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Deepika
PG Scholar, Department of Veterinary Medicine, College of Veterinary and Animal Science Navania, Vallabhnagar, Udaipur, (RAJUVAS) Bikaner, Rajasthan, India

Sandhya Morwal
Assistant Professor, Department of Veterinary medicine, College of Veterinary and Animal science Navania, Vallabhnagar, Udaipur, (RAJUVAS) Bikaner, Rajasthan, India

SK Sharma
Professor and Head, Department of Veterinary medicine, College of Veterinary and Animal science Navania, Vallabhnagar, Udaipur, (RAJUVAS) Bikaner, Rajasthan, India

Corresponding Author:
Deepika
PG Scholar, Department of Veterinary Medicine, College of Veterinary and Animal Science Navania, Vallabhnagar, Udaipur, (RAJUVAS) Bikaner, Rajasthan, India

Prevalence of *Theileria annulata* infection in cattle at Vallabhnagar region, Udaipur district of Rajasthan

Deepika, Sandhya Morwal and SK Sharma

Abstract
The present study was carried out to determine the prevalence of bovine tropical theileriosis in cattle. A total of one hundred fourty five cattle were examined during July to November-2021 out of which, thirty cattle were found positive for *Theileria annulata* infection on the basis of Giemsa-stained blood and lymph node aspirate smears examination. The overall prevalence of bovine tropical theileriosis amongst cattle was found to be 20.69 percent. The prevalence was higher irrespective of age from 0 to 6 month (33.33%), sex wise (23.00% in female), Breed wise (27.50% in Cross breed), Month wise July and August (33.33% and 30.00%) while lower prevalence irrespective of age above 2 year (17.28%), sex wise (15.55% in male), breed wise (12.30% in non-descript) and month wise October (11.90%) was recorded.

Keywords: Theileriosis, prevalence, giemsa-stained

Introduction
India has 302.79 million bovine population, out of which total cattle population is 192.49 million (Male cattle, 47.37 million & Female cattle,145.12 million) and the population of cattle in Rajasthan, 1,39,37,630 million (Exotic cattle, 23,23,033 million & indigenous cattle, 1,16,14,597 million) and Udaipur district of Rajasthan having 8,31,496 million (Exotic cattle, 80,211 million & indigenous cattle, 7,51,285 million) cattle population. (According to 20th livestock census, 2019). Theileriosis is a burning problem of the livestock in veterinary field, due to this disease huge morbidity and mortality occur in cattle population, which reflects economic of farmer and elevates the poverty level (Naila *et al*., 2015) [18]. This economic stunned disease is more prevalent in tropical and subtropical parts of world. It is a serious challenge to the livestock improvement programme in India (Sitotaw *et al.*, 2014) [23]. Theileriosis is more common in rainy season then summer and least in winter due to increased tick population and stress in affected animal (Parmar and Chandra, 2019) [20]. The newborn calves having high risk of theileriosis during summer and rainy season because of immediate exposure to infected ticks which are more active during this period (Sudan *et al*., 2012) [25]. Affected animal having highest incidence in month of October to January followed by June to September and least in February to May (Masare *et al*., 2009) [15]. The present study was undertaken to know the prevalence of theileriosis of cattle in vallabhnagar, Udaipur, Rajasthan.

Materials and Methods
Experimental animals and duration of study
This study was conducted at vallabhnagar area, Udaipur, Rajasthan on the clinical cases in cattle during the period from July to November 2021. During five-month study period, a total of 145 case of sick and suspected cattle were studied that was informed by farmers at TVCC, CVAS, Navania, Vallabhnagar, Udaipur. Only 30 cattle were infected by *Theileria* spp. among 145 suspected cases. age, sex, breed and month of the cattle owner of all studied were noted in the case sheet. cattle were screened showing clinical symptoms like anorexia, enlargement of superficial lymph nodes, pale mucous membrane, presence of ticks. The prevalence rate was calculated in percentage with respect to overall prevalence, age, sex, breed and month.

Methods followed for diagnosis
History/Anamnesis:
History of tick infestation, duration of illness, appetite of the animal, abnormalities in the behavior, changes in managemental and feeding practice, gait, posture, rumination, defecation

(quantity, consistency and frequency), urination, examination of visible mucous membranes, physical condition, clinical manifestations and general clinical examinations was also recorded.

Physical examination

Physical examination was done by visual inspection, pulse & respiration rate and rectal temperature. Examination of the different organs and systems of the body was carried out by using the clinical methods of palpation, percussion and auscultation.

Sample collection and examination

For hematological studies blood samples were collected from jugular vein with all aseptic precautions in sterilized test tubes from thirty cattle infected with bovine tropical theileriosis and ten healthy cattle. Blood samples were collected in sterile tubes having disodium salt of ethylene diamine tetra acetic acid (EDTA) as an anticoagulant added at the rate of 1 mg/ml of blood (Jain, 1986) [26].

For biochemical studies serum samples were collected in other sterile tube without any anticoagulant. The blood slants were made and incubate for 1 hour at 37 ºC. Blood clots were break and tubes were centrifuge at 2,500 rpm for 30 min. The serum samples were pipette out in small Pyrex tubes and were kept immediately in the deep freeze at -20 ºC till analysis.

A thin blood smear was prepared from each blood sample, air dried and fixed in methanol for 2-3 minutes. Staining was done in 5% Giemsa's stain and rinsing was performed in two changes of distilled water buffered to pH 7.2, then examined under microscope (100x) with immersion oil for the identification of blood parasites as described by Soulsby (1982) [27].

Statistical Methods

The data obtain in the research work undertaken was statistically analysis as per the procedures explain by Snedecor and Cochran (2004) [28].

Results and Discussion

Overall prevalence of theileriosis

Out of 145 cattle suspected for theileriosis showing clinical symptoms and blood smear examination and lymph node biopsy with help of Geimsa stain technique. On the basis of blood smear examination 30 were found positive for theileriosis contributing overall prevalence of 20.69%. Our findings were agreed by Naik *et al.* (2016) [17], Debbarma *et al.* (2017) [7], Dadhich *et al.* (2017) [8], Brahmbhatt *et al.* (2019) [5] and Khawale *et al.* (2019) [12].

Table 1: Overall Prevalence of bovine tropical theileriosis in cattle

Total screened cases	Number of Theileriosis positive cases	Prevalence (%)
145	30	20.69%

The differences in the prevalence rate might be due to variation in the number of samples included in the study and geographical and climatic conditions. The variation in the prevalence might be due to of the study period (Murthy *et al.*, 2014) [16].

Table 2: Age wise prevalence of bovine tropical theileriosis in cattle

Month and Year	Total screened cases	No. of Theileriosis positive cases	Prevalence%
0 to 6 months	24	08	33.33%
7 Months to 2 years	40	08	20.00%
Above 2 years	81	14	17.28%
Total	145	30	

Theileriosis occurred found in all age groups of cattle. The prevalence of theileriosis of cattle from 0 to 6 months of age 8 (33.33%), 7 months to 2 years of age 8 (20.00%) and above two years of age 14 (17.28%). The result has been presented in Table 2. The highest prevalence observed below 6 month of age group i.e. 33.33% similar finding agreed by Brahmbhatt *et al.* (2019) [5] and Khawale *et al.* (2019) [12]' This indicates a lack of immunity in younger calves (1–6 month) especially cell mediated immunity than the older age (7–12 month) calves. It was higher infection recorded in young Gir calves of less than 6 months of age (Brahmbhatt *et al.*, 2019) [5]. The lowest prevalence observed above 2 year of age group *i.e.* 17.28% and similar finding agreed by Khawale *et al.* 2019 [12]. The variation in age-wise prevalence might be due to collection of samples, no. of case study, environmental and geographical situation (Anbu *et al.*, 2020) [2].

Table 3: Sex wise prevalence of bovine tropical theileriosis in cattle

Sex	Total screened cases	No. of Theileriosis Positive cases	Prevalence (%)
Female	100	23	23.00%
Male	45	07	15.55%
Total	145	30	

The prevalence was highest (23%) in females compared to males (15.55%). The result has been presented in Table 3. Highest prevalence in female agreed by Naik *et al.* (2016) [17], Debbarma *et al.* (2017) [7], Brahmbhatt *et al.* (2019) [5] and Khawale *et al.* (2019) [12]. Lowest prevalence in male agreed with Naik *et al.* (2016) [17], Abaker *et al.* (2017) [3], Debbarma *et al.* (2017) [7], Brahmbhatt *et al.* (2019) [5] and Singh *et al.* 2017 [24]. The prevalence in female found higher than male due to immunosuppression in advanced pregnancy and lactation in high producing female cattle (Kocan *et al.*, 2010) [13] and the dairy farmers are interested in raising female calves as replacement stock and less interested to keeping and rearing male calves, that the number of male calves presented for diagnosis and treatment was less (Brahmbhatt *et al.*, 2019) [5]. Higher prevalence in female cattle possibly due the fact that they were kept longer for breeding and milk production purpose, supplied insufficient feed against their high demand or variation in sample size (Kamani *et al.*, 2010) [14].

Table 4: Breed wise prevalence of bovine tropical theileriosis in cattle

Animals	Total screened cases	No. of Theileriosis positive cases	Prevalence (%)
Cross Breed	80	22	27.50%
Non- descript	65	08	12.30%
Total	145	30	

The prevalence was high in cross bred animals (27.50%) compared to non-descript animals (12.30%). The result has been presented in Table 4. Highest prevalence in cross breed cattle agreed with and Panda *et al.* (2011), Naik *et al*. (2016) [17], Khawale *et al.* (2019) [12]. Lowest prevalence in non-descript cattle agreed by Naik *et al.* 2016. The exotic breeds are more susceptible to Tick borne disease due to higher infestation of ticks (Glass *et al*., 2003; Rather *et al.*, 2015) [10, 21]. The genetic variation makes the zebu cattle resistant than cross bred cattle (Radostits *et al*., 2007) [22]. Cross bred cattle are the most sensitive to heat and observed that atmospheric temperature controls the activity of *Theileria* parasites as well as their vectors (Hoffman *et al.*, 1971) [11].

Table 5: Month wise Prevalence of bovine tropical theileriosis in cattle

Month and year (2021)	Total screened cases	No. of Theileriosis Positive cases	Prevalence (%)
July	09	03	33.33%
August	40	12	30.00%
September	45	08	17.77%
October	42	05	11.90%
November	09	02	22.22%
Total	145	30	

The prevalence was highest in July and August (33.33% and 30%) and Lowest in October month 5 (11.90%) The result was presented in Table 5. Prevalence of bovine tropical theileriosis in cattle during July-to November-2021 was studied. The prevalence was higher mainly in July to August (33.33 percent and 30 percent respectively) while lower prevalence was recorded in October (11.90 percent). The higher prevalence in rainy (July to august) similar finding agreement with Brahmbhatt *et al.* (2019) [5]. The lowest prevalence in October month similar finding with Dharanesha *et al.* (2017) [9]. The reason may be due to high abundance of vector population during the monsoon season as compared to other seasons in a year (Ananda *et al.*, 2016) [4].

Conclusion

The overall prevalence of bovine tropical theileriosis amongst cattle was found to be 20.69 percent. The prevalence was higher irrespective of age from 0 to 6 month (33.33%), sex (23.00% in female), Breed (27.50% in Cross breed), Month July and August (33.33% and 30.00%) while lower prevalence irrespective of age above 2 year (17.28%), sex (15.55% in male), breed (12.30% in non-descript), month October (11.90%) was recorded.

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