease dynamics. It is suggested that the implementation of control measures before the periods of higher incidence of the disease, such as winter and summer, may result in a reduction in the number of annual cases. In addition, it is recommended that future research investigate the population dynamics of ticks and evaluate the effectiveness of continuous parasite control strategies in different seasons.

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