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#### Shivakumar V

Assistant Professor, Department of Veterinary Medicine, Veterinary College, KVAFSU, Bidar, Hassan, Karnataka, India

#### Vivek R Kasaraliker

Professor and Head, Department of Veterinary Medicine, Veterinary College, Bidar, Karnataka, India

#### Upendra HA

Former Dean, Veterinary College, Bengaluru, Karnataka, India

#### Shivakumar M

Professor and Head, Department of Veterinary Medicine, Veterinary College, Gadag, Karnataka, India

#### Naveenkumar GS

Associate Professor and Head, Department of Animal Genetic and Breeding, Veterinary College, Hassan, Karnataka, India

#### Santhosh CR

Assistant Professor, Department of Pharmacology and Toxicology, Veterinary College, Bengaluru, Karnataka, India

#### Ramesh PT

Professor and Head, Department of Veterinary Medicine, Veterinary College, Bengaluru, Karnataka, India

#### Corresponding Author:

#### Shivakumar V

Assistant Professor, Department of Veterinary Medicine, Veterinary College, KVAFSU, Bidar, Hassan, Karnataka, India

## Epidemiological study on bovine theileriosis in Hassan district, Karnataka

Shivakumar V, Vivek R Kasaraliker, Upendra HA, Shivakumar M, Naveenkumar GS, Santhosh CR and Ramesh PT

### Abstract

The present work has been carried out to study the epidemiology of Bovine theileriosis in and around Hassan District of Karnataka State. Retrospective study was carried out over a period of three years and prospective study for a period of one year. Prevalence of Bovine theileriosis was found to be 4.05 percent and 17.69 percent in retrospective and prospective study, respectively. There was a statistically significant increase in percent prevalence in prospective study compared to retrospective study. Present study revealed statistical significant ( $p \leq 0.05$ ) difference with respect to gender-wise prevalence. Female animals suffer more from Bovine theileriosis compared to male animals. Among positive animals, percent prevalence was more in female animals (87.80%) compared to male animals (12.20%). In both retrospective and prospective study, breed-wise prevalence was more in HF crossbred cattle followed by Jersey crossbred and Non-descript cattle. It was noticed that there was no statistical significant difference with respect to breed-wise prevalence although crossbred animals are more prone to diseases than indigenous. There was no statistical significant difference with respect to age-wise prevalence indicating the Bovine theileriosis can occur in any age group whenever animals are exposed to causative agents. In retrospective study, prevalence of Bovine theileriosis was highest in post monsoon followed by summer, monsoon and least in winter season. Moreover in prospective study same trend was noticed with high prevalence in post monsoon, summer, monsoon and least in winter season. When season-wise prevalence of Bovine theileriosis was analyzed statistically, there was no significant difference among different season in both retrospective and prospective study indicating Bovine theileriosis can occur throughout the year depending on other predisposing factors.

**Keywords:** Prevalence, year-wise, breed-wise, age-wise, season-wise

### 1. Introduction

Agriculture in India provides livelihood to about 65-70 percent of the population. Diseases affecting livestock can have a devastating effects on animal productivity and on trade of live animals, meat and other animal products, on human health and consequently on the overall process of economic development. Vector borne haemoprotozoan diseases namely theileriosis, babesiosis and trypanosomiasis cause devastating losses to the livestock industry and pose major constraints to dairy industry throughout the world. Recent studies have shown that Bovine theileriosis is of highest significance in relation to its high incidence, loss of production and mortality. Theileriosis brings about serious economic loss to the livestock industries through stunted growth, delayed maturity, decreased milk production, abortion in pregnant cows and death of high yielding crossbred cows. *Theileria* is an obligate intracellular protozoan parasite that belongs to Phylum - Apicomplexa, Class-Piroplasmida, Order-Piroplasmorida and Family-Theileriidae. Impact of Bovine theileriosis on livestock is felt more in the tropical and subtropical parts of the world. Bovine theileriosis is mainly caused by *T. annulata*, *T. parva* and rarely *T. orientalis* which affect domestic cattle (*Bos taurus* and *Bos indicus*) and Asian buffalo (*Bubalus bubalis*). *T. parva* and *T. annulata* are the two most pathogenic and consequently economically important species worldwide (Von Schubert *et al.*, 2010)<sup>[41]</sup>. Bovine theileriosis is trans-stadially transmitted by ticks. The occurrence of Bovine theileriosis is seasonal and coincides with the incidence of ticks on the host, which is very high during the period from June to October. Disease is seen more frequently when naive animals are introduced into an endemic area or when infected animals are introduced to a herd where a competent vector is present. Some additional factors namely stress due to hot climate, transportation, intercurrent diseases, vaccination stress, parturition, lactation etc. also markedly influence the progression and outcome of the disease (Aditya, 2015)<sup>[2]</sup>.

## 2. Materials and Methods

### 2.1 Ethical animal handling

The study protocol was reviewed and approved by the Institutional Animal Ethical Committee, (IAEC), Veterinary College, Bengaluru. All the precautions were taken to avoid or minimize discomfort, distress and pain to the animals under study.

### 2.2 Epidemiological study

Retrospective study was conducted for the period of three conjugative years from 1<sup>st</sup> April 2018 to 31<sup>st</sup> March 2021. Data with respect to prevalence of Bovine theileriosis was collected from the case sheets maintained in the Veterinary Clinical Complex, Veterinary College, Hassan, Karnataka. Information pertaining to age, gender, breed, season, clinical signs and haematological parameters were collected, tabulated and analysed using suitable statistical methods. Prospective study was conducted for a period of one year from 1<sup>st</sup> April 2021 to 31<sup>st</sup> March 2022 in dairy cattle presented to Veterinary Clinical Complex, Veterinary College, Hassan. Cattle showing signs of anorexia, fever, enlarged lymphnodes, history of ticks on the body or cattle shed, respiratory distress, pale conjunctival or oral mucus membrane were subjected to thorough clinical and laboratory investigation. One hundred cattle which were showing clinical signs suggestive of Bovine theileriosis and found positive on blood smear examination, fine needle aspiration technique of enlarged lymphnodes and confirmed by Polymerase Chain Reaction (PCR) were selected for prospective study. Information pertaining to age, sex, breed and season-wise prevalence of Bovine theileriosis was collected, tabulated, analyzed using suitable statistical methods.

### 2.3 Blood smear examination

Blood smear was made using blood collected from the

peripheral circulation such as ear vein, fixed with absolute methanol (5mins), stained with 10% Giemsa stain (30mins) and examined under oil immersion microscope to observe intraerythrocytic forms of *Theileria orientalis* (Zafar *et al.*, 2006) [42]. The parasites were identified according to the characters described by Soulsby (1982) [36].

### 2.4 DNA extraction and PCR

The DNA from all the blood samples was isolated using the method described by Martin *et al.* (2010) [21] and was subjected to PCR assay for amplification of specific genes. PCR assay was performed for confirmation by using *Theileria orientalis* (MPSP gene) specific primers (Ahmed *et al.*, 2020) [3] and *Theileria annulata* (Cytochrome b1 gene) specific primers (Chouch *et al.* (2018)) [8].

## 3. Results

### 3.1 Epidemiology of Bovine theileriosis

In retrospective study, among 1949 cases of cattle presented to Veterinary Clinical Complex, Veterinary College, Hassan over a period of three years, 79 cattle were found positive for Bovine theileriosis with a prevalence of 4.05 percent wherein diagnosis was made based on clinical signs and blood smear examination.

In prospective study, a total of 712 cattle were screened for Bovine theileriosis which were presented to Veterinary Clinical Complex, Veterinary College, Hassan over a period of one year. Among 712 cattle, 126 cattle were found positive with a prevalence of 17.69 percent wherein diagnosis was made based on clinical signs, blood smear examination and Polymerase Chain Reaction (PCR). There was a statistically significant ( $p \leq 0.05$ ) increase in percent prevalence in prospective study compared to retrospective study (Table 1).

**Table 1:** Year-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Retrospective study					Chi square test p value
Duration: Three Years					
Sl. no.	Year	Total Number of Cases (Cattle)	No. of Theileria cases	Percentage (%)	
1.	2018-19	806	21	2.61	
2.	2019-20	483	16	3.31	
3.	2020-21	660	42	6.36	
	Total	1949	79	4.05%	
Prospective study Duration: One Year					
4.	2021-22	712	126	17.69%	

### 3.1.3 Gender-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Gender-wise prevalence of Bovine theileriosis was studied for a period of three years in retrospective study and one year in prospective study. Among 254 cases of male cattle, 7 (2.76%) were found positive for Bovine theileriosis and among 1695 cases of female cattle, 72 (4.25%) were found positive for Bovine theileriosis in retrospective study. Among 110 male cattle, 18 (16.36%) cattle and among 602 cows, 108 (17.94%) cows were found positive for Bovine theileriosis in prospective study. When gender wise prevalence over last four years were analyzed, it was found that 25 (6.87%) male cattle out of 364 and 180 (7.84%) out of 2297 female cattle were positive for Bovine theileriosis. Among positive animals, percent prevalence in both retrospective study and prospective study was more in female compared to male and the difference was statistically significant ( $p \leq 0.05$ ) (Table 2 & 2a).

### 3.1.4 Breed-wise prevalence of Bovine theileriosis

Breed-wise prevalence of Bovine theileriosis was studied for a period of three years in retrospective study and one year in prospective study. Among 1100 cases of HF crossbred, 48 cases (4.36%), among 622 cases of Jersey crossbred cattle, 22 cases (3.54%) and among 227 cases of Non- descript (ND), 8 cases (3.52%) were found positive for Bovine theileriosis in retrospective study. Whereas among 401 cases of HF crossbred, 73 (18.20%), among 203 cases of Jersey crossbred cattle, 36 cases (17.73%) and among 108 cases of non-descript, 17(15.74%) were found positive for Bovine theileriosis in prospective study. When breed-wise prevalence over last four years were analyzed, it was found that 121 (8.06%) out of 1501 HF crossbred and 58 (7.03%) out of 825 Jersey crossbred and 25 (7.46%) out of 335 non-discript were found positive for Bovine theileriosis. However, there was no statistical significant difference with respect to breed-wise prevalence. The results are enumerated in Table 3 & 3a

### 3.1.5 Age-wise prevalence of Bovine theileriosis

Retrospective study for a period of three years showed highest prevalence of 56.96 percent (45/79) in cattle aged between 2-6 years followed by 32.91 percent (26/79) in the cattle more than 6 years of age. Whereas, least prevalence was recorded in cattle aged less than 2 years of age (10.12%, 8/79). Among 126 cases of Bovine theileriosis in prospective study, highest prevalence of 53.17 percent (67/126) in cattle aged between 2-6 years followed by 24.60 percent (31/126) in the cattle more than 6 years of age whereas, least prevalence was recorded in cattle aged less than 2 years of age (22.22%, 28/126) (Table 4 & 4a). Analysis of overall prevalence (retrospective and prospective) of Bovine theileriosis showed highest prevalence in cattle aged between 2-6 years (8.70%) followed cattle aged less than 2 years of age (7.93%) and the least prevalence in the cattle more than 6 years of age (6.20%). In the present study, there was no statistical significant difference with respect to age-wise prevalence indicating the Bovine theileriosis can occur in any age group whenever animals are exposed to causative agents.

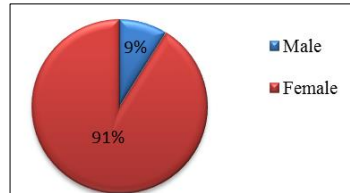
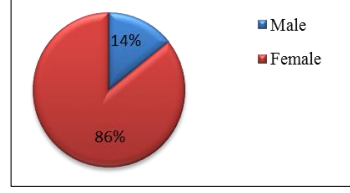
### 3.1.6 Season-wise prevalence of Bovine theileriosis

Season-wise prevalence of Bovine theileriosis was studied for a period of three years in retrospective study and one year in prospective study. In retrospective study, prevalence of Bovine theileriosis was highest in post monsoon season with 5.79 percent (27/466) followed by summer season with 4.18 percent (22/526), monsoon season with 3.35 percent (21/627) and least in winter season with 2.73 percent (9/330). Prevalence in prospective study showed same trend with high prevalence in post monsoon with 19.49 percent (38/195) followed by summer with 18.90 percent (24/127), monsoon with 17.53 percent (51/291) and least in winter with 13.13 percent (13/99). When season-wise prevalence of Bovine theileriosis was analyzed statistically, there was no significant difference among different season in both retrospective and prospective study indicating that Bovine theileriosis can occur throughout the year and highest number of cases recorded in the month of July followed by August, September and October and least number of cases in the month of January (Table 5).

**Table 2:** Gender-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Bovine theileriosis	Year	Total Number of Cases (Cattle)	Total number of positive Theileria cases	Male			Female		
				Total no. of male cases	No. of Theileria cases	% of occurrence	Total no. of female cases	No. of Theileria cases	% of occurrence
Retrospective study	2018-19	806	21	108	2	1.85	698	19	2.72
	2019-20	483	16	54	2	3.70	429	14	3.26
	2020-21	660	42	92	5	5.43	568	37	6.51
	Total	1949	79	254	7	2.76	1695	72	4.25
Prospective study	2021-22	712	126	110	18	16.36	602	108	17.94
Gender wise prevalence over four years		2661	205	364	25	6.87	2297	180	7.84
Chi square test P value		< 0.001							

**Table 2a:** Gender-wise percent prevalence of Bovine theileriosis among positive animals

Number of Theileria positive animals		Male	Female	Pie diagram depicting gender-wise point prevalence of Bovine theileriosis among positive animals	
				Retrospective Study	Prospective study
Retrospective study	79	7 (8.86%)	72 (91.14%)		
Prospective study	126	18 (14.29%)	108 (85.71%)		

**Table 3:** Breed-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Bovine theileriosis	Year	Total Number of Cases (Cattle)	Total number of Theileria cases	HF Crossbred			Jersey Cross bred			ND (Non-Descript)		
				Total no. of HFx	No. of Theileria cases	%	Total no. of Jrx	No. of Theileria cases	%	Total no. of ND	No. of Theileria cases	%
Retrospective study	2018-19	806	21	460	15	3.26	284	3	1.06	62	3	4.84
	2019-20	483	16	256	9	3.52	146	6	4.11	81	1	1.23
	2020-21	660	42	384	24	6.25	192	13	6.77	84	4	4.76
	Total	1949	79	1100	48	4.36	622	22	3.54	227	8	3.52
Prospective study	2021-22	712	126	401	73	18.20	203	36	17.73	108	17	15.74
Breed wise prevalence over four years		2661	205	1501	121	8.06	825	58	7.03	335	25	7.46
Chi square test p value		0.2739										

**Table 3a:** Breed-wise percent prevalence of Bovine theileriosis in retrospective study and prospective study in positive animals

	Number of Theileria positive animals	HF crossbred	Jersey crossbred	Non-Descript (ND)	Pie diagram depicting breed-wise point prevalence of Bovine theileriosis among positive animals	
					Retrospective Study	Retrospective Study
Retrospective study	79	48 (60.75%)	22 (27.85%)	8 (10.13%)		
Prospective study	126	73 (57.94%)	36 (28.57%)	17 (13.49%)		

**Table 4:** Age-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Bovine theileriosis	Year	Total Number of Cases (Cattle)	Total number of Theileria cases	≤2 years			2-6 Years			≥6 Years		
				Total no. of cattle	No. of Theileria cases	%	Total no. of cattle	No. of Theileria cases	%	Total no. of cattle	No. of Theileria cases	%
Retrospective study	2018-19	806	21	122	3	2.46	406	11	2.71	278	7	2.52
	2019-20	483	16	74	2	2.70	183	7	3.83	226	7	3.10
	2020-21	660	42	94	3	3.19	354	27	7.63	212	12	5.66
	Total	1949	79	290	8	2.76	943	45	4.77	716	26	3.63
Prospective study	2021-22	712	126	164	28	17.07	345	67	19.42	203	31	15.27
Age-wise prevalence over four years		2261	205	454	36	7.93	1288	112	8.70	919	57	6.20
Chi square test p value		0.2429										

**Table 4a:** Age-wise point prevalence of Bovine theileriosis in retrospective and prospective study in positive animals in percentage

Number of Theileria positive animals		Cattle aged ≤ 2 Years	Cattle aged 2-6 Years	Cattle aged ≥ 6 Years	Pie diagram depicting age-wise point prevalence of Bovine theileriosis among positive animals	
					Retrospective Study	Retrospective Study
Retrospective study	79	8 (10.12%)	45 (56.96%)	26 (32.91%)		
Prospective study	126	28 (22.22%)	67 (53.17%)	31 (24.60%)		

**Table 5:** Season-wise prevalence of Bovine theileriosis in Hassan District, Karnataka

Sl. No	Season	Retrospective study			Prospective Study			Chi square test p Value
		Total no. of cases	No. of Theileria cases	% Positivity	Total no. of cases	No. of Theileria cases	% Positivity	
1.	Summer	526	22	4.18	127	24	18.90	0.2367
2.	Monsoon	627	21	3.35	291	51	17.53	
3.	Post-Monsoon	466	27	5.79	195	38	19.49	
4.	Winter	330	9	2.73	99	13	13.13	

**4. Discussion**

In the retrospective study, out of 1949 cases of cattle presented to Veterinary Clinical Complex, Veterinary College, Hassan over a period of three years, 79 cattle were found positive for Bovine theileriosis with an occurrence of 4.05 percent wherein diagnosis was made based on clinical signs and blood smear examination. The present finding is in accordance with Venkataraman *et al.* (1999) [40], Hoghoogi Rad *et al.* (2011) [16] and Madhukar (2015) [20] who have also reported lower prevalence of Bovine theileriosis in their retrospective study. However Kohli *et al.* (2014) [18] reported prevalence of theileriosis as 14.94 percent which is comparatively higher compared to present investigation. The

lower prevalence recorded at Hassan during retrospective study period of three years might be due the fact that information was collected from data available from Veterinary Clinical Complex, Veterinary College, Hassan especially during COVID 19 pandemic years where less number of cases were recorded and diagnosis was made based on only clinical signs and blood smear examination.

In the prospective study, a total of 712 cattle were screened for Bovine theileriosis which were presented to Veterinary Clinical Complex, Veterinary College, Hassan over a period of one year. Among 712 cattle, 126 cattle were found positive with an occurrence of 17.69 percent wherein diagnosis was made based on clinical signs, blood smear examination and



Polymerase Chain Reaction (PCR). The increase in the prevalence of Bovine theileriosis in the prospective study compared to retrospective study was statistically significant ( $p \leq 0.05$ ). High prevalence of Bovine theileriosis during prospective study is in agreement with several authors. Higher prevalence in the present study may be attributed to extensive survey and use of several diagnostic tests including gold standard PCR which has high specificity and sensitivity as compared to all other tests. High prevalence in this area could be due to presence of ticks almost throughout the year and also lack of awareness among cattle owners with respect to possible transmission Bovine theileriosis through ticks. The study area, Hassan District is situated in the tropical zone where temperature will be in the range of 20 °C to 25 °C and relative humidity of 75 to 85 percent during monsoon and post monsoon season which lasts for about five to six months. Favourable climatic condition for tick proliferation and other predisposing causes such as stress and malnutrition increase the incidence of the disease in crossbred cattle.

Overview of Bovine theileriosis indicated high prevalence of Bovine theileriosis in various states of India. In Haryana state, Galhotra and Chandiramani (1981) [13] reported 35.53 percent prevalence in cattle and buffaloes. Chengalva Raidu and Hafeez (1997) [9] reported 10.50 percent prevalence in cattle and buffaloes from Andhra Pradesh. Roy *et al.* (2004) [32] reported 8.17 percent prevalence of theileriosis in Durg, Rajhandgaon, Raipur and Bastar Districts of Chhattisgarh. Raina *et al.* (2005) [28] reported the prevalence of Bovine theileriosis 3.44 percent in Jammu District. Aktas *et al.* (2006) [4] reported 45 percent prevalence of *Theileria* based on specific Polymerase Chain Reactions. Aulakh and Singla (2006) [7] reported 6.94 percent prevalence of *Theileria annulata* in Punjab. Soundarajan and Rajavelu (2006) [37] reported 28.2 and 8.0 percent prevalence of *Theileria annulata* in cattle and buffaloes respectively in and around Madras, Tamil Nadu. Pallav and Haque (2007) [24] reported Bovine theileriosis prevalence of 33.31 percent in Jharkhand. Muhanguzi *et al.* (2010) [23] reported higher prevalence (68%) of *Theileria* infection using reverse line blot (RLB) assay and PCR. Veluswamy *et al.* (2014) [39] reported prevalence of 13 percent in cattles using microscopic examination in Tamil Nadu. Kohli *et al.* (2014) [18] reported 27.2 percent overall prevalence of theileriosis in Dehradun, Uttarkhand state by blood smear examination and 32.5 percent by using *Theileria* genus specific PCR test. Kumar *et al.* (2015) [19] reported 9.35 percent prevalence of theileriosis. De *et al.* (2014) [11] reported the prevalence of 7.31 percent. Madhukar (2015) [20] reported over all prevalence of 31.6 percent in Bidar, Karnataka. In Turkey, Inci *et al.* (2008) [17] reported that prevalence of Bovine theileriosis was 60.5 percent by microscopic examination and 67.5 percent by IFAT. Patil (2017) [26] reported the prevalence of theileriosis of 17.62 percent on the basis of microscopic examination of blood smear and 39.20 percent on the basis of PCR assay in buffaloes of Nagpur region. Shashikala *et al.* (2018) [34] reported prevalence of 31.05 percent in and around Patna, Bihar. From the above reports it was clear that Bovine theileriosis is highly prevalent throughout India which corroborates the high prevalence of Bovine theileriosis in and around Hassan in the present investigation.

Gender-wise prevalence of Bovine theileriosis was studied for a period of three years in retrospective study and one year in prospective study. Among positive animals, higher prevalence (87.80%) was recorded in female (cows) compared to males

(12.20%). In recent years there was increased trend to rear female milch animals among the dairy farmers. The latest animal censuses (2020) showed an increase of 18 percent in female cattle population, where as male cattle population decreased by 30.2 percent compared to previous cattle censuses (2012). Further, one more reason could be attributed to the stress of parturition and also during peak lactation period which could pre dispose female animals to Bovine theileriosis. Higher prevalence of Bovine theileriosis in female animals finds support from the findings of previous workers namely Sahoo (1991) [33], Panda *et al.* (2011) [25], Aditya (2015) [2], Madhukar (2015) [20] and Shashikala *et al.* (2018) [34].

Higher prevalence of Bovine theileriosis in HF crossbred animals was recorded in the present investigation compared to Jersey crossbred and Non-descript cattle. The results of the present study indicated that prevalence of Bovine theileriosis was not influenced by the breed of bovines. However, susceptibility and higher prevalence of Bovine theileriosis in pure breed and cross breeds has been documented by various workers *viz.* Gautam (1981) [14], Raja *et al.* (1986) [29], Datta *et al.* (1988) [10], Grewal (1990) [15], Singh (1990) [35], Ashfaq and Razzak (2000) [6], Rakha and Sharma (2003) [30], Zahid *et al.* (2005) [43], Abdou *et al.* (2005) [1], Muhanguzi *et al.* (2010) [23], Aditya (2015) [2], Madhukar (2015) [20] and Shashikala *et al.* (2018) [34]. Genetic predisposition, higher tendency for tick infestation due to thin skin could be attributed for comparatively higher incidence of Bovine theileriosis in crossbred cattle compared to non descript cattle.

In the present study, there was no statistical significant difference with respect to age-wise prevalence indicating the Bovine theileriosis can occur in any age group whenever animals are exposed to causative agents. However during the study period prevalence of Bovine theileriosis was numerically higher in cattle in the age group of 2-6 years followed by cattle in the age group of above 6 years and cattle under 2 years of age. Prevalence of Bovine theileriosis was more in animal's age group of 2-6 year and it is due to the fact that cattle undergo lot of stress during this phase such as pregnancy, parturition and peak production period. Animals aged more than 6 years and young animals less than two years might have less immunity which may also contribute to occurrence of theileriosis. Several factors contribute to occurrence of theileriosis namely immune status of the animal, feeding pattern, good managerial practice, stress of pregnancy, parturition, lactation, vector prevalence and other concurrent infection.

Review of literature indicated that various workers have reported higher prevalence of Bovine theileriosis in different age groups which confirms the fact that age has no direct influence on prevalence of Bovine theileriosis. The results of present investigation are in accordance with the earlier reports of Raina *et al.* (2005) [28], Ram Rup and Gupta (2006) [31], Ananda *et al.* (2009) [5], Madhukar (2015) [20], Aditya (2015) [2] and Shashikala *et al.* (2018) [34]. However reports of Rakha and Sharma (2003) [30], Roy *et al.* (2004) [32], Muhanguzi *et al.* (2010) [23] and Sudhakar and Vijayakumar (2020) [37] documented higher incidence in young animals than adult. Differences in geographical, agro climatic conditions might have attributed to the trend of higher occurrence in adult cattle in the present research.

Season-wise prevalence of Bovine theileriosis was studied for a period of three years in retrospective study and one year in prospective study. In retrospective study, prevalence of

Bovine theileriosis was highest in post monsoon season which is followed by summer season, monsoon season and least in winter season. Similar trend was noticed with high prevalence in post monsoon season, summer season, monsoon season and least in winter season in prospective study. However difference was not statistically significant. Thereby, it can be concluded that Bovine theileriosis was recorded throughout the year.

High ambient temperature and humidity during June to September has been suggested as favourable environment for vector population by earlier reports of Eren *et al.* (1998)<sup>[12]</sup>, Muhammad *et al.* (1999)<sup>[22]</sup>, Rakha and Sharma (2003)<sup>[30]</sup>, Ananda *et al.* (2009)<sup>[5]</sup> and Shashikala *et al.* (2018)<sup>[34]</sup>. However, higher incidence during dry season of summer has been reported by Datta *et al.* (1988)<sup>[10]</sup>, Pallav and Haque (2007)<sup>[24]</sup>, Quayyum *et al.* (2010)<sup>[27]</sup> and Panda *et al.* (2011)<sup>[25]</sup>.

High ambient temperature and increased humidity in and around Hassan District, the area of interest in present study, during June to September might be favourable for vector abundance. Moreover, these factors found to stimulate maturation of sporozoites in the salivary gland of infected ticks.

## 5. Conclusion

Bovine theileriosis is highly prevalent in and around Hassan, Karnataka area. Bovine theileriosis can have a devastating effects on animal productivity and on trade of live animals, meat and other animal products, on human health and consequently on the overall process of economic development. So study on epidemiology of Bovine theileriosis helps in formulating different strategies for prevention and control of Bovine theileriosis.

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