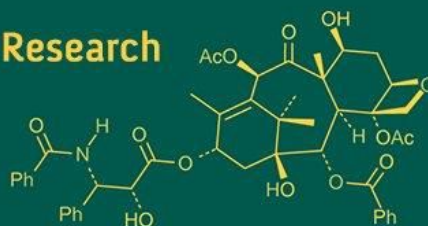
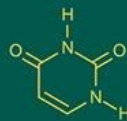
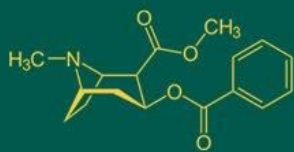


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(12): 1012-1016
www.biochemjournal.com
Received: 05-09-2025
Accepted: 08-10-2025

Shivam Sharma
Department of Veterinary
Medicine, Dr. GC Negi College of
Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Pardeep Sharma
Department of Veterinary
Medicine, Dr. GC Negi College of
Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Devina Sharma
Department of Veterinary
Parasitology, Dr. GC Negi College
of Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Ajay Katoch
Department of Veterinary
Medicine, Dr. GC Negi College of
Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Ankur Sharma
Department of Veterinary
Medicine, Dr. GC Negi College of
Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Adarsh Kumar
Department of Veterinary Surgery
& Radiology, Dr. GC Negi College
of Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Corresponding Author:
Pardeep Sharma
Department of Veterinary
Medicine, Dr. GC Negi College of
Veterinary and Animal Sciences,
CSK Himachal Pradesh Krishi
Vishwavidyalaya Palampur,
Himachal Pradesh, India

Prevalence of different types of arrhythmias in canine babesiosis and ehrlichiosis

Shivam Sharma, Pardeep Sharma, Devina Sharma, Ajay Katoch, Ankur Sharma and Adarsh Kumar

DOI: <https://www.doi.org/10.33545/26174693.2025.v9.i12m.6701>

Abstract

The study assessed cardiac arrhythmias in dogs naturally infected with tick-borne diseases in Palampur. Of 2,755 dogs examined, 465 (16.87%) were haemoparasite-positive and 108 (23.22%) exhibited electrocardiographic abnormalities. *Babesia gibsoni* was the predominant pathogen, followed by *Ehrlichia canis*. Major arrhythmias included sinus arrhythmia, tachycardia, low-voltage QRS complexes, QRS notching and ST-segment deviations. Middle-aged male dogs were most affected. The findings highlight significant cardiac involvement in tick-borne infections and underline the importance of routine ECG for early detection and management.

Keywords: Babesiosis, Ehrlichiosis, Arrhythmia, ECG

Introduction

Tick-borne haemoparasitic diseases (TBDs) such as babesiosis and ehrlichiosis are widely prevalent among dogs in India and are frequently associated with multisystemic complications including anaemia, thrombocytopenia and systemic inflammation. Cardiac involvement is an important but often underestimated consequence of these infections, with arrhythmias being a common manifestation of myocardial hypoxia, inflammatory injury and electrolyte disturbances. Limited information exists on arrhythmias associated with naturally occurring TBDs in the Himalayan region. Thus, the present investigation was undertaken to determine the prevalence and pattern of arrhythmias in dogs infected with *Babesia gibsoni* and *Ehrlichia canis*.

Materials and Methods

A total of 2,755 dogs presented to the Department of Veterinary Medicine, COVAS, Palampur, from April 2024 to August 2025 were screened. Giemsa-stained blood smears were examined for haemoparasites. Positive animals underwent haematobiochemical evaluation and electrocardiography. Standard six-lead ECGs were recorded in right lateral recumbency. Data were analysed based on age, sex, month-wise occurrence and type of arrhythmia. Prevalence percentages were calculated following standard procedures.

Results and Discussion

Of the 2,755 dogs examined, 465 (16.87%) were positive for haemoparasites (Table 1). *Babesia gibsoni* (68.81%) was the most prevalent organism, followed by *Ehrlichia canis* (27.09%), while *Babesia canis*, *Hepatozoon canis* and mixed infections were less frequent (Table 2). These observations concur with earlier findings indicating the predominance of *B. gibsoni* in northern India (Chaudhuri *et al.*, 2017) [2].

Table 1: Prevalence of tick-borne diseases in Dogs

Parameter	No. of Cases	Percentage (%)
Total dogs presented	2755	...
Canines with tick-borne diseases	465	16.87

Table 2: Prevalence of tick-borne diseases in dogs (Giemsa-stained blood smear)

Etiology	No. of Cases	Percentage (%)
<i>Babesia gibsoni</i>	320	68.81
<i>Ehrlichia canis</i>	126	27.09
<i>Babesia canis</i>	6	1.29
<i>Hepatozoon canis</i>	2	0.43
Co-infection	11	2.36

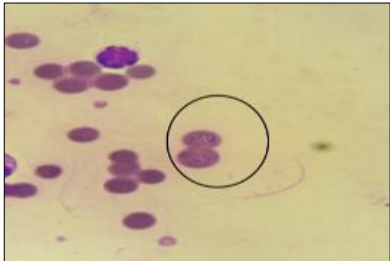


Fig 1: *Babesia gibsoni* in a RBC with acute angle (circled) in blood smear

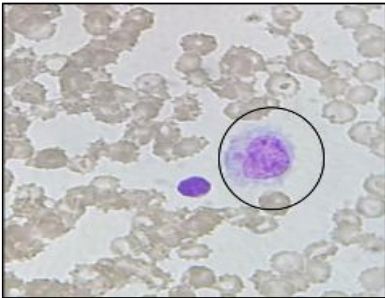


Fig 2: *Ehrlichia canis* morula in a monocyte in blood smear

Higher case occurrence was recorded during warm and humid months, with a peak during August 2024. Male dogs and those aged 2-6 years were predominantly affected (Table 3). Similar demographic trends have been reported previously (Chisu *et al.*, 2024)^[3].

Table 3: Month, age and sex wise prevalence of tick-borne diseases (Giemsa Stained)

Month-Year	<i>Babesia gibsoni</i>	<i>Ehrlichia canis</i>	<i>Babesia canis</i>	<i>Hepatozoon canis</i>	Co-infection	Male	Female	Age		
								<2y	2-6y	>6y
Apr-24	21	5	0	0	0	19	7	11	9	6
May-24	19	11	1	0	0	27	4	12	14	5
Jun-24	21	5	0	2	0	22	6	9	12	7
Jul-24	24	14	1	0	0	33	6	13	17	9
Aug-24	38	11	1	0	1	39	12	6	30	15
Sep-24	20	11	0	0	1	25	7	5	16	11
Oct-24	23	7	0	0	4	27	7	12	16	6
Nov-24	24	10	0	0	2	26	10	8	19	9
Dec-24	11	5	0	0	0	12	4	3	9	4
Jan-25	16	9	0	0	0	20	5	5	16	4
Feb-25	13	5	0	0	0	15	3	5	10	3
Mar-25	15	4	0	0	0	13	6	3	11	5
Apr-25	17	5	1	0	1	18	6	7	10	7
May-25	14	10	1	0	0	20	5	13	7	5
Jun-25	18	4	1	0	0	17	6	5	12	6
Jul-25	14	6	0	0	1	16	5	8	9	4
Aug-25	12	4	0	0	1	14	3	6	8	3
Total	320	126	6	2	11	363	102	131	225	109

Among 465 haemoparasite-positive animals, 108 (23.22%) exhibited ECG abnormalities (Table 4). Babesiosis accounted for 53.70% of these cardiac cases, followed by ehrlichiosis (32.40%) and mixed infections (12.03%).

Comparable myocardial involvement in TBDs has been reported by Chaudhuri *et al.*, (2017)^[2] and Diniz *et al.*, (2008)^[4].

Table 4: Prevalence of positive cases with cardiac alterations

Total positive cases (n=108)								
Babesiosis			Ehrlichiosis			Co-infection		
58			35			13		
Male		Female	Male		Female	Male		Female
50			29			12		
		8			6			1
Age (y = years)								
<2y	2y-6y	>6y	<2y	2y-6y	>6y	<2y	2y-6y	>6y
18	21	19	9	15	11	2	6	5

Breed distribution indicated the highest involvement in Mongrels, followed by Labradors and German Shepherds

(Table 5). This likely reflects greater exposure to outdoor environments.

Table 5: Breed-wise prevalence of positive cases with cardiac alterations

Breed	Babesiosis (n= 58)	Ehrlichiosis (n= 35)	Co-infection (n=13)	Prevalence (%)
Labrador	10	6	1	16.0
German Shepherd	8	5	1	13.2
Golden Retriever	6	4	2	11.3
Husky	5	3	1	8.5
Mongrel	20	10	6	34.0
Toy Breeds (Shi Tzu, Lhasa, Pug, French Bulldog)	5	4	1	9.4
Giant Breeds (St. Bernard, Rottweiler, Bully)	4	3	1	7.5

Twenty-nine arrhythmic patterns were identified (Table 6). The most common abnormalities included tachycardia (44.4%), sinus arrhythmia (23.1%), low-voltage QRS complexes (20.3%), QRS notching (19.4%), atrial standstill

(16.6%) and ST-segment deviations (14.8%-17.6%). These changes may be attributed to anaemia-induced hypoxia, metabolic derangements and inflammatory myocardial injury (Lobetti, 2005) [7].

Table 6: Prevalence of different types of arrhythmias in tick-borne diseases (n=108)

Sr. No.	Arrhythmia	Affected Number	Prevalence %
1.	Sinus Arrhythmia	25	23.1
2.	Wandering pacemaker	15	13.8
3.	Tachycardia	48	44.4
4.	Bradycardia	12	3.7
5.	Atrial Fibrillation	3	2.7
6.	Supraventricular premature complexes / Supraventricular tachycardia	1	0.9
7.	Atrial flutter	2	1.8
8.	Ventricular premature complexes or ventricular escape complex	8	7.4
9.	Ventricular fibrillation	1	0.9
10.	Paroxysmal ventricular tachycardia	1	0.9
11.	Ventricular trigeminy	1	0.9
12.	SA block	9	8.3
13.	Atrial Standstill	18	16.6
14.	1 st degree Heart Block	1	0.9
15.	2 nd degree Heart Block	2	1.8
16.	3 rd Degree Heart Block	1	0.9
17.	Bundle Branch Blocks (Left & Right bundle branch blocks)	2	1.8
18.	ST elevation	16	14.8
19.	ST depression	19	17.6
20.	ST coving	3	2.7
21.	Low Voltage QRS complexes	22	20.3
22.	QRS notching	21	19.4
23.	High Voltage QRS complexes	4	3.7
24.	Wide QRS complexes	4	3.7
25.	P-mitrale	11	10.8
26.	P-pulmonale	2	1.8
27.	Tall T waves	6	5.5
28.	Deep Q waves	16	14.8
29.	Deep S waves	2	1.8

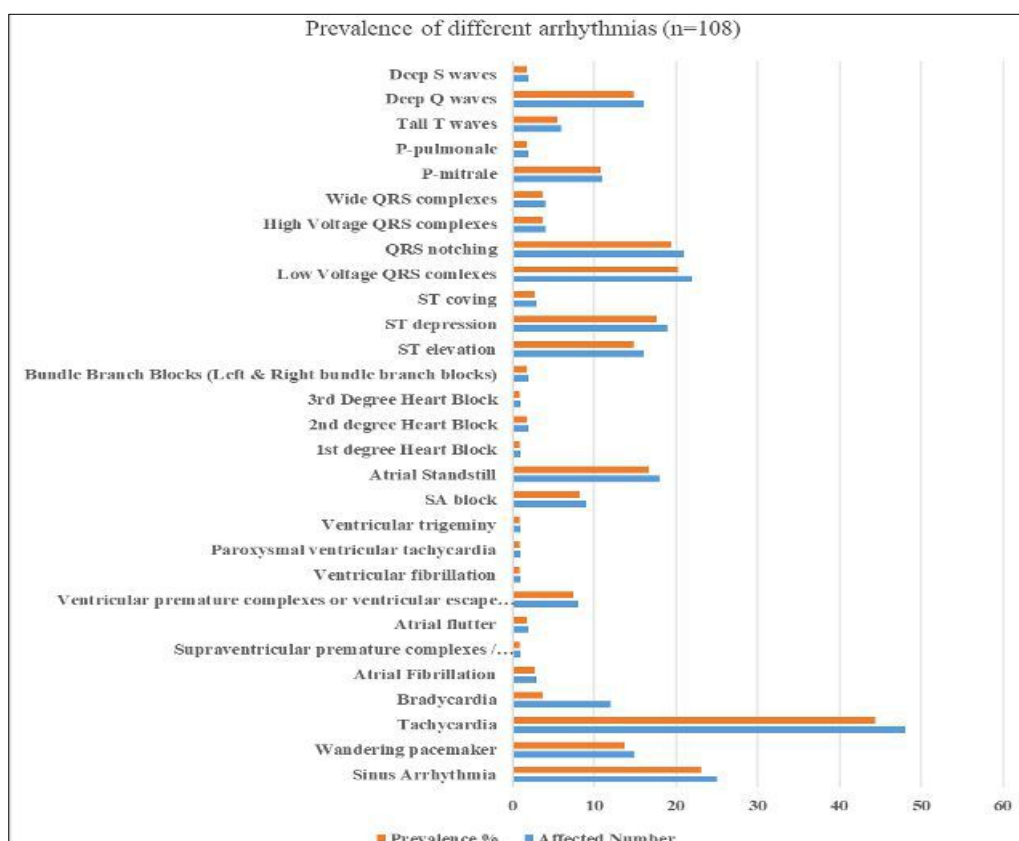


Fig 3: Prevalence of different types of arrhythmias in dogs with tick-borne diseases

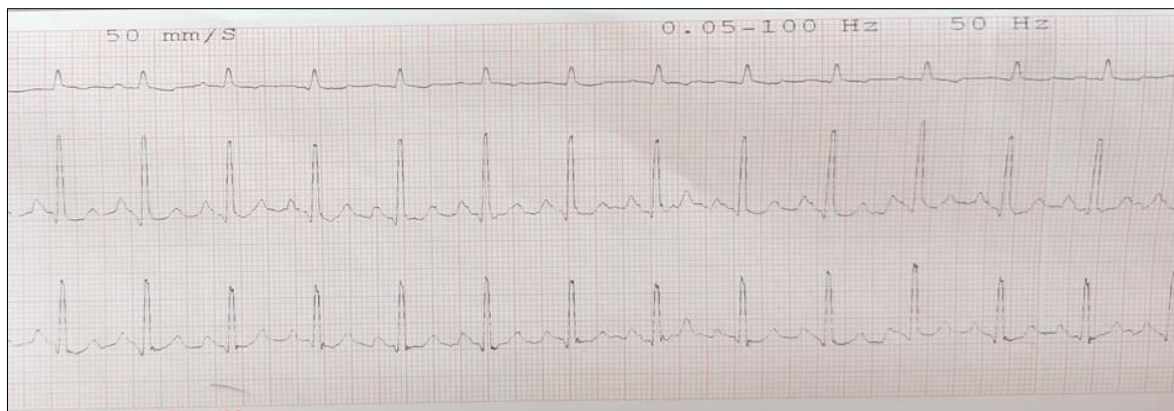


Fig 4: ECG of dog affected with *B. gibsoni* showing sinus tachycardia HR-200 bpm (recorded at 50 mm/s paper speed and 10 mm/mV gain)

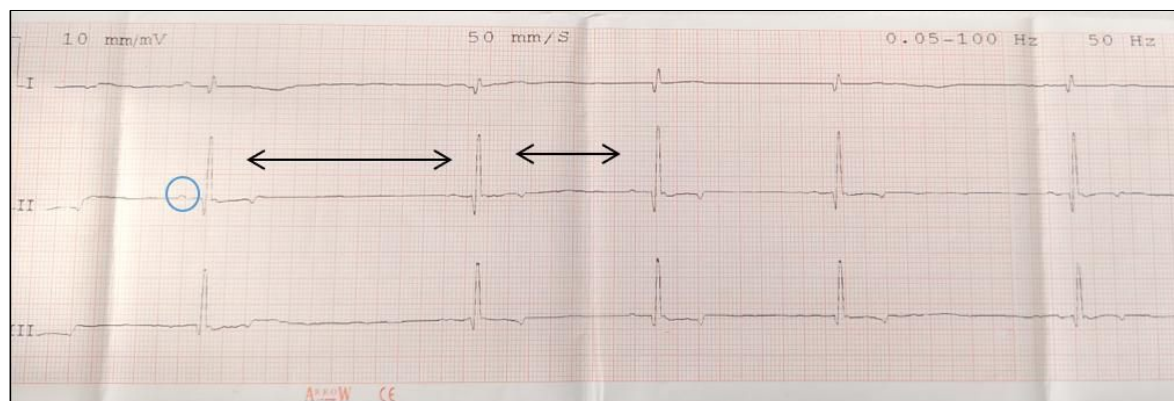


Fig 5: ECG of dog affected with *E. canis* showing bradycardia HR-60 bpm with irregular R-R interval and wandering pacemaker (recorded at 50 mm/s paper speed and 10 mm/mV gain)

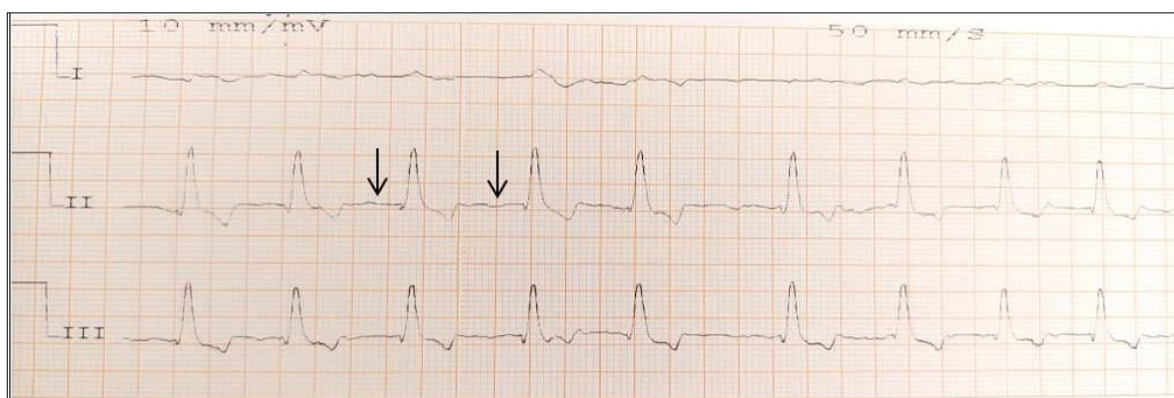


Fig 6: ECG of dog affected with *B. gibsoni* showing atrial fibrillation with no discernible P waves (recorded at 50 mm/s paper speed and 10 mm/mV gain)

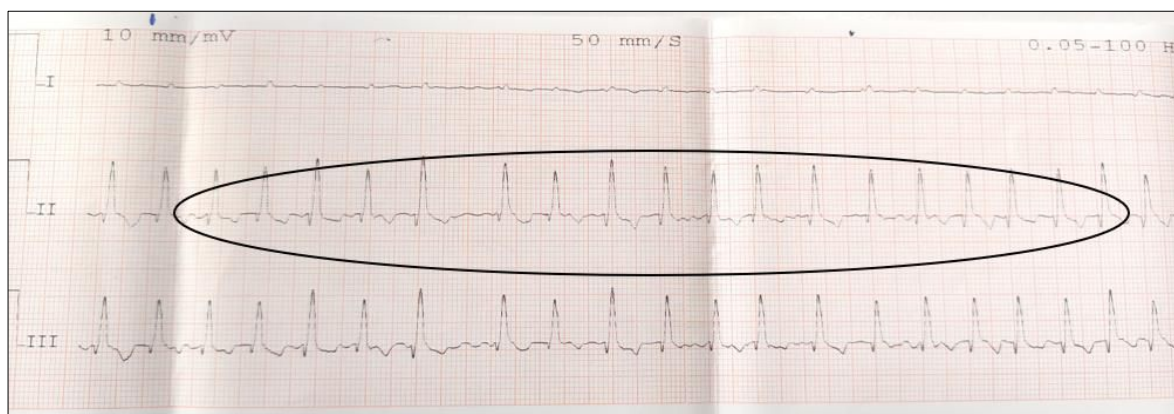


Fig 7: ECG of dog affected with *B. gibsoni* showing supraventricular tachycardia HR- 240 bpm (recorded at 50 mm/s paper speed and 10 mm/mV gain)

ST elevation, ST depression, deep Q waves and T-wave abnormalities observed in this study have been previously documented in canine babesiosis (Gowtham *et al.*, 2022 and Champion *et al.*, 2013) [5, 1]. Atrial standstill, a severe conduction disturbance, suggests significant electrolyte imbalance or myocardial degeneration, which aligns with earlier findings (Diniz *et al.*, 2008) [4].

Overall, the arrhythmias recorded in this study reflect the multifactorial cardiac pathogenesis of TBDs, involving hypoxia, oxidative stress and myocarditis, as supported by Lobetti *et al.*, (2002) [6].

Conclusion

The present study conclusively demonstrates that tick-borne haemoparasitic infections, particularly babesiosis and ehrlichiosis, are associated with a substantial burden of cardiac involvement in dogs. *Babesia gibsoni* emerged as the predominant pathogen, reflecting its endemic significance in the study region, with infections showing clear seasonal, age- and sex-related trends. Nearly one-fourth of haemoparasite-positive dogs exhibited electrocardiographic abnormalities, confirming that myocardial dysfunction is a frequent and clinically relevant complication of these diseases.

A wide spectrum of arrhythmias was documented, with tachycardia, sinus arrhythmia, low-voltage QRS complexes, QRS notching and ST-segment deviations being the most prevalent. These electrocardiographic alterations indicate underlying myocardial hypoxia, inflammatory injury, oxidative stress and conduction disturbances secondary to anaemia and systemic illness. The occurrence of severe abnormalities such as atrial standstill, atrial fibrillation and ventricular arrhythmias further emphasizes the potential for life-threatening cardiac complications in affected dogs.

Overall, the findings highlight the importance of incorporating routine electrocardiographic evaluation into the diagnostic and monitoring protocols for dogs with tick-borne diseases. Early recognition of cardiac involvement can facilitate timely therapeutic interventions, improve clinical management and potentially reduce morbidity and mortality. This study adds valuable regional data to the existing literature and underscores the need for heightened clinical vigilance regarding cardiovascular complications in canine tick-borne haemoparasitic infections.

Acknowledgement

The authors thank the Department of Veterinary Medicine, COVAS, CSKHPKV, Palampur, for providing necessary facilities.

References

1. Champion T, Franco C, Neto GB, Camacho AA. Electrocardiographic evaluation and serum cardiac troponin I levels in anemic dogs with blood parasitosis. *Semina: Ciências Agrárias*. 2013;34(6):2915-2924.
2. Chaudhuri S, Varshney J, Chaugkija B. Electrocardiographic changes in canine babesiosis. *Archives of Palliative Care*. 2017;2(2):1014.
3. Chisu V, Tanda A, Sechi S, Pinna P, Parpaglia ML, Masu G, Loi F, Masala G. Clinical study and serological diagnosis of vector-borne pathogens in Sardinian dogs. *Veterinary Sciences*. 2024;11(7):313.
4. Diniz PP, De Moraes HS, Breitschwerdt EB, Schwartz DS. Serum cardiac troponin I concentration in dogs with ehrlichiosis. *Journal of Veterinary Internal Medicine*. 2008;22(5):1136-1143.
5. Gowtham RM, Gowri B, Kavitha S, Leela V. Myocardial dysfunction due to babesiosis in a dog. *Indian Journal of Veterinary and Animal Sciences Research*. 2022;51(4):84-90.
6. Lobetti R, Dvir E, Pearson J. Cardiac troponins in canine babesiosis. *Journal of Veterinary Internal Medicine*. 2002;16(1):63-68.
7. Lobetti RG. Cardiac involvement in canine babesiosis. *Journal of the South African Veterinary Association*. 2005;76(1):4-8.