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PREVALENCE OF GASTROINTESTINAL PARASITES IN CATTLE OF DISTRICT SWABI, KHYBER PAKHTUNKHWA

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Abstract

Background: *Gastrointestinal parasites are a significant constraint on cattle health and productivity, particularly in tropical and subtropical regions. These parasites can cause substantial economic losses due to reduced growth, lower fertility, and higher mortality rates. Despite their importance, limited data exist on the prevalence of these parasites in cattle within District Swabi, Khyber Pakhtunkhwa, Pakistan.* ***Objectives:*** *This study aimed to determine the prevalence and distribution of gastrointestinal parasites in cattle across District Swabi, providing baseline data to inform targeted parasite control strategies.* ***Methods:*** *A cross-sectional survey was conducted during 2023-24, across four tehsils (Lahor, Razzar, Swabi, Topi) in District Swabi. A total of 400 fecal samples were collected from cattle of varying ages, sexes, and body conditions. Samples were examined microscopically using flotation and sedimentation techniques for the presence of nematode, trematode, and cestode eggs and larvae. Species identification was performed based on standard morphological keys. Data were analyzed using descriptive statistics and chi-square testing with a significance threshold of $p < 0.05$.* ***Results:*** *The overall prevalence of gastrointestinal parasites was 35% (140/400). Nematodes were the most prevalent group (19%), followed by trematodes (10%) and cestodes (4.25%). Mixed infections were observed in 1.75% of cattle. Among nematodes, Trichostrongylus spp. (10.25%) and Ostertagia ostertagi (5.5%) were most common. Significant variation was observed among tehsils ($p < 0.001$), with Tehsil Swabi reporting the highest prevalence (48%) and Tehsil Lahor the lowest (21%).* ***Conclusion:*** *This study confirms a substantial burden of gastrointestinal parasitism in cattle of District Swabi, with notable differences between tehsils. These findings emphasize the need for evidence-based parasite control programs, including strategic anthelmintic use, farmer education, and improved pasture management, to minimize production losses and improve animal welfare in the region.*

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INTRODUCTION

Parasitism remains a significant constraint to livestock production worldwide, posing a considerable threat to the sustainability of the livestock-based economy, particularly in tropical and subtropical agro-ecological zones (Vercruysse and Claerebout, 2001). Among parasitic infections, helminthiases are regarded as one of the principal obstacles limiting livestock productivity, as they reduce feed efficiency, growth rates, fertility, and overall animal health, ultimately resulting in substantial economic losses for farming communities (Sykes, 1994; Githiori *et al.*, 2004).

Gastrointestinal helminth infections, especially those caused by nematodes and trematodes, are responsible for significant reductions in livestock production by increasing morbidity and mortality rates, as well as elevating costs associated with prevention and treatment (Lashari and Tasawar, 2011; Rashid *et al.*, 2016). Additionally, these infections impair digestive functions, negatively impact reproductive performance, and compromise the overall condition of affected animals.

The gastrointestinal tract of cattle provides a favorable habitat for a wide variety of parasites capable of producing both clinical and subclinical disease (Yonas *et al.*, 2018). Among farm ruminants, gastrointestinal parasites are a major contributor to production losses, with nematodes in particular representing a substantial economic burden globally (Rafiullah *et al.*, 2011). Although nematodes are the most commonly reported parasites, trematodes, cestodes, and coccidian infections have also been documented with considerable prevalence in different regions (Tulu and Lelisa, 2016). Notable gastrointestinal parasites of cattle include Strongyle, Toxocara, Trichuris, Fasciola, Paramphistomum, Moniezia, and Eimeria species (Rafiullah *et al.*, 2011). These infections cause significant adverse effects on animal health and result in heavy economic losses to the cattle industry in both sub-Saharan Africa and worldwide.

The consequences of gastrointestinal parasitism in cattle vary depending on parasite species, infestation intensity, host factors such as age and immunity, as well as seasonal and management conditions (Singh *et al.*, 2014). Diagnosis is most commonly performed through fecal examination, complemented by clinical evaluation, with flotation, sedimentation, and fecal culture techniques serving as standard laboratory methods (Gupta *et al.*, 2012).

Given the substantial impact of these parasites on animal health and productivity, the present study was designed to determine the prevalence and distribution of gastrointestinal parasites in cattle in District Swabi, Khyber Pakhtunkhwa, Pakistan.

Materials and Methods

Study Area

The present study was conducted in District Swabi, located in the Khyber Pakhtunkhwa province of Pakistan, with geographical coordinates 34.1241°N latitude and 72.4613°E longitude. District Swabi is situated between two major river systems, the Indus and the Kabul Rivers. The district is subdivided into four administrative tehsils: Lahor, Razzar, Swabi, and Topi. District Swabi covers an area of 1,543 square kilometers, and according to the 2017 national census, has a human population of approximately 1,625,477. The district's mixed farming system and agro-ecological conditions make it suitable for cattle rearing, *yet also* potentially favorable for parasite transmission.

Study Design and Sample Collection

A cross-sectional study design was adopted to determine the prevalence of gastrointestinal parasites in cattle across the four tehsils of District Swabi during 2023-24. A total of 400 fecal samples were collected from cattle of varying age groups, sexes, and body conditions during a field survey. Samples were collected directly from the rectum or immediately after defecation to minimize environmental contamination. Approximately 200 grams of fecal material was collected from each animal using clean, leak-proof plastic containers. To prevent the embryonation or hatching of parasite eggs, samples were preserved during transportation in containers packed with ice.

Each sample was carefully labeled with relevant information, including the date of collection, sampling location (tehsil and village), age and sex of the animal, and the general health status or body condition score of the animal as assessed by visual examination. Samples were transported to the

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laboratory on the same day of collection and processed within 24 hours to ensure diagnostic accuracy.

Sample Processing and Parasitological Examination

Fecal samples were examined using both flotation and sedimentation techniques as described by Hendrix (1998) to maximize parasite recovery. Briefly, about 1 gram of feces was mixed thoroughly with 15–20 ml of distilled water. The resulting suspension was filtered through fine muslin cloth or a fine-mesh sieve to remove coarse debris. The filtrate was then transferred to a test tube, and 4–5 ml of flotation solution (saturated sodium chloride, zinc sulfate, or sugar solution) was added and mixed well. The tube was then filled completely with the flotation solution and covered with a coverslip. After allowing the tube to stand in a vertical rack for 20–30 minutes, the coverslip was carefully removed and placed on a glass slide for microscopic examination.

For the identification of trematode eggs and heavier eggs that might not float, the sedimentation method was also performed on the remaining fecal sample using distilled water. Sediment samples were examined similarly under a microscope.

Microscopy was performed under phase-contrast objectives at magnifications ranging from 10x to 40x as recommended by Thienpont *et al.* (1979). Parasite eggs and larvae were identified to the genus or species level based on their morphological features following standard parasitological keys described by Soulsby (1982).

Statistical Analysis

All collected data were compiled and entered into Microsoft Excel for initial organization and screening. Descriptive statistics were used to calculate the overall prevalence of gastrointestinal parasites as well as the prevalence of individual parasite species. Prevalence was expressed as a percentage of positive samples relative to the total number of samples examined. Tehsil-wise comparisons were performed to assess differences in parasite distribution across the district. Where appropriate, 95% confidence intervals (CI) were calculated for prevalence estimates to indicate precision. Statistical analyses were conducted using SPSS software version [23.0] (IBM Corp., Armonk, NY, USA). Associations between parasite prevalence and categorical variables such as tehsil, age group, and sex of animals were evaluated using the chi-square test, with statistical significance set at $p < 0.05$.

Results

Out of a total of 400 cattle examined in District Swabi, the overall prevalence of gastrointestinal parasites was 35%, with 140 samples testing positive. Among parasite groups, nematodes were the most prevalent, detected in 19% of the cattle (95% CI: 15.3–23.2), followed by trematodes at 10% (95% CI: 7.3–13.4) and cestodes at 4.25% (95% CI: 2.5–6.7). Mixed infections were observed in 1.75% of samples (95% CI: 0.7–3.6). Conversely, 65% of the animals were free of any gastrointestinal parasitic infection. These findings suggest that nematodes represent the predominant parasite burden in cattle within the study area (Table 1).

At the species level, Trichostrongylus spp. were the most frequently identified parasites, detected in 10.25% of the examined cattle (95% CI: 7.5–13.6). This was followed by *Ostertagia ostertagi* (5.5%, 95% CI: 3.5–8.2), *Fasciola hepatica* (4.5%, 95% CI: 2.7–7.0), and *Haemonchus placei* (3.25%, 95% CI: 1.7–5.5). Other detected species included Paraphistomum cervi (3.25%), *Fasciola gigantica* (2.25%), *Moniezia expansa* (2.75%), and *Moniezia benedeni* (1.5%). Mixed infections involving multiple parasite species were present in 1.75% of the samples. These results highlight that strongyle-type nematodes, particularly Trichostrongylus, remain the most dominant GIT parasites at the species level in District Swabi (Table 2).

When analyzing the data by tehsil, a statistically significant difference ($p < 0.001$) was found among the four tehsils. The highest prevalence of gastrointestinal parasites was recorded in Tehsil Swabi (48%, 95% CI: 38.3–57.8), followed by Tehsil Topi (41%, 95% CI: 31.5–50.9), Tehsil Razzar (30%, 95% CI: 21.4–39.6), and Tehsil Lahor (21%, 95% CI: 13.6–30.2). This variation suggests regional differences in parasite exposure or management practices that may influence infection rates (Table 3).

The distribution of specific parasite groups varied across the tehsils, with nematodes consistently emerging as the dominant parasite type. In Tehsil Swabi, nematodes were found in 29% of the cattle,

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while Topi showed a high prevalence of trematodes at 15%, the highest trematode rate among all tehsils. Tehsil Lahor showed lower overall prevalence, with nematodes at 10% and trematodes at 8%. Mixed infections were detected across all tehsils in low numbers (1–3%). The differences in parasite type distribution among tehsils were statistically significant ($p < 0.001$), indicating that ecological, husbandry, or seasonal factors may play a role in shaping parasite occurrence across District Swabi (Table 4).

Table 1. Overall prevalence of gastrointestinal parasites detected in cattle from District Swabi

Parasite Group	No. of Positive Samples	Prevalence (%)	95% CI
Nematodes	76	19.0	15.3–23.2
Trematodes	40	10.0	7.3–13.4
Cestodes	17	4.25	2.5–6.7
Mixed Infections	7	1.75	0.7–3.6
Uninfected	260	65.0	60.0–69.7
Total	**400**	**100**	–

Table 2. Species-wise prevalence of gastrointestinal parasites in cattle from District Swabi

Parasite Species	No. of Positive Samples	Prevalence (%)	95% CI
Trichostrongylus spp.	41	10.25	7.5–13.6
Ostertagia ostertagi	22	5.5	3.5–8.2
Haemonchus placei	13	3.25	1.7–5.5
Paraphistomum cervi	13	3.25	1.7–5.5
Fasciola hepatica	18	4.5	2.7–7.0
Fasciola gigantica	9	2.25	1.0–4.2
Moniezia benedeni	6	1.5	0.5–3.2
Moniezia expansa	11	2.75	1.4–4.9
Mixed infections	7	1.75	0.7–3.6

Table 3. Tehsil-wise prevalence of gastrointestinal parasites in cattle of District Swabi

Tehsil	Total Samples	Positive Samples	Prevalence (%)	95% CI	*p*-value
Lahor	100	21	21.0	13.6–30.2	<0.001
Razzar	100	30	30.0	21.4–39.6	<0.001
Swabi	100	48	48.0	38.3–57.8	<0.001
Topi	100	41	41.0	31.5–50.9	<0.001
Total	**400**	**140**	**35.0**	30.2–39.9	–

Table 4. Tehsil-wise distribution of parasite types among positive cattle in District Swabi

Tehsil	Nematodes (%)	Trematodes (%)	Cestodes (%)	Mixed Infections (%)	*p*-value
Lahor	10	8	2	1	<0.001
Razzar	17	9	3	1	<0.001
Swabi	29	8	8	3	<0.001
Topi	20	15	4	2	<0.001

Discussion

The present study demonstrates that gastrointestinal parasites remain a significant constraint to cattle production in District Swabi, with an overall prevalence of 35%. This finding aligns with earlier reports from other regions of Pakistan, confirming that gastrointestinal helminthiases continue to pose a major threat to cattle health and productivity (Rafiullah *et al.*, 2011; Rashid *et al.*, 2016). The predominance of nematodes, which were detected in

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19% of cattle, is consistent with reports highlighting Strongyle-type nematodes as the most impactful parasite group in ruminants worldwide (Vercruysse and Claerebout, 2001; Sykes, 1994). In particular, Trichostrongylus spp. and *Ostertagia ostertagi* were the most prevalent nematode species identified, supporting the view that these parasites are persistent challenges for grazing cattle due to their wide ecological adaptability (Soulsby, 1982; Githiori *et al.*, 2004).

Trematode infections were also prominent, accounting for 10% of the infections, with *Fasciola hepatica* and *Fasciola gigantica* detected at 4.5% and 2.25%, respectively. These findings agree with the observations of Lashari and Tasawar (2011) and Tulu and Lelisa (2016), who reported that liver flukes are important pathogens of cattle in similar agro-ecological regions, contributing to significant reductions in animal productivity. The detection of *Paraphistomum cervi* at 3.25% further emphasizes the burden of trematode infections, particularly in areas where waterlogged grazing environments support the intermediate snail hosts necessary for their life cycle (Singh *et al.*, 2014).

Cestode infections were less frequently encountered in this study, with *Moniezia expansa* and *Moniezia benedeni* recorded at 2.75% and 1.5%, respectively. Although their prevalence was comparatively low, their presence still suggests exposure to infected oribatid mites on pasture, which serve as intermediate hosts (Soulsby, 1982). Mixed infections were found in 1.75% of cattle, demonstrating that simultaneous exposure to multiple parasites is not uncommon and can complicate clinical management strategies.

Tehsil-wise variation in parasite prevalence was marked, with Tehsil Swabi showing the highest infection rate (48%), followed by Topi (41%), Razzar (30%), and Lahor (21%). The observed differences among tehsils were statistically significant ($p < 0.001$) and may reflect heterogeneity in grazing patterns, deworming practices, herd management, and climatic conditions, as suggested in previous surveys (Rafiullah *et al.*, 2011; Yonas *et al.*, 2018). Higher nematode prevalence in Tehsil Swabi and higher trematode prevalence in Tehsil Topi may be attributed to local environmental factors such as irrigation patterns, animal movement, and the presence of intermediate hosts in low-lying or marshy areas (Lashari and Tasawar, 2011).

Our findings reinforce the importance of routine parasitological surveillance and integrated parasite control programs in District Swabi. Strategic deworming, improved pasture management, and farmer education on parasite transmission pathways could reduce the burden of GIT parasites and improve cattle productivity (Gupta *et al.*, 2012; Vercruysse and Claerebout, 2001). Considering the identified species, priority control measures should target Strongyle nematodes and trematodes, while monitoring for emerging resistance patterns should also be emphasized to ensure sustained efficacy of anthelmintic treatments (Githiori *et al.*, 2004). Further research with seasonal and age-stratified sampling is recommended to better understand infection dynamics and guide evidence-based control strategies tailored to local conditions.

Conclusion

This study confirms a substantial prevalence of gastrointestinal parasites among cattle in District Swabi, with nematodes, particularly Trichostrongylus spp., as the most dominant group, followed by significant levels of trematodes and cestodes. Tehsil-level differences in infection rates were statistically significant, highlighting the influence of local management and ecological factors. These findings underscore the urgent need for region-specific, evidence-based parasite control programs incorporating strategic anthelmintic use, improved pasture hygiene, and regular parasitological monitoring to enhance cattle health and productivity in the district.

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