WebLog Journal of Veterinary Science and Animal Husbandry

Research Article
Published: 03 Sep, 2026

# A Cross-Sectional Study of Gastro-Intestinal Tract (GIT) Nematode Infestation in Small Ruminants in Kamba District, Gamo Zone, South Ethiopia

***Abenezer Mara[1]* and Abebayehu Labena[2]***

*[1]Livestock Department Coordinator, Gamo Zone Kamba Town Agriculture Office, Ethiopia*

*[2]Animal Health expert, Agriculture Office, Damot Gale District, Ethiopia*


## Abstract

Small ruminant production is the integral part of livestock production with major economic significance in Kamba district. However, their productive and reproductive performance is very low which could be associated with parasitic infestations. The objective of this study was to determine the prevalence of gastro-intestinal parasites of small ruminants and its major risk factors in the Kamba district, Gamo zone, South Ethiopia. A cross-sectional survey was conducted to estimate the prevalence and risk factors associated with small ruminant nematodes in Kamba district. The study lasted between August, 2025 to February, 2026. A total of 384 small ruminants (250 sheep and 134 goats) were examined using standard parasitological procedure. The study revealed that the overall prevalence of nematode was 52.08%. The species level prevalence of nematode was 52.0 % and 52.24% in sheep and goats, respectively. In animals with poor body condition and previously non treated (dewormed) animals the nematode egg detection level was higher than the corresponding categories ($p$<0.05). However no statistically significant difference was noted between sex, species, and age of the animals. Hence the need for strategic deworming and other related measures were suggested to reduce the production loss associated with GIT nematodes in small ruminants.

**Keywords: Gastrointestinal Nematodes; Prevalance; Small Ruminants; Kamba District**

**OPEN ACCESS**

***Correspondence:***
*Abenezer Mara, Livestock Department Coordinator, Gamo Zone Kamba Town Agriculture Office, Ethiopia, E-mail: kidistzeki2k@gmail.com*

**Received Date**: *17 Jul 2026*
**Accepted Date:** *01 Sep 2026*
**Published Date:** *03 Sep 2026*

***Citation:***
*Mara A, Labena A. A Cross-Sectional Study of Gastro-Intestinal Tract (GIT) Nematode Infestation in Small Ruminants in Kamba District, Gamo Zone, South Ethiopia. WebLog J Vet Sci Anim Husb. wjvsah.2026.i0305. https://doi.org/10.5281/zenodo.22645397*

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## Introduction

Sheep and goats assume a great share in the socioeconomic activities of about 85% of the population in Ethiopia. Small holders in the high land and low land areas where there are mixed crop-livestock population own most sheep and goats. They are integral parts of livestock sector of the economy [1].

Sheep and goat (small ruminants) are produced and extremely play significant role in the livelihoods of smallholder farmers in Ethiopia and the world. However, the small ruminant sector is faced with various challenges. Its performance is generally reduced but the situation could easily be improved with targeted interventions on the most limiting factors within the value chain. Productivity per animal and flock off-take are both low (for example, estimates of the average annual off-take rate from sheep and goat flocks indicated values of 33% and 35%, respectively) [2, 3].

There are many factors that contributed the major role in the reduced productive and reproductive performances of small ruminants. The factors could be nutritional problems, managemental, infectious and non-infectious diseases. Among these factors, widespread and extensive prevalence of different parasites worsen the growth, production, reproduction and the income generated by small ruminants [4]. Any endeavor designed to correct the risk of reduced productivity and reproductivity of small ruminants should largely depend on effective disease control and preventive strategies and genetic improvement programs. Different approaches have been followed for several decades to improve small ruminant production and reproduction to exploit the potential of the sector. These approaches that include different breeding and health monitoring programs were the different options implemented in Ethiopia to improve the performance of local breeds [5, 6].

Helminthes infection in domestic ruminants are of major importance in many agro-ecological zones in Africa and had the highest index as an animal health constraint to the poor keepers of livestock worldwide through losses due to reduced weight gains, growth rate, reduced nutrient utilization, lower meat, wool and milk production, involuntary culling, cost of treatment, mortality

and condemnation of affected organs at slaughter.

Gastrointestinal nematodes are among the most destructive pathogen affecting ovine production, given the high prevalence in flocks and the serious consequences of infection [7]. However, the effects of helminthes infection on production of particular livestock species depend mostly upon the age of the animals, the breed, the parasite species involved and the intensity of the worm population within the definitive host. Several factors are known to determine the epidemiological patterns of the associated disease conditions. These include weather conditions, husbandry practices, and the physiological status of the animal [8].

There are different parasites affecting the gastrointestinal tract of small ruminant animals. Among those parasites, gastro-intestinal nematode infection is one of the major health problems in the world. These nematodes infections affect the health of millions of people and animals by causing huge economic loss in livestock farming practices in the world. Moreover, Trichostrongyloidea that includes the genera Haemonchus, Trichostrongylus, Cooperia, Nematodirus, Strongyloidea, Ostertagia, Capilaria and Ancylostomatoidea with Oesophagostomum and Bunostomum are the most economically important and widely prevalent GIT nematodes [9-11].

In the nematoda, the sexes are separate and the males are generally smaller than the females whith lay eggs or larvae. During development, a nematode moults at intervals shedding its cuticle. In the complete life cycle there are four moults, the successive larval stages being designated L1, L2, L3, L4 and finally L5, which is the immature adult [12, 13].

The prophylactic treatment of nematode infection depends basically on the use of anthelmintics [14]. Notable, the availability of safe, broad spectrum anthelmintics has helped to reduce the incidence of a great number of worm diseases. In general, anthelmintic groups are greatly effective against the immature and mature stages of virtually all of the important gastrointestinal nematodes as well as many extra intestinal helminth species.

Therefore, the objectives of study were:

- To estimate the prevalence of small ruminant nematodes based on faecal examination in Kamba district.
- To assess the associated risk factors with the small ruminant nematodes.

## Materials and Methods

### Study area

The study was conducted from August, 2025 to February, 2026 in Kamba district Gamo zone, south Ethiopia. Kamba town is approximately 125km from Arba Minch, the administrative capital of Gamo zone and is located between 6.060 N and 37.20 E and 550 kms far from Addis Ababa. The Kamba town lies at altitude of 1831 meters above sea level and annual average rainfall ranges from 900 mm to 1,700 mm. The mean annual maximum and minimum temperature are 10.6$^0$C and 25.4$^0$C, respectively. The predominant farming system is mixed livestock and crop production system.

### Study design

A cross-sectional survey was conducted to estimate the overall prevalence of small ruminant GIT nematodes in Kamba district based on coproscopic examination. Villages known for their small ruminats population was purposely selected and animals were picked by moving from house to house and restraining at the grazing field with the help of owners. Following fecal sample collection biodata of the individual animal was captured using a semi-structured questionnaire.

### Study animals

The study animals were sheep (250) and goats (134) of both sexes and different age groups in and around Kamba district. The animals were of local breeds, kept under traditional extensive management system. Conventionally, the age of small ruminants classified as less than one year young while greater than or equal to one year adult Steele *et al.,* [15] and Body condition scoring of sampled animal was carried out according to the method described by Thompson and Meyer [16] and categorized into two scores as poor and good. The poor body condition was recorded when individual spinous process was sharp to touch and easily distinguished, in addition, the bony structure of the animals was easily noticeable. The eye muscles are of moderate depth. Good body condition was recorded when the top and side of the back bone in loin area immediately behind the last rib and above the kidney were covered with muscles. The eye muscles were full and had a thick fat cover.

### Sample size determination

The desired sample size was calculated using the standard formula described by Thrusfield [17]. The formula given below, the sample size was calculated using 50% expected prevalence, 5% absolute precision, and 95% confidence interval and the calculated total sample size was 384.

$N= 1.96^2 p_{exp} (1-p_{exp})/d^2$

Where, N = Sample size

Pexp = Expected prevalence

1.96 = the value of Z of 95% confidence level

d = Desired absolute precision = 5%

### Sampling method and sample collection

The study conducted in the Kamba district, five (5) kebeles were selected purposely based on small ruminant population. The selected sites were: Dombe Sale, Dombe Sero, Kole, Lagefu, and Ossa Meriche. Equal proportions of samples were collected from each site and animals were picked at random. Faecal samples were collected every month throughout the study period. The animals dewormed or not, body condition scores, estimated age group and sex were recorded. The participating farmers were identified by name. A fresh faecal sample was collected directly from the rectum of each animal. Collected fecal samples were put in the sampling bottle containing 10% formalin and transported to Parasitology laboratory of Kamba Zuria woreda agriculture office veterinary laboratory and stored at refrigerated temperature (4°C) until processing. In the laboratory, fecal samples were examined for the detection of nematode eggs using standard procedures of flotation as described by Charles (2006) and the floatation solution used was NaCl (Sodium Chloride).

### Data management and analysis

The prevalence was calculated for all data as the number of infected individual divided by the total number examined times hundred. A statistical software package (STATA-14) was used to carry out different statistical analysis.

## Results

In this survey the fecal sample of 384 small ruminants were, examined and 52.08% of them were found to be positive for ova of GIT nematodes. The observed proportion between the two species was not found statistically significant ($P$>0.05) (Table 1).

Among the studied small ruminants 136 of them were young as they were all less than one year of age while greater than or equal to one year considered as in the adult category. 52.21 % of the age groups were observed to have one or more parasitic egg in their feces. In the adult category 52.02% of them were identified to harbor the nematodes egg (Table 2).

Regarding sex 52.45% the females and 51.26% of males studied were positive for nematode egg in their feces. Statistically, there was no significant difference between the two sex groups ($P$>0.05) (Table 3).

Fecal sample collected from animals with poor body condition were more frequently positive for parasitic egg than the corresponding animals with good body condition. In the category the prevalence difference observed between the two groups were statistically different ($P$<0.05), (Table 4).

In relation to previous treatment (deworming status), 169 (69.36%) from 235 previously non dewormed small ruminants were examined positive and 37 (24.83%) from 149 previously dewormed small ruminants within one month before sample collection was also revealed positive results (Table 5).

**Table 1:** Prevalence of major GIT nematodes in small ruminant.

| Species | No. examined | No. infected | P (95% CI) | $X^2$ | d.f | *P*-value |
|---|---|---|---|---|---|---|
| Ovine | 250 | 130 | 52.0 | 0.0020 | 1 | 0.96 |
| Caprine | 134 | 70 | 52.24 | | | |
| Total | 384 | 200 | 52.08 | | | |

**Table 2:** Prevalence of small ruminant major GIT nematodes by age category.

| Age | No. examined | No. infected | Prevalence (95% CI) | $X^2$ | Df | *P*-value |
|---|---|---|---|---|---|---|
| Young | 136 | 71 | 52.21 | 0.0013 | 1 | 0.97 |
| Adult | 248 | 129 | 52.02 | | | |
| Total | 384 | 200 | 52.08 | | | |

**Table 3:** Prevalence of major GIT nematodes on sex basis.

| Sex | No. examined | No. infected | Prevalence (%) | $X^2$ | Df | *P* - value |
|---|---|---|---|---|---|---|
| Male | 119 | 61 | 51.26 | 0.0112 | 1 | 0.916 |
| Female | 265 | 139 | 52.45 | | | |
| Total | 270 | 200 | 52.08 | | | |

**Table 4:** Prevalence of small ruminant major GIT nematodes based on body condition score.

| BCS | No. examined | No. infected | Prevalence (95% CI) | $X^2$ | Df | *P* - value |
|---|---|---|---|---|---|---|
| Poor | 103 | 70 | 67.96 | 14.22 | 1 | 0.000163 |
| Good | 281 | 130 | 46.28 | | | |
| Total | 384 | 200 | 52.08 | | | |

**Table 5:** Prevalence of small ruminant GIT nematodes based on previously dewormed or not.

| Dewormed | No. examined | No. infected | Prevalence | $X^2$ | Df | *P* - value |
|---|---|---|---|---|---|---|
| Yes | 149 | 37 | 24.83 | 72.45 | 1 | 0.0017 |
| No | 235 | 163 | 69.36 | | | |
| Total | 384 | 200 | 52.08 | | | |

## Discussion

The present study revealed the existence of major GIT nematode parasites with an overall prevalence of 52.08% in small ruminants. The study showed that 52.0% and 52.24% of sheep and goats respectively are infested with one or more nematodes. This finding is lower than the results of other surveys in sheep and goat carried out in Bishoftu 78.1% sheep and 76.6% goat, [18], in Boloso Sore district 64.1%, [19], in Gondar 81.2% sheep and 73.5% goat [20], in Kombolcha sheep 81.35% and 72.6% goat [21], in Lamo Hadiya zone 74.41% [22]. This deference could be due to extensive use of anthelmintics by the farmers, difference in agro-climatic conditions that could support prolonged survival and development of infective larval stage of most nematodes. But this result is higher than the work of [23] who reported the total prevalence of GIT nematodes in small ruminants in the Shirka District, South Eastern Oromia, was 41.7% (160/384) out of the total sampled animals based on coprological examination. This difference might be due to the difference between the management system of examined animals and geographical and environmental location of the area.

The study further revealed that age of the animal did not show significant association with the prevalence of the nematodes infection which is in agreement with the other reports [24]. Absence of association between age groups is disagreement with previous reports [25, 26] in Ethiopia. Age was considered an important risk factor in GIT nematodes [27]. Several authors have documented that adult and old animals develop acquired immunity [13, 26] against nematode infections as they get mature due to repeated exposure and this will help expel the parasite before it establishes itself in the gastrointestinal tract.

The present study revealed that sex of the animal did not show significant association with the prevalence of the nematodes infection. The absence of association between sexes and prevalence is agreement with previous reports [24, 25]. This indicated that male and female small ruminants have equal chance of infection if they are exposed to the same contaminated communal grazing pasture. However, Dagnachew *et al.,* [26] reported that female animals are more susceptible to parasitism. It is assumed that sex is a determinant factor influencing prevalence of parasitism, and females are more prone to parasitism during pregnancy and peri-parturient period due to stress and decreased immune status [28].

Difference in body condition score is statistically significant ($P$<0.05) with gastrointestinal nematode infection such that shedding of nematodes eggs increased with poor body condition (67.96%) than in good body condition (46.28%) animals in both single and mixed parasitic infection. This is because of heavy parasitic loads, stress due to other infections, disease which can cause small ruminants to lose conditions because they are not eating or the nutrients they eat are being diverted to parasites. The finding of the present study was in line with Lema *et al.,* [3], Hailie *et al.,* [29] who reported that the prevalence was significantly higher in animals having poor body conditions than good body conditions in their study. The achievable explanations for this investigation could be due to immune-suppression in small ruminants with poor and good body conditions, concurrent infection by other parasites including GIT helminths and/or malnutrition [4].

Poorly nourished animals appear to be less competent in getting rid of nematode infection. Evidently, the infection with a parasite by itself might result in progressive emaciation of the animals where as well nourishment and watering of small ruminants lead to less risk of helminths infection as reported by Constable *et al.,* [10] and Win *et al.,* [1].

From the current study, previous treatment (deworming) given to small ruminants was found statistically significant ($p<0.05$) and higher infections were observed from 163/235 (69.36%) from previously non treated small ruminants as compared to previously treated (deworming) small ruminants 37/149 (24.83%) within one month before sample collection was conducted. This is in agreement with the findings of Taylor and Coop [4] and Constable *et al.,* [10] who stated that regular and proper therapy/ deworming of small ruminants is crucial to reduce and prevent the risk of infection of small ruminants with gastrointestinal nematode parasites. But animals already treated by anthelmintics were also found positive and different nematode parasites were identified from them which could be associated with inappropriate dosage regimen given by animal owners during deworming schedule and development of drug resistance with these anthelmintics that is in line with the findings investigated by Taylor and Coop [4], Besier and Aucamp [30] and Negash *et al.,* [31].

## Conclusion and Recommendations

In general, the overall prevalence of gastrointestinal nematodes in the study area indicates gastrointestinal nematodes to be important health problem due to its high prevalence (52.08%). The survey indicates that the prevalence to be higher particularly in animals with poor body condition and previously non dewormed. No statistically significant difference was noted in any of other risk factor categories considered under the investigation.

Based on the above conclusions, the following recommendations are forwarded:

- Awareness creation for animal owners and other stakeholders on regular deworming of small ruminants is needed.
- Detailed study should be conducted to identify the parasite at species level.
- Strategic treatment of small ruminants with anthlmentics should be practiced to minimize the impact of gastrointestinal nematodes on the health of animals.

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