

Prevalence of gastrointestinal helminth infections in Black Bengal goats of South 24 Parganas district of West Bengal, India

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Abstract

Prevalence studies of any disease are necessary for adopting effective control strategies in an area. In this present study, the prevalence and intensity of gastrointestinal helminthes (GIHs) were recorded in Black Bengal (BB) goats in the South 24 Parganas district of West Bengal. One hundred and fifty BB goats (4 – 12 months old) of either sex were screened at monthly intervals from May 2023 to April 2024 for GIHs. Per-rectally collected faecal samples were examined qualitatively and quantitatively to determine the intensity of infection in terms of the number of eggs per gram (EPG) of faeces. All three types of helminthic parasites (i.e., trematodes, cestodes and nematodes) were recorded in BB goats, with an overall prevalence of 73.66%. Strongyle nematodes were the predominant species, followed by paramphistomes. The overall prevalence of GIHs was highest ($P<0.05$) during the monsoon season (87%), followed by the winter (71.16%) and summer (62.83%) seasons. The prevalence and intensity of strongyle nematodes were significantly ($P<0.05$) greater during the monsoon season than during the winter and summer seasons. The highest prevalence of paramphistome infection was observed in the monsoon season, but the differences among the three seasons were not significant ($P>0.05$). The prevalence of *Trichuris* and *Moniezia* was very low compared to other helminths, with the highest prevalence during the winter season. The epidemiological data obtained in the present study might be useful for designing a GI helminth control program for BB goats in South 24 Parganas of West Bengal.

Keywords: Bengal goats, Gastrointestinal helminths, Intensity, Prevalence

Highlights

- High prevalence of GIH infections was recorded in Bengal goats.
- Strongyle group of nematodes was the predominant species amongst GIHs
- The Monsoon season was the most favourable for the development of GIHs

INTRODUCTION

The “Black Bengal goat”, considered the most prized livestock species of Bengal, is renowned for both its outstanding quality palatable chevon and silky, glossy skin. Additionally, the Bengal goat is highly sought after as a source of genetic material for the improvement of non-descript goat breeds, because of its high prolificacy. Although the economic potential of goat rearing has increased significantly in rural India, especially in West Bengal, lucrative goat husbandry is still constrained by a number of problems. The main barrier to achieving the highest level of goat production is high disease burdens. Despite having a range of illnesses, goats are particularly vulnerable to parasitic diseases due to their feeding habits and habitats. The global output of small ruminants is strongly impacted by gastrointestinal parasites that cause high mortality (Hoste & Torres-Acosta, 2011; Stear et al., 2011; Knox et al., 2012; Falzon et al., 2014) as well as losses resulting

from subclinical infection that are manifested as decreased productivity (Charlier et al., 2014). The detrimental effects of parasite infections can include low fertility, weight loss, delayed growth, decreased milk supply and food conversion, a sluggish growth rate, and high mortality rates in cases of severe infections (Vilela et al., 2012; Hamid et al., 2023).

The gastrointestinal tracts of ruminant livestock are frequently inhabited by different types of helminth parasites. Common GI helminths recorded in sheep and goats of different parts of the world, including India, are *Haemonchus*, *Oesophagostomum*, *Trichostrongylus*, Hookworms, *Trichuris*, *Moniezia*, Paramphistomes and *Fasciola* (Jas et al., 2017; Singh et al., 2017; Sorathiya et al., 2017; Malathi et al., 2021; Srinivasarao et al., 2024). Different studies conducted in India, including West Bengal, have reported that *Haemonchus* is the predominant parasite in sheep and goats (Brahma et al., 2018; Jas et al., 2020). The chronic and

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subclinical nature of GI helminth infection has led to severe economic losses in small ruminant production systems, and this can be prevented by effective and sustainable control measures against GI helminths. Epidemiological knowledge is indispensable for adopting strategic control of any disease, including GI helminths. The South 24 Parganas district falls under the coastal zone of West Bengal, and the agroclimatic conditions of this region are favourable for the development and survival of the free-living stages of helminth parasites. Therefore, the present work was designed to study the prevalence of natural GI helminth infections in Black Bengal (BB) goats reared semi-intensively in villages of the South 24 Parganas district of West Bengal, India.

MATERIALS AND METHODS

Study area: Six villages under three different blocks (Joynagar I, Mathurapur I and Kultali) were selected for the present study. The selection was based on the bulk of the village's small and marginal farmers and landless labourers raising goats. The goats were reared in a semi-intensive method, which allowed them to graze freely in the open field during the day and confined them at night. The goat keepers were not even aware that routine deworming was necessary.

The study was carried out for a period of one year, i.e., from May 2023 to April 2024.

Study animals: About 25 goats in the age group of four months to one year and of either sex were selected from each of the six villages; thus, a total of 150 (one hundred and fifty) goats were selected for the present study. The selected goats were properly identified by using plastic neck tags, the owner's name and the morphological appearances of the goats, and they were reared as per the owner's choice in a semi-intensive system. Routine deworming was not followed for the selected goats; only as and when needed, anthelmintic was given to individual goats.

Collection and examination of faecal samples: For the prevalence study, approximately 3-5 g of faecal samples were randomly collected from each of the selected goats at monthly intervals during the study period. Per-rectally collected faecal samples and, when available, fresh voided pellets were collected, avoiding soil contamination.

A portion of each sample was qualitatively examined by using the standard sedimentation technique and salt floatation technique to check for the presence of nematode, cestode and trematode eggs

in faecal samples (Soulsby, 1982). Quantitative faecal examination was performed on the remaining portion of the sample to determine the intensity of gastrointestinal nematode (GIN) infection by using the modified McMaster technique (Soulsby, 1982).

Qualitative faecal examination: Approximately 3 g of faecal material was uniformly triturated in 8-10 mL of water with a mortar and pestle. After straining, the faecal suspension was left to settle for 15-20 minutes and the supernatant was subsequently discarded. One drop of sediment mixed with water was examined under 10X magnification of the compound microscope (Soulsby, 1982).

The salt floatation technique of the faecal sample was performed as per the method of Soulsby (1982), and the sediment was resuspended in saturated salt (NaCl) solution after discarding the supernatant. A glass slide was placed on the top of the container and left undisturbed for 15-20 minutes. After that, the slide was removed and examined as above.

Quantitative faecal examination: Quantitative faecal examination was done by the modified McMaster technique (Soulsby, 1982) to determine the number of eggs per gram (EPG) of the faecal sample of individual goats. One gram of the individual faecal sample was carefully used for the sedimentation technique (Soulsby, 1982), and after that, the sediment was mixed with water and spun for 15 minutes at 3000 r.p.m. Then, the sediment was mixed with the saturated salt solution to obtain a volume of 15 mL. Afterwards, the faecal suspension was suspended in a McMaster slide chamber and examined under the low power (10X) of a compound microscope. The eggs of the strongyle nematodes were counted individually in each of the two chambers. The following formula was used to compute the EPG of individual goats.

Eggs per gram (EPG) of faeces = Mean number of eggs in two chambers $\times$ 100 (dilution factor).

Statistical analyses: The prevalence (%) of GI helminthes (GIH) and EPG data were compared (Analyze-Compare Means) for obtaining the mean value along with the standard error (S. E). The data obtained in the present study were analyzed by the Duncan method (One-way ANOVA), and the significance (p value) was recorded at the 5% ($P < 0.05$) and 1% ($P < 0.01$) levels. All the statistical analyses were performed with the help of the Statistical Package for Social Sciences (SPSS), Windows version 20.0.

Table 1. Monthly and overall prevalence of gastrointestinal helminth infections in BB goats in the South 24 Parganas district of West Bengal

Months	Overall Prevalence(%)	Strongyle (%)	<i>Trichuris</i> (%)	Paramphistome (%)	<i>Moniezia</i> (%)
May' 23	63.33	60.00	2.00	18.67	3.33
June' 23	81.33	81.33	2.67	30.00	2.67
July' 23	75.33	73.33	2.67	33.33	6.67
August' 23	88.00	85.33	3.33	36.67	8.67
September' 23	90.00	88.67	2.67	31.33	5.33
October' 23	94.67	90.00	1.33	27.33	2.00
November' 23	83.33	75.33	2.67	41.33	2.67
December' 23	77.38	72.67	5.33	35.33	8.00
January' 24	66.67	62.67	5.33	24.67	10.67
February' 24	57.33	53.33	4.67	18.67	6.67
March' 24	57.33	55.33	2.00	20.00	1.33
April' 24	49.33	46.67	1.33	14.67	2.00
Overall	73.66%	69.83	3.00	27.67	5.00

RESULTS

Prevalence of GI helminth infections in Black Bengal goats:

Gastrointestinal helminth (GIH) infections were recorded all-round the year in Black Bengal goats in the study area. The average rate of GIH infection was observed as 73.66% in Bengal goats during the study period (Table 1). All three types of helminthes, nematodes (Strongyles, *Trichuris*), trematodes (paramphistomes) and cestodes (*Moniezia*), were found to infect the GI tract of BB goats. Among the different types of helminths, strongyle groups of nematodes were found to be the predominant species (69.83%) followed by paramphistomes (27.67%), which infected the BB goats of South 24 Parganas of West Bengal, India. The highest rates of GIH infection and strongyle nematodes were observed in the month of October, whereas the lowest prevalence was recorded in the month of April in Bengal goats (Table 1). The overall prevalence of the *Trichuris* nematode was very low, infecting only 3% of the selected goats. The maximum number of goats infected with paramphistomes occurred during the month of November (41.33%), and the lowest prevalence was recorded in April (14.67%). The prevalence of *Moniezia* did not follow a regular pattern, with the highest prevalence in the month of January (10.67%) and the lowest in the month of March (1.33%).

Seasonal prevalence of GI helminth infections in Black Bengal goats:

Climatic factors, particularly temperature and humidity/moisture, significantly affects the development and survival of the free-living stages of GIHs in the environment. The prevalence of GI helminths was significantly ($P < 0.05$) higher in the monsoon season (87%) compared to the summer season (62.83%). No significant ($P > 0.05$) variation was observed between the monsoon and winter seasons (71.16%) or between the summer and winter seasons (Fig. 1). The prevalence of

strongyle nematodes was significantly ($P < 0.05$) higher in the monsoon season (82.67%) than in the summer (60.83%) and winter (66%) in BB goats, but the difference was not significant between the summer and winter seasons (Fig. 1). The prevalence of *Trichuris* infection was significantly higher in the winter season (4.50%) compared to summer and monsoon seasons. There was no significant difference ($P > 0.05$) in the prevalence of paramphistomes in BB goats among the three different seasons. A significantly ($P < 0.05$) higher prevalence of *Moniezia* was recorded in the winter season (7%) compared to the summer season (2.33%). No significant ($P > 0.05$) variation was observed between the monsoon (5.67%) and winter seasons (Fig. 1).

Intensity of GIN infection in Black Bengal goats: The intensity of GIN infection in goats was assessed in

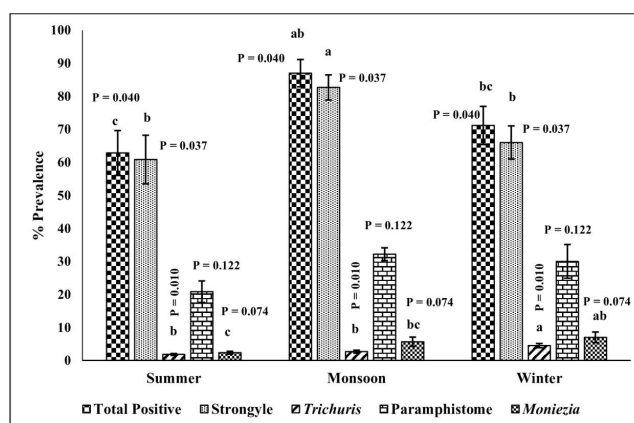


Fig. 1. Seasonal prevalence of gastrointestinal helminth infection in Black Bengal goats in the South 24 Parganas district of West Bengal

Bar bearing a, b, c.. varies significantly ($P < 0.05$) for a parameter among the three seasons.

terms of EPG. The intensity of GIN infection (mean EPG) in goats varied from 350 (± 48.30) in April to 870 (± 200.85) in September, with an overall intensity (mean EPG) of 560.42 (± 52.19). The intensity of GIN infection was significantly ($P < 0.05$) higher in the monsoon season (780 ± 31.88) compared to summer (450 ± 41.28) and winter (451 ± 55.99) in BB goats in the South 24 Parganas district of West Bengal (Fig. 2).

DISCUSSION

Gastrointestinal parasitosis has a frequent occurrence in small ruminants across the globe (Cai et al., 2023; Ruhollah et al., 2023; Araya et al., 2025), including in India (Singh et al., 2017; Chiranjeevi et al., 2021; Malathi et al., 2021; Srinivasarao et al., 2024).

The overall prevalence of GIHs, including nematodes, trematodes and cestodes of goats, as observed in the present study, was considerably high (73.66%). The higher prevalence of GIHs in goats of West Bengal, as observed in the present study, is quite reasonable. Since the prevailing agroclimatic conditions of West Bengal favour the occurrence of GIHs in livestock, a high prevalence has been recorded. The monthly average temperature, rainfall and relative humidity in West Bengal are ideal for the survival and translation of free-living stages of GIHs throughout the year (Jas et al., 2017). Besides a semi-intensive system of rearing in which the goats use to graze on pasture during daytime and those pastures are generally contaminated with infective larvae of GIHs. Hence high rate of GIH infections was recorded in BB goats. Previously, a higher prevalence of GIH in goats has been reported from different parts of the world (Olanike et al., 2015; Tumusiime et al., 2022) and India (Dixit et al., 2017; Bihagi et al., 2017; Saiyam et al., 2018). The high prevalence of GIHs in goats in the current study is in contrast to the findings of previous reports by Sharma and Mandal (2013) and Sharma et al. (2025), which recorded a prevalence of only 34.51% in goats in Jammu, India, and a low prevalence of GIN infections (23.17–27.23%) in goats in semiarid rural villages in the Mathura region, India. This discrepancy might have been a result of the distinct agroclimatic conditions of West Bengal, Mathura and Jammu, which might be due to differences in climatic factors such as temperature, rainfall pattern and humidity.

In the current study, all three types of helminths: nematodes, trematodes, and cestodes, were identified, among which the strongyle group of nematodes (69.83%) was predominant, followed by

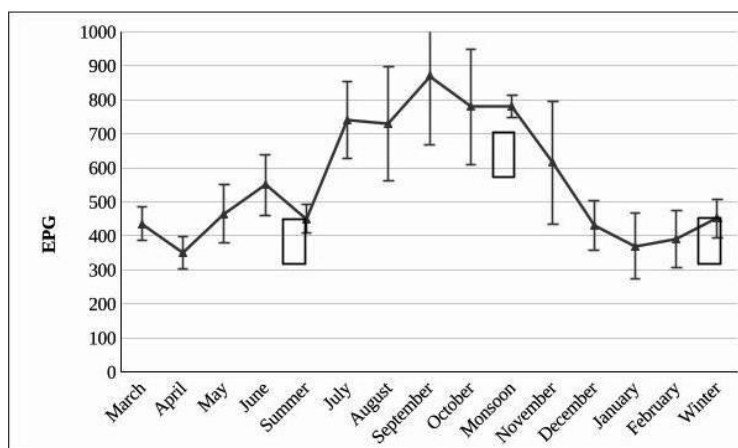


Fig. 2. Monthly and seasonal intensity of strongyle nematodes infection in Black Bengal goats in the South 24 Parganas district of West Bengal

paramphistomes (27.67%). A high prevalence of strongyles in goats has also been recorded previously by many workers worldwide (Islam et al., 2017; Mohammedsalih et al., 2019) as well as in India (Jas et al., 2017; Dixit et al., 2017; Brahma et al., 2018). The prevalence of paramphistomes (27.67%) in goats recorded in the present study was also in agreement with earlier records (Godara et al., 2014; Preethi et al., 2019). The prevalence of *Moniezia* (4.28%) in goats was low in the present study. The low prevalence of *Moniezia* is in agreement with earlier records (Olanike et al., 2015). The prevalence of the strongyle group of nematodes is greater than that of the trematode (paramphistomes) and cestode (*Moniezia*) groups because GI nematodes mostly have a direct life cycle without the involvement of any intermediate host, thus increasing the rate of development and survivability of free-living stages of strongyle larvae in the environment. The climatic factors, such as temperature and humidity and also the environmental conditions of West Bengal, such as availability of green grasses and water-logged areas, ponds, etc., are favourable for the development and survival of free-living GIN larvae in pastures. On the other hand, trematodes and cestodes have indirect life cycles that require intermediate hosts to complete their life cycles.

Seasonal factors, particularly temperature, humidity and rainfall, influence the prevalence of GIH infection in ruminant livestock. The season-wide highest overall GIH infection was found in the monsoon season, followed by that in the winter, and the lowest occurred in the summer. Similar seasonal trends have been reported by previous works (Jas et al., 2017; Singh et al., 2017; Brahma et al., 2018; Sivajothi & Reddy, 2018). The microclimate created by dung parts protects parasitic stages from harsh weather and increases

pasture contamination during monsoons, which is favourable for their survival (Dixit et al., 2017). The seasonal prevalence of GI helminth parasites in goats in the present study is in contrast to earlier records by Mir et al. (2013). In West Bengal, temperature and moisture during the rainy season are most favourable for the development and survival of the free-living larval stages of the strongyle group of nematodes and also favourable for the proliferation of the snail intermediate host of the trematode parasite; hence, the highest prevalence and intensity of infection occur during the monsoon season in BB goats. In the subtropical Jammu area of Jammu & Kashmir, Mir et al. (2013) reported that the maximum prevalence was observed in summer (88.13%), followed by winter (78.3%), spring (68.75%) and autumn (58.97%). This divergence might be due to the different agro-climatic conditions of Jammu & Kashmir than those of West Bengal. The temperature and humidity of Jammu might be most favourable for the development and survival of infective stages of GI helminths during the summer season, and thus resulting highest of GIH during the summer season in small ruminants. The intensity of GIN infection was significantly ($P < 0.05$) higher during the monsoon season than during summer and winter seasons in BB goats in South 24 Parganas in West Bengal and this observation was in accordance with the prevalence report of strongyles nematodes in the present study. Comparatively lower intensity of strongyles nematodes in goats in summer and winter seasons has also been reported earlier (Jas et al., 2017; Brahma et al., 2018), which might be due to the high temperature and low humidity in the summer season and the low temperature and low humidity in the winter season, which reduced the rate of development and

survival of free-living stages of strongyle larvae in the pasture.

The results of the present study indicate a higher prevalence of GI helminths in Black Bengal goats of the South 24 Parganas district of West Bengal, with the highest prevalence and intensity during the monsoon season. The epidemiological data obtained in the current study might be utilized for planning a control programme for GI helminth infections in small ruminants of South 24 Parganas in West Bengal.

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Author's contribution: FK: Investigation, methodology; PSJ: Project administration, data analysis; SP: Methodology, data curation; RJ: Conceptualization, project administration, writing – original draft, review and editing. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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