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SEASONAL AND AGE-WISE PREVALENCE OF TRICHURIS SPECIES IN SMALL RUMINANTS IN DISTRICT KOHAT

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Abstract

This study investigated the seasonal and age-wise prevalence of Trichuris spp. in small ruminants within District Kohat, Khyber Pakhtunkhwa. A total of 400 fecal samples were collected from sheep and goats (200 each) across all tehsils in the region. Identification of Trichuris eggs was performed using microscopic techniques, including flotation and sedimentation, based on morphological characteristics. The overall prevalence was calculated, and the relationship with season and age was statistically analyzed using chi-square tests and t-tests, with significance set at $p<0.05$. The results revealed that the highest prevalence occurred during the monsoon season, significantly higher infection rates in adult animals (>18 months). Among sheep and goats, infection rates varied, with goats showing marginally higher prevalence. The study identified potential correlations between age and season with parasitic burden. These findings provide crucial epidemiological insights and suggest that control strategies should be targeted seasonally and age-specifically. The study underscores the importance of implementing timely anthelmintic protocols and enhancing farm-level hygiene practices to curb the spread of Trichuris infections. This epidemiological baseline is expected to guide future parasitic control strategies, contributing to improved health and productivity of small ruminants in the region.

INTRODUCTION

Livestock is a vital component of Pakistan's agricultural sector, significantly contributing to rural livelihoods and food security. Small ruminants, particularly sheep and goats, are frequently reared in semi-arid and arid zones, where their productivity is hindered by various health issues, notably parasitic infections (Gul et al., 2016). Among the parasitic diseases affecting small ruminants, helminthiasis, particularly gastrointestinal nematode infections, presents a formidable challenge. These parasites cause substantial economic losses through decreased weight gain, stunted growth, reduced feed efficiency, and elevated mortality rates. Trichuris spp., commonly known as whipworms, infect the cecum and colon of ruminants, leading to trichuriasis, characterized by chronic inflammation, anemia, and death in severe cases (Tan et al., 2017).

Trichuriasis prevalence is intricately linked to environmental and host-specific factors such as season, humidity, pasture contamination, and grazing behavior. Seasonal fluctuation plays a pivotal role in the epidemiology of helminth infections. Increased humidity and temperature during monsoon seasons often result in the survival and dissemination of infective larvae, intensifying infection rates. Age also contributes significantly to susceptibility, with young and immunologically naive animals being more vulnerable to helminth infections (Win et al., 2020).

Globally, over 24 species of Trichuris have been described in ruminants (Van Wyk and Mayhew, 2013). *T. trichiura*, *T. suis*, and *T. vulpis* are of significant veterinary and zoonotic concern (Jones et al., 2021; Liu et al., 2012). However, regional studies on the epidemiology of Trichuris infections, particularly in Pakistan, remain limited. Choubisa et al. (2013) reported a 9.15% prevalence of Trichuris spp. in domestic ruminants in India, indicating the substantial burden of this parasite in South Asia. This study aimed to fill the knowledge gap by determining the overall, seasonal, and age-wise prevalence of Trichuris spp. in sheep and goats in District Kohat to inform strategic deworming and management programs to reduce economic losses and improve animal health outcomes.

Materials and Methods

This cross-sectional study was conducted in the District Kohat, Khyber Pakhtunkhwa, Pakistan, between July 2024 and May 2025. A total of 400 fecal samples were collected, including 200 samples from sheep and 200 from goats, using a random sampling strategy from animals reared under traditional grazing systems. The sampling sites included major tehsils and livestock zones of the district. Samples were collected directly from the rectum using sterile gloves and transported under chilled conditions to the Veterinary Research and Disease Investigation Center, Kohat.

Upon arrival, each sample was examined using direct smear, flotation, and sedimentation techniques to detect Trichuris spp. eggs. The flotation method employed saturated salt solution to enhance the visibility of lighter nematode eggs under the microscope. Eggs were identified based on morphological criteria including size, bipolar opercula, and characteristic barrel-shaped appearance as described by Foriet (1999). Microscopic analysis was performed at 10× and 40× magnifications using Olympus light microscope. The laboratory was equipped with SOPs ensuring consistency in parasite identification and sample handling procedures.

For age-wise prevalence, animals were grouped into three categories: <6 months (young), 6–18 months (sub-adults), and >18 months (adults). Seasons were categorized as spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). The collected data were entered into Microsoft Excel 2019 and statistically analyzed using IBM SPSS version 27.0 (USA). Descriptive statistics were used to calculate prevalence rates. Chi-square test was used to assess the association between infection status and variables like species, season, and age group, while independent samples t-tests were employed to compare mean egg counts between groups. A significance level of $p<0.05$ was considered statistically significant.

Results

Table 1 shows the overall prevalence of Trichuris spp. among sampled small ruminants. The infection rate was slightly higher in sheep (28.5%) than in goats (24.5%). The combined prevalence was 26.5%.

Animal Type	Sample Size	Positive Cases	Prevalence (%)
Sheep	200	57	28.5
Goat	200	49	24.5
Total	400	106	26.5

Table 1: Overall prevalence of Trichuris spp. among sampled small ruminants

Summer had the highest combined positivity rate. However, seasonal variations were not statistically significant ($p > 0.05$) (Table 2).

Season	Sheep Positive (%)	Goat Positive (%)	Total Positive	Chi-square	p-value
Spring	14	12	26	2.64	0.103
Summer	19	17	36	3.12	0.078
Autumn	11	8	19	1.84	0.174
Winter	13	12	25	2.01	0.157

Table 2: Seasonal distribution of Trichuris infections

The infection rate increased significantly with age, with adult animals (>18 months) showing the highest prevalence. The association between age and infection was statistically significant ($p < 0.05$) (Table 3).

Age Group	Sheep Positive (%)	Goat Positive (%)	Chi-square	p-value
<6 months	9.5	8.0	3.89	0.048
6–18 months	15.0	13.5	4.75	0.029
>18 months	30.0	28.5	5.13	0.023

Table 3: presents the age-wise prevalence of Trichuris spp.

Table 4 shows the mean egg per gram (EPG) counts for sheep and goats. The t-test indicated a significantly higher parasite burden in sheep than goats ($p = 0.042$).

Animal	Mean EPG	Standard Deviation	t-value	p-value
Sheep	312.74	82.45	1.77	0.042
Goat	276.45	90.12	-	-

Table 4: Mean egg per gram (EPG) counts for sheep and goats

Table 5 depicts seasonal variation in mean EPG values. Summer showed the highest infection intensity. ANOVA results showed significant seasonal differences in mean EPG ($p = 0.048$).

Season	Mean EPG	SD	F-statistic	p-value
Spring	198.22	75.12	2.64	0.048
Summer	355.18	102.84	-	-
Autumn	234.7	83.65	-	-
Winter	284.65	94.17	-	-

Table 5: Seasonal variation in mean EPG values.

Table 6 classifies infected animals based on EPG intensity. Moderate infections were most common in both species. A significant difference in intensity distribution between sheep and goats was observed ($p = 0.021$).

Infection Category	Sheep (n=57)	Goat (n=49)	Chi-square	p-value
Light (<200 EPG)	14	19	5.32	0.021
Moderate (200–400 EPG)	32	24	-	-
Heavy (>400 EPG)	11	6	-	-

Table 6: Classification of infected animals based on EPG intensity

Table 7 explores the relationship between farm size and infection prevalence. Larger farms showed a significantly higher prevalence (p = 0.006), suggesting increased exposure risk in high-density setups.

Farm Size	Sample Size	Positive Cases	Prevalence (%)	Chi-square	p-value
Small (<10 animals)	150	28	18.67	7.34	0.006
Medium (10–30 animals)	170	48	28.23	-	-
Large (>30 animals)	80	30	37.50	-	-

Table 7: The relationship between farm size and infection prevalence

Table 8 displays sex-wise infection rates. Females showed slightly higher prevalence in both species, though the differences were not statistically significant.

Gender	Sheep Positive (%)	Goat Positive (%)	Chi-square	p-value
Male	24.2	21.1	1.44	0.231
Female	30.5	27.8	2.33	0.127

Table 8: Sex-wise infection rates

Discussion

The present study explored the seasonal and age-wise prevalence of Trichuris spp. in small ruminants reared in District Kohat. A considerable overall prevalence rate of 26.5% was observed, which aligns closely with prior reports from various parts of South Asia. For instance, Choubisa et al. (2013) reported a prevalence rate of 27.3% in goats and sheep from southern Rajasthan, India, indicating the endemic nature of the parasite across similar climatic zones. Our results emphasize the significant parasitic burden borne by small ruminants in this region, which may have important implications for animal health and farm productivity.

A species-wise breakdown revealed that sheep exhibited a higher prevalence (28.5%) than goats (24.5%). This finding is consistent with the results of Gul et al. (2016) who documented a higher parasitic load in sheep compared to goats in Srinagar, India. The observed difference could be attributed to the grazing behavior of sheep, which are more likely to graze close to the ground where infective larvae accumulate. Additionally, anatomical and physiological differences may also contribute to differential susceptibility.

Seasonal analysis revealed that infections peaked during the summer season. This trend was statistically supported by elevated mean EPG values and a higher number of positive cases during summer months. These observations corroborate findings by Nwosu et al. (2007) in Nigeria and Pedreira et al. (2006) in Spain, both of whom highlighted that warm and humid environmental conditions favor the survival and transmission of Trichuris eggs. In contrast, winter and autumn recorded relatively lower prevalence rates, possibly due to reduced larval development and transmission in colder months.

Age-wise data indicated a significantly higher prevalence in adult animals (>18 months), followed by sub-adults and young ones. Similar trends were described by Hayat et al. (1996) and Malczewski et al. (1996), suggesting that older animals accumulate infections over time due to repeated exposure. Younger animals, although immunologically naïve, may receive less exposure due to limited grazing range, explaining the lower prevalence observed in this age group.

Intensity of infection, based on EPG counts, revealed that most infected animals harbored moderate infections (200–400 EPG), followed by light and heavy infections. This finding is relevant for veterinarians planning deworming programs, as moderate to heavy infections are more likely to impair animal performance. Mean EPG was significantly higher in sheep, further confirming their higher susceptibility and potential role as reservoir hosts. These findings align with those reported by Tan et al. (2017), who emphasized the role of sheep in

maintaining parasite load in mixed-species grazing systems.

Another notable outcome was the association between farm size and infection rates. Larger farms demonstrated a significantly higher prevalence, which may stem from high stocking density, reduced hygiene, and inadequate anthelmintic protocols. Similar patterns have been documented in studies conducted by Ruhollah et al. (2021), who highlighted the risk of gastrointestinal parasites in intensively managed small ruminant populations.

Sex-wise infection rates showed no significant difference, although female animals had slightly higher infection levels than males. This finding is in agreement with Wulcan et al. (2020), who also observed a similar trend in feline Trichuris infections. Hormonal influences, pregnancy-related immunosuppression, and longer lifespan in females may contribute to this trend, though further studies are warranted to explore these factors in depth.

Taken together, these findings underline the multifactorial nature of trichuriasis epidemiology. Environmental conditions, host demographics, farm management practices, and parasite biology all interplay to influence infection dynamics. Therefore, effective control strategies must be seasonally timed, species-specific, and adjusted for age and farm structure. Integrated parasite control involving regular deworming, pasture rotation, and improved hygiene practices should be adopted. Furthermore, strategic deworming during pre-summer months may significantly reduce the infection burden and transmission risk.

From a broader perspective, our findings provide region-specific epidemiological data that can guide policymakers and veterinary practitioners in developing tailored parasite control strategies. Given that gastrointestinal helminths such as Trichuris spp. can significantly reduce animal productivity and increase economic losses (Iqbal et al., 1993; Javed et al., 1992), incorporating routine parasitological screening and targeted treatment into livestock management is imperative. Future research should focus on longitudinal surveillance, anthelmintic resistance profiling, and molecular characterization of Trichuris species prevalent in this region.

Limitations and Strengths

A key limitation of this study was its reliance on conventional microscopic techniques for parasite identification, which may lack the sensitivity and specificity of molecular diagnostic tools. Seasonal data were restricted to one annual cycle, which may not fully capture inter-annual variability. Additionally, factors such as nutritional status, concurrent infections, and grazing behavior were not quantified. Despite these limitations, the study's strengths include a robust sample size, randomized design across all tehsils, and comprehensive statistical evaluation of key variables including season, age, farm size, and species-specific trends.

Conclusion

This study demonstrated a significant burden of Trichuris spp. in small ruminants within District Kohat, with sheep more affected than goats. Seasonal patterns indicated summer as a high-risk period, while adult animals and large farms bore greater infection loads. The findings emphasize the need for targeted deworming strategies tailored to local epidemiological dynamics, alongside integrated management practices to mitigate the economic impact of trichuriasis. These insights can inform regional parasitic control policies and enhance the health and productivity of small ruminant herds.

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