INSIGHTS IN ANIMAL SCIENCE

IAP

Short Communication

Influence of Season, Age, and Sex on Prevalence of Tick-Borne Diseases in Goats

Irem Anwar [1], Muhammad Sheraz Anwar [2,*], Muhammad Yousaf [1], Tabassum Munir[1], Muhammad Umer Iqbal [3] and Maqsood Akhtar [1]

[1] Livestock Production Research Institute, Bahadurnagar, Okara 56301, Pakistan
[2] University of Veterinary and Animal Sciences, Lahore 54000, Pakistan
[3] Buffalo Research Institute, Pattoki 55300, Pakistan
* Corresponding author: sherazanwar81@yahoo.com

Abstract: The current study aimed to assess the prevalence of tick-borne diseases among different goat breeds in relation to season, sex, and age at the Livestock Production Research Institute, Bahadurnagar, Okara, Punjab, Pakistan. A total of 960 blood smears from apparently healthy animals were screened for haemoprotozoan infestations using Giemsa staining technique and observed under an oil immersion lens (100X). The overall prevalence was 7.81%, with 4.68%, 2.18%, and 0.93% of theileriosis, anaplasmosis, and babesiosis, respectively, recorded on examination of blood smears. The prevalence of theileriosis was significantly higher in summer (7.08%), followed by autumn, spring, and winter at 4.58%, 4.16%, and 2.91%, respectively. However, no significant seasonal influence was observed on the prevalence of anaplasmosis and babesiosis. Analysis of age groups revealed a significantly higher prevalence of tick-borne diseases in young stock (11.56%) compared to adults (7.81%) and sucklers (4.06%). There was no significant influence observed regarding the occurrence of these diseases based on sex and breed. The study suggests that these diseases were more prevalent during summer, and young stock goats were more susceptible to haemoprotozoan diseases than adults and sucklers.

Keywords: goats; haemoprotozoan; seasonal prevalence

1. Introduction

Livestock sector plays a major role in the economy of Pakistan. It contributes 62.68% to the agricultural GDP and 3.78% to total GDP. Economic Survey of Pakistan (2022-23) notifies total population of goat and sheep is about 78.2 and 30.9 million heads, respectively. The day-by-day increase in the demand for small ruminants is primarily due to their economic value and fast-growing ability, which are essential for food security. In the country, the rising demand for mutton is another significant factor driving the increased demand for rearing small ruminants [1]. This increased demand also aligns with the need for sustainable livestock production in the face of climate change, as small ruminants are often more resilient to environmental challenges compared to larger livestock species.

Parasitic infestations are the foremost reason affecting the sustainability and production of sheep and goat [2]. Parasitism is considered as the most critical issue and obstacle in successful farming worldwide and global food security [3]. Tick-borne diseases lead to a decline in animal production, resulting in increased mortality and negatively impacting the income of livestock farmers. This is particularly significant for smallholder farmers [3, 4]. Ticks are the predominant pest of livestock in tropical and subtropical regions worldwide. They rank among the most significant parasites affecting livestock health, performance, and productivity due to their role in transmitting disease

Citation: Anwar, I.; Anwar, M.S.; Yousaf, M.; Munir, T.; Iqbal M.U.; Akhter, M. Influence of Season, Age, and Sex on Incidence of Tick-Borne Diseases in Small Ruminants. *Insights Anim. Sci.* **2024**, *1*(1), 8–11.

https://doi.org/10.69917/ias.01.01-05

Received: March 6, 2024
Accepted: April 3, 2024
Published: June 1, 2024

Copyright: © 2024 by the authors.
License: This article is published under the Creative Commons Attribution 4.0 International. (CC BY 4.0)

Publisher: Insights Academic Publishing (IAP), Lahore, Pakistan.

agents [5]. Small ruminants are highly susceptible to a variety of parasites, particularly haemoparasites such as Theileriosis, Anaplasmosis, and Babesiosis [6]. The climate in tropical and subtropical regions fosters the multiplication and growth of ticks, which are predisposing factors for the spread of various hemoprotozoan diseases [6].

In Pakistan, sporadic cases of haemoprotozoan disease are observed throughout the year. The geographical distribution of Pakistan reveals that it is a tropical country hence providing optimal conditions for tick growth and survival [7]. Field diagnosis of blood protozoans is mainly based on symptoms, existence of vector and history of the ailment. However, confirmatory diagnosis depends upon microscopic analysis of thin blood smears by using Giemsa staining technique [6]. Theileria ovis and Theileria hirci are the main species causing theileriosis in small ruminants showing the sign of intermittent fever, lymph node swelling, liver, and spleen enlargement [8]. Rhipicephalus ticks are involved in transmitting Babesia ovis from animal to animal in goats [9] showing signs of pyrexia, hemoglobinuria, anemia resulting in loss of animal [8]. Following epidemiological measures is an important tool for prevention and control of these diseases.

The current study was designed to investigate the prevalence of blood protozoan infections and to examine the influence of season, age, and sex on the prevalence of haemoprotozoans in six different goat breeds maintained at Livestock Production Research Institute, Bahadurnagar, Okara (Pakistan).

2. Materials and Methods

2.1. Study Site and Animals

This research was conducted on six different breeds of goats, namely Teddy, Naachi, Beetal Makhi Cheeni, Beetal Faisalabadi, Daira Din Pannah, and Nukri. The study took place at the Livestock Production Research Institute, Bahadurnagar, Okara, during the years 2022-23. A total of 960 animals were selected for this study. The selected animals were grouped by age as sucklers (≤4 months), young (>4 months–1 year), and adult (≥1 year), with 80 animals in each group (randomly sampled). The year was divided into four seasons: summer (May to July), autumn (August to October), winter (November to January), and spring (February to April), and samples were collected for haemoparasitic examination.

2.2. Sampling and Data Collection

For sample collection, the ear vein was located, and the skin was cleaned with absolute alcohol. A drop of peripheral blood was then collected by pricking the ear vein with a needle and placed on a glass slide to prepare two thin smears. The smears were labelled accordingly and taken to the Health Control Laboratory of LPRI, Bahadurnagar, as early as possible for further processing. The blood smears were stained using Giemsa staining technique and examined under an oil immersion lens (X 100) for the identification of blood parasites at the genus level [10]. Data on age group and sex were also collected.

2.3. Statistical Analysis

All the statistical procedures were performed through SPSS. Chi square test was performed to assess the association of different variables with tick-infestation prevalence. The significance was declared at $P \leq 0.05$.

3. Results and Discussion

The overall prevalence of blood protozoans is summarized in Table 1. Among all goat breeds, the prevalence of blood protozoans was recorded at 7.81%, which falls within the lower range of values reported in the published literature under similar environmental

conditions [6]. This difference could be attributed to the application of better tick management strategies in the institutional flock of goats, as well as the use of improved detection methods.

The influence of sex on the prevalence of blood protozoans was not significant, but a higher prevalence was detected in male goats compared to females [Table 1]. This contrasts with the findings of Khan et al. [6], who observed a higher prevalence in females. As previously described, the improved management practices at the institutional herds could have affected the prevalence of blood protozoans and their association with the risk factors present in field conditions, highlighting the importance of extending these management practices to farmers.

Table 1. Overall prevalence of blood protozoans in goats, n = 960.

Items	Overall prevalence of protozoans		
	Total samples	Positive sample	Percentage, %
Seasons [1]			
winter	240	26	10.8
spring	240	17	7.1
summer	240	11	4.5
autumn	240	21	8.8
Sex			
male	320	29	9.1
female	640	46	7.2
Age groups [2]			
sucklers	320	13	4.1
youngstock	320	37	11.6
adult	320	25	7.8

[1] Seasons: summer (May to July); autumn (August to October); winter (November to January); and spring (February to April).
[2] Age groups: sucklers (≤4 months); young (>4 months–1 year); and adult (≥1 year).

Age significantly influenced the prevalence of blood protozoans in this study [Table 1], with the highest prevalence observed in young stock, followed by the adult and suckler age groups. Adil et al. [6] also reported a higher prevalence in young animals. In contrast to our findings, this differs from Shah et al. [9], who reported a higher prevalence in sucklers than in young stock and the adult age group. These differences may be due to variations in the study area, husbandry management, and the species studied.

The incidence of a specific type of blood infestation is presented in Table 2. Theileriosis was found to be significantly related to the season, with the highest prevalence recorded in summer (7.33%), followed by spring, autumn, and winter. The seasonal incidence of babesiosis, as presented in Table 2, did not show a significant relationship with the season. In the current study, the incidence of anaplasmosis in goats was significantly lower (2.19%; Table 2) than in earlier reported studies [11]. These discrepancies may be attributed to differences in the study area and methodologies employed. It is pertinent to mention that in studies conducted at the same institutional herd, Shahzad et al. [12] reported a much higher prevalence of blood parasites compared to the current study. This lower trend of infestation indicates the implementation of better tick control strategies for small ruminants at the research station.

The present findings suggest a reasonable prevalence of blood protozoans in goats, with seasonal variations influencing prevalence rates. However, the rates were lower compared to the previously reported averages, indicating an opportunity to improve tick-borne disease control. Further research to improve extension services could enhance the effectiveness of control strategies for blood protozoans in goats.

Table 2. Seasonal prevalence of different blood protozoans in goats, n = 960.

Seasons [1]	Blood protozoan infestation prevalence, n (%)		
	Theileriosis	**Anaplasmosis**	**Babesiosis**
Winter	17 (0.8)	7 (2.9)	2 (0.8)
Spring	11 (0.9)	4 (1.7)	2 (0.9)
Summer	7 (0.4)	3 (1.3)	1 (0.4)
Autumn	10 (0.7)	7 (2.9)	4 (1.7)

[1] Seasons: summer (May to July); autumn (August to October); winter (November to January); and spring (February to April).

4. Conclusions

In conclusion, this study highlights a peak prevalence of blood protozoans in goats during the summer compared to other seasons. Therefore, it is recommended to implement vector control programs before the season of higher vector activity. Regular dipping and other vector control measures are also advised for goat farms.

Author Contributions: Conceptualization, I.A., M.S.A and M.Y.; methodology, M.Y., T.M. and M.U.I; formal analysis, M.Y., T.M. and M.U.I; resources, M.A.; data curation, I.A., M.Y., T.M. and M.U.I; writing—original draft preparation, I.A., M.A.; writing—review and editing, I.A., M.A. and M.S.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted on approval from the research committee of the Livestock Production Research Institute, Bahadurnagar, Okara.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Mehmood, H.Z.; Afzal, H.; Abbas, A.; Hassan, S.; Ali, A. Forecasts about Livestock Production in Punjab-Pakistan: Implications for Food Security and Climate Change. J. Anim. Plant Sci. **2022**, *32*(5), 1347–1355. [CrossRef]
2. Fthenakis, G.C.; Papadopoulos, E. Impact of Parasitism in Goat Production. *Small Rumin. Res.* **2018**, *163*, 21–23. [CrossRef]
3. Fitzpatrick, J.L. Global Food Security: The Impact of Veterinary Parasites and Parasitologists. *Vet. Parasitol*. **2013**, *195*, 233–248. [CrossRef]
4. Dahmani, M.; Marié, J.L.; Scandola, P.; Brah, S.; Davoust, B.; Mediannikov, O. Anaplasma Ovis Infects Sheep in Niger. *Small Rumin. Res.* **2017**, *151*, 32–35. [CrossRef]
5. Nasirian, H. Detailed New Insights about Tick Infestations in Domestic Ruminant Groups: A Global Systematic Review and Meta-Analysis. *J. Parasit. Dis*. **2022**, *46*(2), 526–601. [CrossRef]
6. Khan, A.; Ahmed Muhammed, A.; Nasreen, N.; Iqbal, F.; Cossio-Bayugar, R.; Sha, S.S.A.; Alanazi, A.D.; Zajac, Z. Tick-Borne Haemoparasitic Diseases in Small Ruminants in Pakistan: Current Knowledge and Future Perspectives. *Saudi J. Biol. Sci*. **2022**, *29*(4), 2014–2025. [CrossRef]
7. Naz, S.; Maqbool, A.; Ahmed, S.; Ashraf, K.; Ahmed, N.; Saeed, K.; Latif, M.; Iqbal, J.; Ali, Z.; Shafi, K. Prevalence of Theileriosis in Small Ruminants in Lahore-Pakistan. *J. Vet. Anim. Sci*. **2012**, *2*, 16–20.
8. Taylor, M.A.; Coop, R.L.; Wall, R. Veterinary Parasitology; John Wiley & Sons, **2015**.
9. Shah, S.S.A.; Khan, M.I.; Rahman, H.U. Epidemiological and Hematological Investigations of Tick-Borne Diseases in Small Ruminants in Peshawar and Khyber Agency, Pakistan. *J. Adv. Parasitol*. **2017**, *4*(1), 15–22.
10. Urquhart, G.M.; Armour, J.; Duncan, J.L.; Dunn, A.M.; Fw, J. Veterinary Parasitology 2nd ed. Black Well Science Ltd. **2003**.
11. Durrani, A.Z.; Younus, M.; Kamal, N.; Mehmood, N.; Shakoori, A.R. Prevalence of Ovine Theileria Species in District Lahore, Pakistan. *Pak. J. Zool*. **2011**, *43*(1), 57–60.
12. Shahzad, W.; Haider, N.; Mansur-ud-Din, A.; Munir, R.; Saghar, M.S.; Mushtaq, M.H.; Ahmad, N.; Akbar, G.; Mehmood, F. Prevalence and Molecular Diagnosis of Babesia Ovis and Theileria Ovis in Lohi Sheep at Livestock Experiment Station (LES), Bahadurnagar, Okara, Pakistan. *Iran. J. Parasitol*. **2013**, *8*(4), 570–578.

Publisher's Note: The views expressed in all publications, including statements, opinions, and data, are solely those of the individual author(s) and contributor(s) and do not necessarily reflect the views of Insights Academic Publishing (IAP) and/or its editor(s). IAP and/or its editor(s) are not responsible for any injury to persons or damage to property resulting from the ideas, methods, instructions, or products referenced in the content.