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Prevalence of Bovine Theileriosis in South Bihar

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Abstract

The present study was undertaken to know the prevalence of Bovine Theileriosis in South Bihar, during the period of June'2019 to May'2021 with the randomized sampling of biological sample with three districts of south Bihar by collecting blood samples from 500 tick infested animals. Thin blood smears were prepared, air dried, fixed with methanol and stained with Giemsa stain. The microscopic observation of stained blood smears was done to observe the presence of intraerythrocytic piroplasms, indicator of theileria. Prevalence of Theileriosis in South Bihar was recorded to be 33.20% and among 3 studied district, prevalence of Theileriosis was highest in Nawada (35.92%) followed by Patna (33.75%) and the least in Sheikhpura (27.03%). The highest number of clinical Theileriosis were recorded (47.59%) in rainy followed by summer (31.33%) and least in winter (21.08%) season. Age wise prevalence was found to be highest in above 3 years age group (40.98%) followed by 1-3 years age group (27.70%) and least in below one year age group (18.60%). Higher prevalence was occurred in females (35.19%) than males (20.59%) and more in lactating ((42.35%) than non-lactating (23.42%) cattle. Under breed wise, the highest prevalence (38.20%) occurred in HF cross followed by Jersey cross (30.46%) and least in non-descript breed (18.64%) of cattle.

Keywords: theileriosis, prevalence, south Bihar, tick, season and breed

Introduction

Bovine Theileriosis, a lympho-proliferative, tick-borne hemoprotozoan disease of cattle, is caused by an apicomplexan parasite *Theileria annulata*. It causes severe economic losses to livestock farmers globally due to high incidence, mortality, weight losses, abortions, reduced milk yield and cost of control measures (Gharbi *et al.*, 2006, 2011) [8, 9]. It is widely distributed in both tropical and sub-tropical region and most profoundly occurs around the Mediterranean basin, Middle East and Southern Asia (Gubbels *et al.*, 1999; Branco *et al.*, 2010; Silva *et al.*, 2010) [11, 5, 26]. The parasite acts as a serious constraint to the cattle production in endemic areas, causing lethal infections in exotic cattle and considerable mortality in indigenous and crossbred stock (Hassanpour *et al.*, 2008; Woods *et al.*, 2013) [12, 31]. The bovine mortality rate rises up to 40–60% and even more (Razmi *et al.*, 2009) [23]. An estimate stated that bovine tropical theileriosis costs the Indian livestock sector about US \$ 384.3 million annually (Kumar *et al.*, 2018) [17].

Ticks of the genus *Hyalomma* are the common vectors of this protozoan parasite that transmit the parasite to the final hosts including cattle and water buffaloes (Kahn and Line 2006; Robinson, 1982) [13, 24]. These are mostly two host ticks, preferring hot and humid climate for completion of their life cycle and the tick positive for infective stages of *Theileria annulata* acts as constant source of infection to susceptible animals (Singh *et al.*, 2017 and Kohli *et al.*, 2014) [27, 18].

Osman and Al-Gaabary, 2007 [20] reported typical clinical signs which usually appear 7-25 days after tick attaches, comprised of marked rise in body temperature, reaching to 40 - 41.5 °C, followed by anorexia, depression, lacrimation, nasal discharge and swelling of the superior lymph nodes. Marked emaciation and occasional haemoglobinuria may also occur (Soulsby, 1982) [29].

Bihar is one of the important states of India located in the eastern part of country with sizable livestock population. Bihar has a diverse climate. Its temperature is subtropical in general with hot summers and cool winters. Taking the topography, rainfall and temperature into consideration, Bihar has been divided into four agro-climatic zones (Government of Bihar, 2009) [10]. These are Zone-I (North Alluvial Plain), Zone-II (North-East Alluvial Plain), Zone-III (South East Alluvial Plain) and Zone IIIB (South West Alluvial Plain).

The total area covered by the state of Bihar is 94.163 sq. Km (36357 sq.mi). It's average elevation above sea level is 173 feet (53 m).

The prevalence of Theileriosis differs from region to region and various factors determine the occurrence of the disease such as sex, age, breed, season, tick density, geographical area and management. Previously the disease has been reported from different states by various workers in different years, Bihar (Kala *et al.*, 2018) [14], Odisha (Singh *et al.*, 2017, Acharya *et al.*, 2016) [27, 3], Punjab (Kumar *et al.*, 2015) [16], Hariyana (Chaudhari *et al.*, 2013) [6], Gujarat (Vahora *et al.*, 2012) [30] and North Bangalore (Ananda *et al.*, 2009) [2].

Materials and Methods

The study areas were chosen prudently to focus purposefully all the zones covering of South Bihar to generate sensitive data representing the entire South Bihar. Accordingly, the study areas were fixed to district Patna under Zone IIIA and Sheikhpura and Nawada under Zone IIIB has been selected.

Collection of Samples: Blood samples collected from 500 tick infested animals having clinical manifestation of pyrexia, lymph nodes enlargement, pallor mucous membrane, anaemia, bilateral lacrimation, rough coat, debilitated condition and weakness. The study was conducted during the period of June'2019 to May'2021 from study area.

Microscopic Examination through blood smear: For presence of Theileria organisms (piroplasma) within the RBCs, the blood smear was prepared from the ear margin capillary bed and stained with Giemsa stain which then examined further under microscope. The smears were

examined under 100 X before declaring as negative for Theileria organisms.

The protocols followed in the study are as mentioned below:

- Age wise: Animals were subjected for the prevalence study under three groups according to age. Number of animals within the age group was taken as per available cases.
 - Group I comprised of animals of less than one year of age.
 - Group II consisted between one to three years age of animals.
 - Group III consisted with the age above three years.
- Sex wise: Available cases were grouped under either sex (male/female).
- Lactation status: The infected animals were grouped as per status of lactation
- Season wise: Seasonal effect on disease prevalence was monitored and recorded.
- Breed wise: Prevalence of Theileriosis was also recorded in different available breeds in the area.

Statistical analysis: All the data recorded were analysed statistically as per the standard method given by Snedecor and Cochran (1994) [28]. Chi-square test was used to see significant differences ($P < 0.01$) among age, sex, lactation, season and breed.

Results and Discussion

The result of the study revealed that prevalence of Theileriosis in south Bihar was recorded to be 33.2%. Highest prevalence was recorded in Nawada (35.92%) followed by Patna (33.75%) and the least in Sheikhpura (27.03%) (Table 1).

Table 1: District wise prevalence of Theileriosis in cattle

District	Total no. of animals screened	No. of animals positive	% positive animals	Calculated value χ^2 2df
Patna	323	109	33.75	1.66 ^{NS}
Sheikhpura	74	20	27.03	
Nawada	103	37	35.92	
Total	500	166	33.20	

NS-Non-significant

Geographical locations of South Bihar have had much prevalence of Theileriosis, but not yet such comprehensive study was done in South Bihar. However, it has to be mentioned that Kala *et al.* (2018) [14] reported only on prevalence in and around Patna to 31.05%,

Season wise Prevalence: The highest number of clinical Theileriosis were found in rainy season (47.59%) followed by summer (31.33%) and least in winter (21.08%) (Table-2). The recorded data were highly significant ($P < 0.01$).

Table 2: Season wise prevalence of Theileriosis in cattle

Season	No. of animals positive	Percentage	Calculated value χ^2 2df
Rainy	79	47.59	11.15**
Winter	35	21.08	
Summer	52	31.33	

** Significant at $P < 0.01$

The study region was characterized by three well defined seasonal periods. Winter season during October to January with decrease in temperature and rainfall that leads to a reduction of the population of vectors. Summer season from

February to May coincides with an increase in temperature and humidity with occasional rain. Rainy season from June to September with high rainfall and temperature coupled with humidity resulting in an increased number of vectors. In addition, the decreased host resistance due to climatic stress in rainy season resulted into precipitation of disease. Highest prevalence was observed in rainy season. The observations are in conformity with that of Vahora *et al.* (2012) [30], Kohli *et al.* (2014) [18] and Brahma *et al.* (2018) [4]. In contrast to present finding, Datta *et al.* (1988) [7] and Pallav and Haque (2007) [21] observed highest prevalence in summer followed by rainy and lowest in winter season.

Age wise Prevalence: Out of 86 animals of age group up to 1year, screened for Theileriosis by microscopic observation; 16 (18.60%) were found positive. In 1 to 3years of age group; 41 (27.70%) out of 148 animals were found positive and under group of more than 3 yrs of age; 266 animals were screened, of which 109 (40.98%) were found positive for Theileriosis. The highest prevalence was found in >3 years age group followed by 1-3 years and least in <1 year group (Table-3).

Table 3: Age wise prevalence of Theileriosis in cattle

Age group	Total no. of animals screened	No. of animals positive	% positive animals	Calculated value χ^2 2df
<1 year	86	16	18.60	17.53**
1-3 years	148	41	27.70	
>3 years	266	109	40.98	
Total	500	166	33.20	

** Significant at P<0.01

Least incidence in age group of below 1 year might be due to the group containing calves lesser than six months of age having passive immunity from mother against disease. Inverse age resistance and stronger passive acquired immunity might be the contributing factors ensuing lower prevalence of parasites in younger age group of animals. Findings of present study are in close agreement with the findings of Naik *et al.*, 2016^[19] and Brahma *et al.*, 2018^[4].

Sex wise prevalence: Out of total 500 animals taken for the study, 14 males (20.59%) out of 68, and 152 females (35.19%) out of 432, were found positive for Theileriosis. The calculated value of χ^2 1df (5.64) revealed significant (P<0.05) difference in the prevalence pattern of Theileriosis in cattle on the susceptibility of sex (Table-4). Sex wise prevalence was observed more in females (35.19%) than males (20.59%).

Table 4: Sex wise prevalence of Theileriosis in cattle

Sex	Total no. of animals screened	No. of animals positive	% positive animals	Calculated value χ^2 1df
Male	68	14	20.59	5.64*
Female	432	152	35.19	
Total	500	166	33.20	

* Significant at P<0.05

Females found more prone to Theileriosis in comparison to male. This might be ascribed to lesser number of male samples collected from study area due to paucity of male animals. Higher incidence in female might be due to some hormonal disturbances which penetrate it to weaken immune system. This is in concurrence with reports of Naik *et al.* (2016)^[19], Saleem *et al.* (2014)^[25] and Khan *et al.* (2017)^[15].

Lactation wise prevalence: For the study of lactation wise prevalence, total 392 animals were screened and were divided into two groups namely lactating (281) and non-lactating (111). Among lactating animals, 119 (42.35%) and among non-lactating animals, 26 (23.42%) were found positive for Theileriosis. The prevalence of Theileriosis was found more in lactating than non-lactating animals (Table-5).

Table 5: Lactation wise prevalence of Theileriosis in cattle

Lactating/ Nonlactating	Total no. of animals screened	No. of animals positive	% positive animals	Calculated value χ^2 1df
Lactating	281	119	42.35	12.23**
Nonlactating	111	26	23.42	
Total	392	145	36.99	

** Significant at P<0.01

Stress during lactation is one of the major factors behind the immuno-suppression which lead to nourishment and flourishment of infective organism in the host system. In the present study prevalence of Theileriosis was found more in lactating animals. Higher infection in lactating animal might be due to hormonal and immunological changes.

Breed wise Prevalence: Breed wise prevalence of

Theileriosis in different available breeds of the area was recorded. Five hundred animals screened in the study consists of 267 (HF cross), 174 (Jersey cross) and 59 (non-descript breed) among which 102 (38.20%) in HF cross, 53 (30.46%) in Jersey cross and 11 (18.64%) in non-descript breed were found positive for Theileriosis. The highest prevalence was found in HF cross followed by jersey cross and least in non-descript breed (Table 6).

Table 6: Breed wise prevalence of Theileriosis in cattle

Breed	Total no. of animals screened	No. of animals found positive	% of positive animals	Calculated value χ^2 2df
HF cross	267	102	38.20	9.24**
Jersey cross	174	53	30.46	
Non descript	59	11	18.64	
Total	500	166	33.20	

** Significant at P<0.01

Indigenous bred are more resistant for theileriosis than cross breed cows. This might be due the higher resistivity against disease in indigenous breed in comparison to cross breed. Findings are in close agreement with the finding of Naik *et al.* (2016)^[19], Brahma *et al.* (2018)^[4], Rakha and Sharma (2003)^[22], Kohli *et al.* (2014)^[18] and Acharya *et al.* (2016)^[3]. However Abaker *et al.* (2017)^[1], showing the higher prevalence rate in zebu cattle in comparison to cross breed

cows. According to them, lower incidence of Theileriosis in cross breed cows might be due to the application of acaricides to control ticks under good farm management system.

Conclusion

It might be concluded that Prevalence of Theileriosis in South Bihar was recorded to be 33.20% on the basis of blood smear examination. The prevalence of bovine Theileriosis was

significantly higher in rainy season and especially in crossbred cattle which may be due to abundance of vectors development during summer season. Age wise prevalence was found to be highest in above 3 years age group. Higher prevalence was occurred in females than males and more in lactating cattle. We also observed the highest prevalence in HF cross followed by Jersey cross and least in non-descript breed of cattle. This study can further investigated by using molecular diagnostic technique like PCR and effective use of herbal ecofriendly, cost effective tick control methods may be adopted.

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