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EFFECT OF TICK INFESTATIONS ON THE HEMATOLOGICAL PARAMETERS OF CATTLE IN TURBAT, DISTRICT KECH, BALOCHISTAN

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Abstract

This research was conducted in the Turbat (Kech) district of Balochistan. A total of 100 cattle were selected and divided into four groups based on tick infestation levels: the neutral group (no tick infestation, n=25), low infestation group (<40 ticks, n=25), mild infestation group (<80 ticks, n=25), and high infestation group (>100 ticks, n=25). A total of 321 tick specimens were collected, of which 258 (80.38%) were identified as Hyalomma anatolicum and 63 (19.62%) as Hyalomma dromedarii.

Hematological parameters showed significant differences between tick-infested and non-infested cattle. In all infested groups, blood parameters including total leukocyte count (TLC), total erythrocyte count (TEC), hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), packed cell volume (PCV), platelet count, lymphocytes, and neutrophils—were significantly decreased compared to the neutral group. Conversely, a significant increase in mean corpuscular hemoglobin (MCH) and eosinophil levels was observed in infested cattle relative to the neutral group.

Key Words: *Cattle, Hematology, Parasites, Ticks, Turbat*

INTRODUCTION

Livestock, particularly cattle, have been an intrinsic part of human civilization and have played a pivotal role in agrarian economies (1). However, cattle health blood profile is facing unavoidable challenges, among which parasitic infestations, notably ticks, are a major worldwide cattle health concern (2). Research has found that ticks are responsible for causing 80% of the world's cattle population (3). Ticks transmit diseases like *cowdriosis*, *babesiosis*, and *anaplasmosis*, which could result in anemia, paralysis, dermatitis, iron deficiency, and decreased production in parasitized cattle (4). Prolonged tick infestations not only affect the health of animals but also lead to significant economic losses for ranchers due to reduced productivity and increased veterinary costs (5). The annual economic loss caused by ticks and tick-borne diseases is estimated to be 13.9 to 18.7 billion USD (6). The economically important ticks found in tropical regions belong to the genera *Hyalomma, Rhipicephalus, Boophilus,* and *Amblyomma.* The genus *Hyalomma* is identified as the most prevalent tick found in cattle and buffaloes, followed by *Boophilus* (7).

Turbat, Balochistan, is the second-largest populated city in the province after Quetta, where the livelihoods of impoverished communities are sustained through livestock rearing, particularly cattle, playing a crucial role in the socio-economic framework of the community. In Turbat, the hot climatic conditions foster a conducive environment for the growth of various tick species, and it may result in a potential growth of ticks and tick-borne diseases. Despite the recognized threat of tick infestations to cattle health globally, region-specific data on the hematological alterations induced by varying intensities of tick infestation remain scarce, particularly in arid and semi-arid zones like Turbat, Balochistan. Hematological parameters serve as sensitive indicators of the physiological and pathological status of livestock, reflecting underlying conditions such as blood loss, immune response, and inflammatory stress. In tick-infested cattle, the degree of hematological deviation often correlates directly with the burden of parasitism; however, the threshold at

which subclinical infestation transitions into clinically significant hematological change is not well defined. Understanding these dose-dependent relationships is critical for early diagnosis and timely intervention. Furthermore, while the genus *Hyalomma* is known to dominate in tropical regions, the comparative pathogenicity and species-specific impact of *H. anatolicum* versus *H. dromedarii* on cattle blood profiles in Balochistan have not been systematically investigated. Therefore, beyond merely identifying prevalent tick species, it is essential to quantify how increasing tick loads—ranging from low to high infestation—differentially alter key blood constituents. This knowledge gap formed the basis for the present investigation, which specifically links tick burden magnitude to quantifiable changes in the complete blood picture of infested cattle. Considering the significant economic costs and the growing prevalence of tick and tick-borne diseases in cattle, the present study aimed to assess the effects of hard tick (Ixodidae) infestations on domestic cattle health hematology in Turbat City, Balochistan.

MATERIALS AND METHODS

STUDY AREA AND TICK SAMPLING

The study was carried out in Turbat City, located in the district of Kech, Balochistan, Pakistan. A total of 352 hard tick species were collected from randomly examined cattle from three different localities (Abesar, Chahsar, and Agriculture colony) of Turbat, where a high incidence of ticks was observed. The ticks were collected during the study period of March 2024 to February 2025. The ticks were watchfully detached with the help of thumb forceps from the various attachments. The isolated ticks were transferred to Falcon tubes containing 70% ethanol. All the collected tick samples were brought to the departmental laboratory, Department of Zoology, University of Balochistan, Quetta, for identification. Morphological identification of the ticks (Ixodidae) was performed under the dissection microscope with the help of the relevant morphological and taxonomical keys (8).

BLOOD SAMPLING

The blood samples from the jugular vein of the same cattle were collected in an EDTA tube by using18G sterilized needle, and all the blood samples were brought to the Laboratory of Physiology, Department of Zoology, UoB Quetta for hematological examination. On the basis of tick infestation, animals were divided into the following four groups.

Group 1: This group contained cattle, having no tick infestation (neutral group, *n*=25)
Group 2: This group contained cattle with less tick infestation (<40 ticks, *n*=25)
Group 3: This group contained cattle with mild tick infestation (<80 ticks, *n*=25)
Group 4: This group contained high tick infestation (>100 tick, *n*=25).

HEMATOLOGICAL ESTIMATION

The hematological parameters were analyzed using the **SinSeng Hematology Analyzer (Model: HAS 310)**. This hematology analyzer was used to examine the Complete Blood Count (CBC) of the cattle that were investigated. The parameters under the study were: Total erythrocyte count (TEC), Total leucocyte count (TLC), Platelets count, Haemoglobin, Differential leukocyte count (DLC), Packed cell volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC).

STATISTICAL ANALYSIS

For hematological parameters, One-way analysis of variance (ANOVA) was performed by using GRAPHPAD Prism (Version 8), and a P-value (< 0.05) was set as the threshold for statistical significance.

RESULTS

A total of 321 hard ticks were isolated from three different localities in Turbat (Table I). Two species, *H. anatolicum* and *H. dromedarii*, belonging to the genus *Hyalomma,* were identified. Out of 321 ticks, 107 were collected from the cattle farm in the Agricultural colony Turbat, 121 from Absear, and 93 from the Chahsar.

The most identified tick species was *H. anatolicum* (n=258; 80.38 %), followed by *H. dromedarii* (n=63; 19.62 %) (Table I).

Table I. Prevalence of tick species collected from three different localities in Turbat CityFrequency distribution and prevalence of tick's species

Tick species	Frequency of ticks		Agricultural colony	Absear	Chahsar
	n	(%)			
H. anatolicum	258	(80.38)	85	98	75
R. microplus	63	(12.62)	22	23	18
Total	321		107	121	93

SEASONAL PREVALENCE OF TICKS

The tick specimens were collected from March, 2024 to February, 2025 to monitor the seasonal prevalence of ticks in Turbat. *H. anatolicum* showed a higher frequency in hotter months (June to August) with peak n= 92 (35.65%) followed by with a significant decrease in December to February n=33 (12.79%). Similarly, in the case of *H. dromedarii*, a significant increase was also seen in June-August n=22 (34.92%) followed by a significant decline in the months of December to February (Table II).

Table II. Seasonal prevalence of ticks (March-May; June-Aug; Sep- Nov; Dec-Feb)

Seasons	*H. anatolicum* (%)	*H. dromedarii* (%)
March-May	58 (22.48)	18 (28.57)
June-Aug	92 (35.65)	22 (34.92)
Sep-Nov	75 (29.06)	14 (22.22)
Dec-Feb	33 (12.79)	9 (14.28)
Total	258 (100)	63 (100)

SEX-WISE INFESTATION OF TICKS

Out of total tick counts, gender distribution showed a significantly high infestation for female ticks (65.45 %) as compared to that of the male ticks (31.8%) (Table III). Out of 215 female ticks, the average abundance of female ticks showed a high infestation rate for *H. anatolicum* (68.21 %), followed by *H. dromedarii* (61.90 %), respectively. Infestation rates indicated for *H. anatolicum* and *H. dromedarii* males were 32.0 % and 38.09 % respectively. This study shows that the male species, belonging to *H. dromedarii*, had the highest infestation rate (38.09%) compared to the male of *H. anatolicum* (32.0%). However, it is reversed in the case of females (Table III).

Table III. Sex-wise infestation of tick specimens identified from the cattle in Turbat

S.No.	Tick species	The total no. of ticks collected	Male	Average (%)	Female	Average (%)
1	*H. anatolicum*	258	82	31.78	176	68.21
2	*H. dromedarii*	63	24	38.09	39	61.90
Total Average (%) infestation			35.045		65.45	

BLOOD PROFILE

A significant decrease was observed in TEC, Hb, PCV, platelets, Lymphocytes, and Neutrophils of all three infested cattle groups as compared to the non-infested cattle group. The MCV and MCHC were significantly reduced in cattle groups (<80 ticks and >100 ticks) as compared to other groups. It was observed that the TLC had a significant reduction and followed by a significant increase in the level of MCH and eosinophils of cattle with high tick infestation (>100 ticks) compared with other cattle groups respectively (Table IV).

Table IV. Hematological values (Mean ± SEM) of infested and non-infested cattle concerning analyzed significance level

Parameters	Mean±SEM	Mean±SEM	Mean±SEM	Mean±SEM
	Non-infested cattle	Low tick infested cattle (<40 ticks)	Middle tick infested cattle (<80 ticks)	High tick infested cattle (>100 ticks)

TLC (10^9/L)	9.128±0.86	8.078±0.57 N.S	7.640±0.212 N.S	5.808±0.084***
TEC (10^12/L)	5.060±0.171	46.064±0.155**	45.724±0.172*	37.6±0.219***
Hb (g/dL)	12.032±0.256	9.568±0.231***	9.124±0.219***	8.86±0.315***
MCV (fL)	45.12±0.5009	44.66±0.324 N.S	42.86±0.286**	41.01±0.493***
MCH (pg)	14.74±0.750	16.12±0.170 N.S	16.83±0.340N.S	18.01±0.696***
MCHC (g/dL)	35.94±1.142	34.08±0.586 N.S	32.412±0.406**	31.512±0.277***
PCV (%)	34.06±0.332	28.212±0.420***	26.132±0.953***	24.56±0.597***
Platelets (10^9/L)	604.6±46.47	410±1.585*	381±1.471**	272.3±23.90***
Lymphocytes (%)	71.3±0.158	58.92±0.130***	67±0.214***	49.07±0.111***
Monocytes (%)	2.8±0.355	2.3±0.092 N.S	2.506±0.163 N.S	3.12±0.256 N.S
Eosinophils (%)	1.55±0.176	1.952±0.306 N.S	2.48±0.277N.S	3.052±0.217***
Neutrophils (%)	45.72±0.435	39.7±0.077***	37.22±0.083***	34.73±0.524***

Data is represented in Mean±SEM, where * P<0.05, **P<0.001; ***P<0.0001

DISCUSSION

From the 321 collected ticks, one genus and two species, *H. anatolicum*, and *H. dromedarri*, were identified from the study cattle in Turbat, the results are aligned with others (9). In Pakistan, *Hyalomma* ticks were reported to be the second most abundant cattle ticks after *Rhipicephalus* (10). Literature suggests that *H. anatolicum* is mainly found in domestic animals, particularly cattle (7).

In the current investigation, a maximum number of both were recorded in warmer months (from June to Aug, 2025). This investigation is in agreement with the previous finding by (10) in Balochistan. In contrast, the number of ticks started to decrease in the winter season (Dec-Feb). Previous studies indicate that the seasonal variations may be due to the tick's selection for its life cycle and activity (11). A higher temperature with humid weather in the months of summer gives an ideal condition for the tick's growth and proliferation (12). In Balochistan, Pakistan, the prevalence of tick infestation on cattle is much higher in the months of summer (80%) than in winter (7%) (13).

The current study's results showed a substantial gender-based difference in tick infestation on cattle, with a higher rate of female ticks (65.45%) than that of male ticks (35.045%). Among cattle, the highest rate of infestation was recorded in *H. anatolicum* (69 %), followed by *H.dromedarii* (61.90 %). Similarly, others have reported the same species on domestic cattle in Balochistan (14). In the study, a higher significant difference in the frequency of sexes was also found. A higher infestation rate was found in *H. anatolicum*, particularly in female ticks as compared to male ticks. In the present study, it was revealed that male ticks of both species were less likely found on animals as compared to female ticks. Recently published articles/studies from (10, 15) support the current finding in Balochistan and Pakistan, where the *Hyalomma* female is the dominant tick infesting cattle.

In the current investigation, it was observed that the TLC, TEC, Hb, MCV, MCHC, PCV, Platelets, Lymphocytes, and Neutrophils were significantly decreased. Similar findings in the level of TLC and TEC were made by (4, 16) in their respective study. A decrease in the count of TEC may be due to blood loss by tick feeding and the effect of pathogens on erythropoiesis, followed by the destruction of RBCs by parasitizing pathogens like *Theileria and Babesia*, transmitted by tick bites (16, 17). A significant reduction in TEC is also followed by hemoglobin (Hb) and PCV in all tick-infested cattle groups compared to the control group. The current findings of this study are in agreement with the results of other researchers who have also observed a significant reduction in the level of TEC, followed by Hb and PCV (16, 18, 19). Studies revealed that tick infestation in cattle may result in a significant drop in the volume of PCV due to anemia and hemolysis because of tick vector-borne diseases like *babesiosis* and *anaplasmosis* (20). However, researchers have also reported no significant decrease in the level of PCV in tick-infested cattle in their studies (16). A fall in PCV and hemoglobin may sometimes occur due to poor nutrition intake in animals, including cattle (21). The present study concludes that a highly significant reduction (P<0.0001) in the volume of MCV was found only in the cattle group having greater than 100 ticks as compared to the other cattle groups. The present results are in accordance with (22, 23), who have also observed a decreased MCV in tick-infested cattle. However, the difference in MCV was not observed by others (16). In the current study, the MCH of the

naturally tick-infested cattle was observed to be significantly higher. This finding followed the result of (24) who have also observed a significant variable in MCH in cattle with high tick infestation. Ticks transmit pathogens, causing hemolysis, inducing the bone marrow to produce larger, hemoglobin-rich immature red blood cells (reticulocytes), dominating an increase in MCH (25).In addition, MCHC had been found to be significantly decreased (P<0.0001) in cattle with >100 ticks compared to other groups. These results align with the previous works, which reported similar results (21). The present investigation concludes that DLCs, like lymphocytes and neutrophils, were found to be significantly reduced (P<0.0001) in all tick-parasitized cattle groups in relation to the non-tick-parasitized cattle group. However, unlike lymphocytes and neutrophils, a significantly higher (P<0.001) eosinophil count was observed only in the group with >100 ticks when contrasted with the other cattle groups. Similar observations were made by (26, 27) in their respective investigation while an increase in eosinophils count was also reported in tick-infested cattle by (18) which may be due to their role in releasing granules to kill the parasites at the site of attachment (28). The present inquiry finds a significant decrease in the count of platelets in all tick-infested cattle groups in comparison with the non-infested cattle group. The current observations correlate with the results of the previous workers (16, 29, 30) who have also found a significant decrease in the count of platelets due to tick load.

CONCLUSION

This study concludes that tick infestation significantly affects the hematological health profile of cattle in Turbat, Balochistan. The blood of the infested cattle exhibited decreased in key hematological parameters including TLC, TEC, Hb, MCV, MCHC, PCV, platelets, lymphocytes, and neutrophils, whereas MCH and eosinophils found higher. These changes evidence that the physiological stress and immune response is greatly induced by parasitic load. Future research may investigate seasonal variations in tick infestation and their impact on cattle health, as well as the effectiveness of tick control measures to improve livestock productivity and minimize economic losses in the region.

Conflict of interest:

The authors declare no conflict of interest.

Authors' contribution:

Ab conceived study; MN supervised and conceptualized the study; BHAA, KK & NU data interpretation, statistical analysis and critical analysis.

References:

1. Mcintyre S, Heard K, Martin TG. The relative importance of cattle grazing in subtropical grasslands: does it reduce or enhance plant biodiversity? Journal of Applied Ecology. 2003;40(3):445-57.
2. Esteve-Gasent MD, Rodríguez-Vivas RI, Medina RF, Ellis D, Schwartz A, Cortés Garcia B. Research on integrated management for cattle fever ticks and bovine babesiosis in the United States and Mexico: current status and opportunities for binational coordination. Pathogens. 2020;9(11):871.
3. Theron E, Magano S. A reflection on tick control and the potential role of botanical products in integrated management practices. South African Journal of Plant and Soil. 2022;39(3):213-25.
4. El-Hamed A, Hala A, Salem SM, Ibrahim HN. Haemato-biochemical Alterations in Cattle Suffering from Anaemia and their effect on quality of some meat. Egyptian Journal of Chemistry and Environmental Health. 2016;2(2):232-49.
5. Strydom T, Lavan RP, Torres S, Heaney K. The economic impact of parasitism from nematodes, trematodes and ticks on beef cattle production. Animals. 2023;13(10):1599.
6. Nath S, Mandal S, Pal S, Jadhao S, Ottalwar N, Sanyal P. Impact and management of acaricide resistance-pertaining to sustainable control of ticks. International Journal of Livestock Research. 2018;8(10):46-60.
7. Rafique N, Kakar A, Iqbal A, Masood Z, Razzaq W. Identification of Three Species of Ticks Hyalomma anatolicum Anatolicum, Hyalomma aegyptium and Dermacenter andersoni in Quetta Cityof Balochistan, Pakistan. Global Veterinaria. 2015;14(6):842-7.

8. Hoogstraal H, Wassef HY. Haemaphysalis (Allophysalis) Kopetdaghica: identity and discovery of each feeding stage on the wild goat in northern Iran (Ixodoidea: ixodidae). The Journal of Parasitology. 1979:783-90.
9. Amanullah A. Assessment of Knowledge and Attitudes, Prevalence of Hard Ticks Among Goat and Cattle in Kech District, Balochistan. Pakistan's Multidisciplinary Journal for Arts & Science. 2023;4(01):42–7-–7.
10. Hussain A, Hussain S, Yu A, Varga C, De Leo GA, Smith RL. Geographical epidemiology of Hyalomma anatolicum and Rhipicephalus microplus in Pakistan: A systematic review. Plos one. 2024;19(8):e0309442.
11. Vindenes Y, Mysterud A. Unraveling the seasonal dynamics of ixodid ticks: A flexible matrix population model with delayed life history effects. bioRxiv. 2024:2024.01. 08.574636.
12. Eisen RJ, Eisen L. Evaluation of the association between climate warming and the spread and proliferation of Ixodes scapularis in northern states in the Eastern United States. Ticks and tick-borne diseases. 2024;15(1):102286.
13. Kakar M, Khan M, Khan M, Ashraf K, Kakar M, Jan S, et al. Prevalence of tick infestation in different breeds of cattle in Balochistan. JAPS: Journal of Animal & Plant Sciences. 2017;27(3).
14. Kebzai F, Ashraf K, Rehman MU, Akbar H, Avais M. Prevalence and associated risk factors of ixodid tick species infesting cattle and sheep in Balochistan, Pakistan. Veterinary Parasitology: Regional Studies and Reports. 2024;49:100993.
15. Wadaan MA, Khattak B, Riaz A, Hussain M, Khan MJ, Fozia F, et al. Biological control of hyalomma ticks in cattle by fungal isolates. Veterinary Sciences. 2023;10(12):684.
16. Kaur D, Jaiswal K, Mishra S. Effect of tick infestation on haematological parameters of calves. J Entomol Zool Stud. 2017;5:107-11.
17. Nogueira BCF, da Silva Soares E, Orozco AMO, da Fonseca LA, Campos AK. Evidence that ectoparasites influence the hematological parameters of the host: a systematic review. Animal Health Research Reviews. 2023:1-12.
18. Raut P, Sonkhusale V, Khan L, Nakade M, Pagrut N, Bodkhe A. Haematological changes in cattle associated with arthropods infestation. Veterinary world. 2008;1(11):338.
19. Rajendran C, Hafeez M. Haemato-biochemical changes and efficacy of different acaricides in crossbred animals. 2003.
20. Siriporn B, Juasook A. Clinical and hematological changes of canine tick-borne diseases in Thailand. Comparative Clinical Pathology. 2022;31(2):243-8.
21. Arvind Kumar AK, Vihan V, Sharma H. Haematological and biochemical effects of tick infestation in common Indian goat. 2010.
22. Hussain S. Studies of ectoparasites of livestock of Sindh. Final Tech Report. Univ Sindh, Jamshoro, Sindh, 1980.
23. Hasanpour A, Moghaddam G, Nematollahi A. Biochemical, hematological, and electrocardiographic changes in buffaloes naturally infected with Theileria annulata. The Korean journal of parasitology. 2008;46(4):223.
24. Abduch NG, Reolon HG, Ligori VA, de Oliveira Silva RM, Veríssimo CJ, Paz CCP, et al. Resistance to natural tick infestation varies with age and coat and hair traits in a tropically adapted beef cattle breed. Veterinary Parasitology: Regional Studies and Reports. 2024;50:101017.
25. Mohamed HE, Ibrahim HN, Sallam NH. Molecular Characterization, Hematobiochemical Changes and Therapeutic Management of Tick Born Haemoparasites in Naturally Infected Cattle. Journal of Advanced Veterinary Research. 2023;13(10):2039-46.
26. Ragulraj S, Bhakat M, Fernandes A, Nandhini P, Sahu C. Haematological investigation and identification of tick infestation in crossbred cattle. 2023.
27. Ahmed J, Alp H, Aksin M, Seitzer U. Current status of ticks in Asia. Parasitology research. 2007;101:159-62.
28. Gazzinelli-Guimaraes PH, Jones SM, Voehringer D, Mayer-Barber KD, Samarasinghe AE. Eosinophils as modulators of host defense during parasitic, fungal, bacterial, and viral infections. Journal of Leukocyte Biology. 2024:qiae173.
29. Çöl R, Uslu U. Haematological and coagulation profiles during severe tropical theileriosis in cattle. Turkish Journal of Veterinary & Animal Sciences. 2006;30(6):577-82.
30. Ellah M, Al-Hosary AAT. Cattle theileriosis: effect on serum constituents, erythrocytes and platelets pictures. 2011.