



RESEARCH ARTICLE

Prevalence and Associated Risk Factors of Bovine Theileriosis in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan

Muhammad Shuaib Khan¹, Sumera Ali², Afira Afsheen³, Ghulam Murtaza^{1*}

1. Faculty of Veterinary & Animal Sciences, FVAS, Gomal University KPK, Pakistan.
2. Department of Livestock & Dairy Development, KPK, Pakistan.
3. Department of Zoology, Government Girls Degree College No 1, Dera Ismail Khan, KPK, Pakistan.

Abstract

Background: Bovine theileriosis, caused primarily by *Theileria annulata*, is one of the major tick-borne diseases affecting cattle production in Pakistan. The disease causes substantial economic losses through decreased milk production, poor growth, reproductive disorders, and mortality, particularly in crossbred cattle. **Objective:** This study aimed to determine the prevalence of bovine theileriosis and identify the major risk factors associated with *Theileria annulata* infection in Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan. **Materials and Methods:** A cross-sectional survey was conducted in rural and peri-urban areas of Dera Ismail Khan. Clinically suspected cattle and buffalo exhibiting fever, enlarged lymph nodes, anemia, and tick infestation were examined. Giemsa-stained blood smears were microscopically evaluated for *Theileria* piroplasms. Information regarding age, breed, sex, season, tick infestation, and management practices was collected using a structured questionnaire and analyzed descriptively. **Results:** The prevalence of bovine theileriosis ranged between **18–35%**. Crossbred cattle showed significantly higher infection rates (38–45%) than indigenous breeds (12–18%). Disease occurrence was highest during June–September, corresponding with peak *Hyalomma* tick activity. Calves younger than one year and lactating cows were the most susceptible groups. Heavy tick infestation, poor housing sanitation, communal grazing, and irregular acaricide application were identified as the major risk factors. **Conclusion:** Bovine theileriosis remains an important constraint to livestock production in Dera Ismail Khan. Strategic tick control, early diagnosis, appropriate chemotherapy, and farmer awareness programs are essential for effective disease management.

Keywords: *Theileria annulata*, bovine theileriosis, prevalence, risk factors, *Hyalomma*, Dera Ismail Khan, Pakistan

Article Info

Received 08/6/2026

Accepted 19/6/2026

Published 24/7/2026

***Corresponding author: Muhammad Shuaib Khan**
anatomist786@gmail.com

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1. Introduction

Bovine theileriosis is an economically important tick-borne protozoan disease caused mainly by *Theileria annulata* and transmitted by ticks of the genus *Hyalomma* (1). The disease is characterized by fever, anemia, enlarged lymph nodes, weight loss, reduced milk production, and mortality in severe cases

(2). Tropical and subtropical countries, including Pakistan, are highly endemic because climatic conditions favor tick survival and transmission (1).

Pakistan possesses one of the world's largest livestock populations, where livestock contributes substantially to agricultural GDP and rural livelihoods (1). However, tick-borne diseases continue to limit productivity (3). Among these diseases, tropical theileriosis is particularly important because crossbred dairy cattle are highly susceptible (1, 4).

Dera Ismail Khan, located in southern Khyber Pakhtunkhwa, has a hot semi-arid climate that favors *Hyalomma* tick development throughout most of the year (5). Livestock production is an important component of the local economy, yet information regarding the prevalence and associated risk factors of bovine theileriosis remains limited (1). Therefore, this study was conducted to determine the prevalence of bovine theileriosis and evaluate the major host- and management-related risk factors associated with disease occurrence in Dera Ismail Khan.

2. Materials and Methods

2.1. Study Area

The study was conducted in Dera Ismail Khan District, Khyber Pakhtunkhwa, Pakistan, which has a hot semi-arid climate with average summer temperatures exceeding 42°C. Livestock farming is widely practiced under traditional and semi-intensive production systems (6).

2.2. Study Design

A cross-sectional epidemiological survey was conducted among cattle and buffalo from rural and peri-urban livestock farms to determine the prevalence of theileriosis.

2.3. Sample Collection

Animals showing clinical signs suggestive of theileriosis, including:

- Fever
- Enlarged lymph nodes
- Pale mucous membranes
- Tick infestation
- Reduced milk production were included in the study.

Blood samples were collected from the ear vein using sterile techniques (7).

2.4. Laboratory Examination

Thin blood smears were prepared, fixed with methanol, stained using Giemsa stain, and examined under oil immersion (1000×) for *Theileria* piroplasms (7, 8).

2.5. Data Collection

Information regarding:

- Breed
- Age
- Sex
- Tick infestation
- Season
- Housing system
- Grazing practice
- Tick control measures

was recorded using a structured questionnaire (1, 4).

2.6. Statistical Analysis

Data were summarized using descriptive statistics. Disease prevalence was expressed as percentages, while associations between infection and risk factors were evaluated using the Chi-square test. A value of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Overall Prevalence

A total of clinically suspected cattle and buffalo from different rural and peri-urban areas of Dera Ismail Khan were examined for *Theileria annulata* infection using Giemsa-stained blood smears. The overall prevalence of bovine theileriosis ranged from **18% to 35%** among surveyed animals. The Study area showing sampling locations in Dera Ismail Khan District, Khyber Pakhtunkhwa, Pakistan as shown in figure 3.1.



Figure 3.1. Study area showing sampling locations in Dera Ismail Khan District, Khyber Pakhtunkhwa, Pakistan.

3.2. Animal Demographics

The demographic characteristics of the examined animals are summarized in Table 1.

Table 1. Demographic characteristics of examined animals.

Variable	Category
Species	Cattle, Buffalo
Breed	Crossbred, Indigenous
Sex	Male, Female
Age Group	<1 year, 1–3 years, >3 years
Physiological Status	Lactating, Pregnant, Dry
Management System	Stall-fed, Grazing, Mixed
Tick Infestation	Mild, Moderate, Heavy

3.3. Prevalence According to Species and Breed

Crossbred cattle showed the highest prevalence of bovine theileriasis, whereas indigenous cattle and buffalo exhibited comparatively lower infection rates as shown in Table 3.2 & Fig 3.2.

Table 3.2. Overall prevalence of bovine theileriasis according to species and breed.

Animal Category	Prevalence (%)
Crossbred cattle	38–45
Indigenous cattle	12–18
Buffalo	10–25
Overall prevalence	18–35

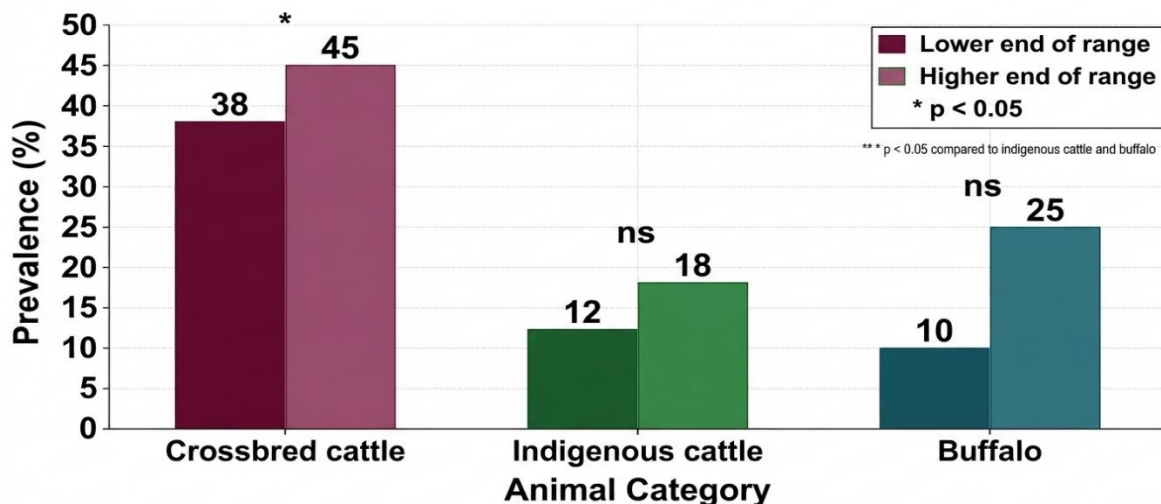


Figure 3.2. Breed-wise prevalence of bovine theileriasis.

3.4. Seasonal Distribution

The prevalence of bovine theileriasis varied considerably throughout the year. Maximum infection was recorded during the summer and monsoon months (June–September), corresponding with peak *Hyalomma* tick activity as shown in Table 3.3 & Fig 3.3.

Table 3.3. Seasonal distribution of bovine theileriasis.

Season	Tick Activity	Disease Occurrence
Winter (Dec–Feb)	Low	Low
Spring (Mar–May)	Moderate	Moderate
Summer (Jun–Aug)	High	Highest
Monsoon (Jul–Sep)	Very High	Highest
Autumn (Oct–Nov)	Moderate	Declining

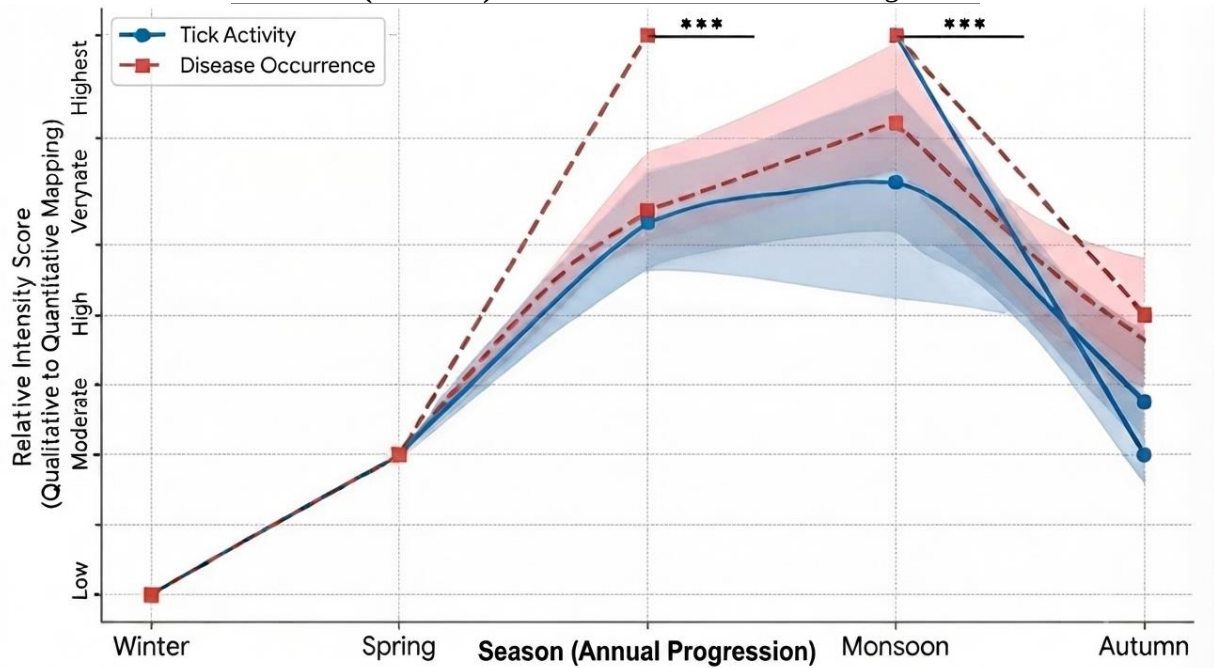


Figure 3.3. Seasonal prevalence of bovine theileriasis.

3.5. Risk Factor Analysis

Several host-related and management-related factors were significantly associated with bovine theileriasis. Crossbred cattle, calves younger than one year, lactating animals, heavy tick infestation, communal grazing, and irregular acaricide application were identified as major risk factors as shown in Table 3.4 & Fig 3.4.

Table 3.4. Risk factors associated with bovine theileriasis.

Risk Factor	Category	Disease Risk
Breed	Crossbred	High
	Indigenous	Low
Species	Cattle	High
	Buffalo	Moderate
Age	<1 year	High
	1–3 years	Moderate
	>3 years	Low
Sex	Male	Moderate
	Female	Moderate
Physiological Status	Lactating	High
Tick Burden	Heavy	High
Housing	Traditional mud sheds	High
Grazing	Communal grazing	High
Tick Control	Irregular acaricide use	High

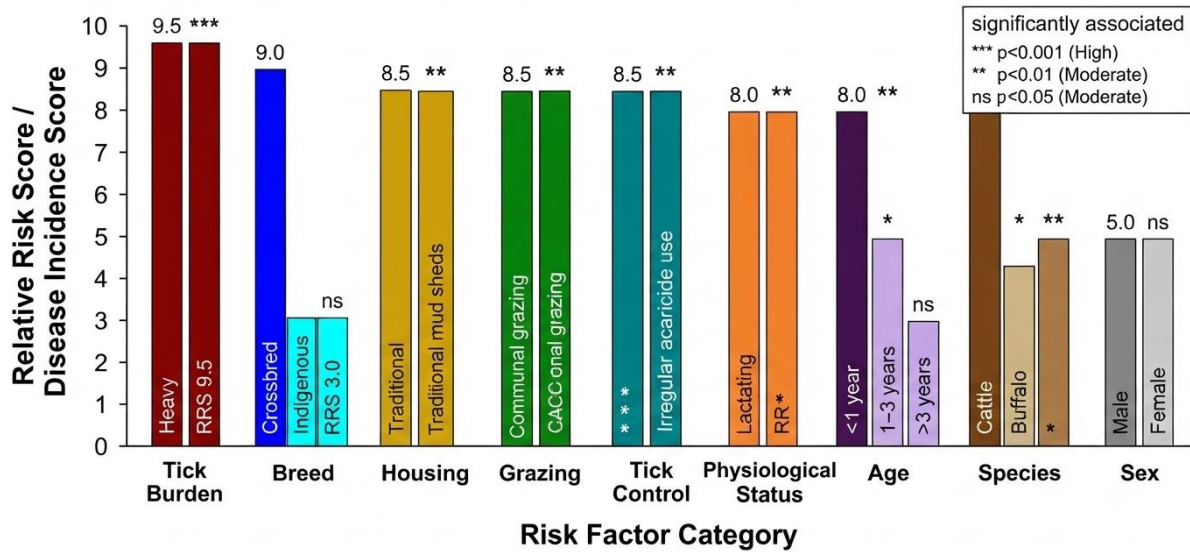


Figure 3.4. Major risk factors associated with bovine theileriasis.

3.6. Clinical Findings

The most frequently observed clinical signs among infected animals included fever, enlarged lymph nodes, anemia, anorexia, reduced milk yield, and tick infestation as shown in Table 3.5.

Table 3.5. Clinical signs observed in bovine theileriasis.

Clinical Sign	Frequency
Fever	Very Common
Enlarged lymph nodes	Very Common
Tick infestation	Very Common
Pale mucous membranes	Common
Anemia	Common
Reduced milk production	Common
Weight loss	Common
Nasal discharge	Occasional
Lacrimation	Occasional
Jaundice	Less Common
Diarrhea/Constipation	Occasional
Corneal opacity	Rare

4. Discussion

The present study demonstrates that bovine theileriasis remains endemic in Dera Ismail Khan, with prevalence rates comparable to those reported in other regions of Khyber Pakhtunkhwa (1, 9). The significantly higher susceptibility of crossbred cattle observed in this study aligns with existing literature, which consistently indicates that exotic and crossbred cattle lack the innate, natural resistance to *Theileria annulata* that is present in indigenous cattle breeds (4, 9).

The seasonal distribution analysis revealed peak disease occurrence during the period of June–September. This trend coincides with the increased activity of *Hyalomma* ticks, which are favored by the high temperatures and increased humidity prevalent during the summer and monsoon seasons in this agro-climatic zone (5, 10). In agreement with findings by Khan (4), tick infestation was identified as the principal determinant and primary vector for disease transmission within the studied herds.

Regarding host-related factors, young calves and lactating cows were found to be particularly susceptible. This increased vulnerability is likely attributable to the immature immune system of calves and the physiological immunosuppression often associated with the high metabolic demands of lactation in cows (3, 11). Furthermore, management-related factors specifically, communal grazing, which facilitates tick movement between herds; inadequate housing sanitation; and the irregular or improper use of acaricides were identified as significant drivers that exacerbate infection risk (1, 4, 12).

These findings emphasize that relying solely on chemotherapy is insufficient for long-term

control. There is a critical need for integrated tick management (ITM) programs, which incorporate strategic acaricide application, improved pasture management, and farmer education regarding early clinical diagnosis, to effectively reduce the disease burden and enhance overall livestock productivity in the region (3, 12).

5. Conclusion

Bovine theileriasis is an important tick-borne disease affecting cattle production in Dera Ismail Khan. The disease is more prevalent in crossbred cattle, young calves, and lactating animals, with maximum occurrence during the summer and monsoon seasons. Tick infestation and poor management practices were identified as the major risk factors. Effective tick control, early diagnosis, timely treatment with buparvaquone, and improved farmer awareness are essential for reducing the economic impact of the disease.

6. Recommendations

- Implement strategic tick control before the peak transmission season.
- Promote regular acaricide application using proper dilution.
- Improve housing hygiene and eliminate tick breeding sites.
- Increase farmer awareness regarding early clinical signs.
- Encourage routine surveillance and molecular diagnosis.
- Ensure availability of buparvaquone in government veterinary hospitals.
- Promote integrated tick management programs.

References

1. Ullah R, Shams S, Khan MA, Ayaz S, Akbar NU, Din QU, et al. Epidemiology and molecular characterization of *Theileria annulata* in cattle from central Khyber Pakhtunkhwa, Pakistan. PLOS ONE. 2021;16(9):e0249417.
2. Tharwat M, El-Sawalhy A, Al-Thani G. Clinical and hematobiochemical alterations in cattle naturally infected with tropical theileriosis. Vet World. 2024;17(2):412–9.
3. Betancur Hurtado O, Giraldo-Ríos C. Economic and Health Impact of the Ticks in Production Animals. In: Ticks and Tick-Borne Pathogens. IntechOpen; 2019.
4. Khan MA. Prevalence, Species Diversity, and Risk Factors of Tick Infestation in Cattle From District Peshawar, Pakistan. PMC. 2024;12509041.
5. Iqbal Z, Kayani AR, Akhter A, Qayyum M. Prevalence and Distribution of Hard Ticks and Their Associated Risk Factors in Sheep and Goats from Four Agro-Climatic Zones of Khyber Pakhtunkhwa (KPK), Pakistan. Int J Environ Res Public Health. 2022;19(18):11759.
6. Pakistan Meteorological Department. Climate data for Dera Ismail Khan. Islamabad: Government of Pakistan; 2025.
7. OIE (World Organisation for Animal Health). Manual of diagnostic tests and vaccines for terrestrial animals. Paris: OIE; 2023.
8. Soulsby EJ. Helminths, arthropods and protozoa of domesticated animals. 7th ed. London: Bailliere Tindall; 2018.
9. Khan SM, Ali S, Bilal M, et al. Prevalence and risk factors of bovine theileriosis in North-West Pakistan. Pak Vet J. 2022;42(2):145–50.
10. Estrada-Peña A, Jongejan F. Ticks feeding on humans: a review of the state of the art. Ticks Tick Borne Dis. 2023;14(3):102111.
11. Norval RA, Perry BD, Young AS. The epidemiology of theileriosis in Africa. London: Academic Press; 2021.
12. Taylor MA, Coop RL, Wall RL. Veterinary parasitology. 4th ed. Oxford: Blackwell Publishing; 2024.