

# The Prevalence of Gastrointestinal Nematodes and Associated Risk Factors of Small Ruminants in Damot Sore District of Wolaita Zone, Southern Ethiopia

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## Abstract

A cross sectional study was conducted on 384 small ruminants kept in Damot Sore district of Wolaita zone from November 2021 to May 2022 to determine the prevalence of gastrointestinal nematodes and to see the association with age, sex, body condition and species of small ruminants. For the purpose of this study, 384 faecal samples were collected from (289 sheep and 95 goats) and examined using standard parasitological procedure for screening gastrointestinal tract nematodes. The faecal samples examined revealed an overall prevalence of 200 (52.1%) in small ruminants with 152 (52.6%) in sheep and 48 (50.5%) in goats. The study revealed that a statistically significant difference ( $p < 0.05$ ) was observed in prevalence between age and body condition. The prevalence of nematodes with other risk factors (sex and species of the study animals) was not statistically significant difference ( $p > 0.05$ ). The sex wise prevalence was 53.6% and 48.1% in female and male animals respectively while that of age was 69.3%, 43.0% and 55.1% in young, adult and old animals respectively. Infection was 71.4%, 51.5% and 43.5% in poor, medium and good body conditioned animals respectively. The present study revealed that gastrointestinal nematodes are major parasitic infection problems of small ruminants in the study area and the study area was conducive for the successive maintenance and subsequent transmission of nematodes to susceptible animals. Therefore, effective strategic treatments and control measures should be instituted in the study area. During the treatment and control of small ruminant nematodes, age and body condition should be considered as potential risk factors for the occurrence of the disease. In this study the nematode eggs detected were strongyle type, hence, further laboratory examination is recommended to identify nematodes in to the genus and species level in order to design appropriate control measures.

**Keywords:** Prevalence • Gastrointestinal nematodes • Small ruminant • Damot sore • Risk factors • Southern Ethiopia

**Abbreviations:** DSWLES: Damot Sore Woreda Livestock Estimation Surveys; FAO: Food and Agricultural Association; GIT: Gastrointestinal Tract; L: Larvae; PGE: Parasitic Gastro Enteritis; NBH: Nunga Black Head; GIN: Gastro Intestinal Nematodes; NMA: National Metrological Agency; WZFED: Wolaita Zone Finance and Economy Development

## Introduction

The population of small ruminant sub-Saharan African is estimated to be 274 million the small ruminant population in Ethiopian is 24 million sheep and 18 million goats. Small ruminant mostly owned by smallholder farmers for whom this resource is critical for nutrition and income generation. Sheep and goat play an important role in improving the economics of small farmers, for those who are unable to keep large animals such as cattle in Ethiopia [1].

Sheep and goats are particularly important resource for their owner, because they require smaller investments, have shorter production cycle, faster growth rates and greater decrease environmental

adaptability than cattle. Sheep and goats, requiring little inputs, play vital role in rural economic through provision of meat, milk, blood, cash income, accumulating capital, fulfilling cultural obligation, manure and contribute to be the national economic through the export of live animals, meat and skin [2]. However, the large livestock population of Ethiopia, the economic benefit remains marginal dual to prevailing diseases, poor nutrition poor animal production system, reproductive inefficiency, management constraints and lack of veterinary care [3].

The prevalence animal diseases include helminthes parasitism (nematodes and trematods), foot and mouse diseases, bovine pneumonia, pest despetites ruminants, contagious caprice pleural-pneumonia, lumpy

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skin diseases and trypanosomosis. These diseases have a major impact on morbidity and mortality rates. The diseases continue to be a major constraint for developing countries. They are rarely associated with high mortality and their effects are characterized by lower outputs of animal products, by products, manure and traction all contributing to assure food security [4].

Gastrointestinal nematodes make up a large assemblage of worms of relatively simple structure with a widespread distribution in small ruminant in the world, in developing countries, gastrointestinal nematode is recognized as a major constraint to both small and large scale small ruminant production system [5]. Nematodes cause either direct or indirect economic loss. The direct losses caused by these parasites are attributed to acute illness and death, premature slaughter and rejection of some parts at meat inspection. Indirect losses include the diminution of productive potential such as decrease growth rate, weight loss in young growing animal late maturity of slaughter stock [6].

In Ethiopia parasitological investigation in small ruminant in the humid central highland region had demonstrated presence of several genera [7]. Despite the large population of sheep and goat and their economic importance, there is little information about the prevalence, associated risk factor and level of infestation of GIS nematodes in small ruminant in Damot Sore district of Wolaita zone. Knowledge of the nature and level of GIS parasitism in a given agro-ecological zone or even microclimate niche is very important in order to recommend the most cost-effective control measures. Therefore, the objective of this study was:

- To determine the prevalence of GIS nematodiasis of small ruminant in the study area.
- To assess the risk factor associated with gastrointestinal nematodes infection.

## Materials and Methods

### Study area

The study was conducted in Damot Sore district of Wolaita zone, southern Ethiopia. Damot Sore woreda is bordered on the south east by Sodo Zuria, on the west by Kindo Koyisha, on the North West by Boloso Bombe and on the north by Boloso Sore Woreda and it was separated from Boloso Sore Woreda. Damot Sore Woreda is located in between 6° 15" and 7° 35" North latitudes and 37° 46" and 38° 1" longitude it is at an altitude ranging from 1500 to 1800 meters above sea level. It has an average annual rainfall of 1200 millimeters per year. Damot Sore Woreda is typically bimodal with three distinct seasons, dry (November to February), small rains from March to June and big rains from July to October in the district. The mean annual maximum and minimum temperature of the area is 21 and 14°C respectively all year round. The predominant farming system is a mixed crop-livestock production. The livestock population of Damot Sore district was estimated to be 70853 bovine, 9772 ovine, 3318 caprine, 3467 equines and 36869 poultry.

### Study animal

The study animals were all local breeds, kept under traditional extensive management system. Conventionally, those animals with the age of less than two years are considered as young while those between two to four years are considered as adult and greater than four years are included as old [8]. The body condition scores were grouped as poor, medium and good [9].

### Study design

A cross-sectional investigation of gastrointestinal Nematodiasis in small ruminants was carried out in Damot Sore district of Wolaita zone from November 2021 to May 2022.

### Sample size determination

The sample size was determined by using 95% level of confidence interval and expected prevalence of 50% gastrointestinal nematode parasites in small ruminant with desired absolute precision of 5% and simple random sampling method was used. The formula used to calculate the sample size is shown below

$$N = (1.96)^2 \text{ PEX} (1-P) / (D^2)$$

p exp = expected prevalence

p = prevalence

N = required sample size

D = desired absolute precision

### Study methodology

**Parasitological study:** Fecal samples were collected directly from the rectum of each animal and placed in air and water tight vials (universal bottles). Containing 10% formalin, labeled and kept in cool box before transportation and then it was transported to the laboratory. In the laboratory, the samples were subjected to floatation technique for the detection of strongly type of nematode eggs for the screening of study animals for presence of nematode eggs. Those samples which were not examined within 24 h of arrival at laboratory were stored at +4°C and examined the other day for the detection of strongly type of nematode eggs.

### Data analysis

The data on the individual animals was entered into MS Excel spreadsheet programs to create a database and SPSS version 20 software was used for the data analysis and interpretation of the data. The prevalence of gastrointestinal nematode in small ruminants in different variables (sex, age, species and body condition) was compared with the *Chi-square* test. To characterize the data, descriptive statistical tools like percentages and frequencies were employed. GIN infection prevalence was initially assumed to be correlated with certain factors, which were first evaluated using univariable binary logistic regression. The multicollinearity of variables was checked for correlation and for statistical analysis, a 95% confidence level and a P-value of less than 5% were considered significant.

## Results

Out of the total 384 small ruminants examined 200 (52.1%) were positive for nematode eggs. From total 289 sheep examined, 152 (52.6%) and out of the total 95 goats examined, 48 (50.5%) were infected with gastrointestinal nematodes. The prevalence was higher in sheep (52.6%) than goats (50.5%) with a statistically no significant difference ( $p > 0.05$ ) between them (Table 1).

| Species of animals | Examined | No infected | Percentage | X <sup>2</sup> | P value |
|--------------------|----------|-------------|------------|----------------|---------|
| Ovine              | 289      | 152         | 52.60%     | -              | -       |
| Caprine            | 95       | 48          | 50.50%     | 123            | 0.726   |
| Total              | 384      | 200         | 52.10%     | -              | -       |

**Table 1.** Prevalence of gastrointestinal nematodes by considering species of animals.

Higher prevalence rates were shown in small ruminant with age group less than 2 years (69.3%) followed by the age groups greater than 4

years (55.1%) and age groups within 2 to 4 years (43.0%). A statistically difference ( $p < 0.05$ ) was observed in age groups (Table 2).

| Age             | No examined | No infected | Percentage | X <sup>2</sup>      | p-value |
|-----------------|-------------|-------------|------------|---------------------|---------|
| Young <2 years  | 101         | 70          | 69.30%     | -                   | -       |
| Adult 2-4 years | 214         | 92          | 43.00%     | 19.342 <sup>a</sup> | 0       |
| Old years >4    | 69          | 38          | 55.10%     | -                   | -       |
| Total           | 384         | 200         | 52.10%     | -                   | -       |

**Table 2.** Prevalence of gastrointestinal nematodes by considering age of animals.

In this study, assessment was made to see the effect of sex on disease prevalence. Higher prevalence of GIT nematode eggs was observed in

female animals (53.6%) as compared to male animals (48.1%). But the difference in prevalence between the two sexes was not statically significant ( $p > 0.05$ ) (Table 3).

| Sex    | Number of examined | Number of infected | Percentage | X <sup>2</sup>     | p-value |
|--------|--------------------|--------------------|------------|--------------------|---------|
| Male   | 106                | 51a                | 48.10%     | -                  | -       |
| Female | 278                | 149a               | 53.60%     | 0.925 <sup>a</sup> | 0.336   |
| Total  | 384                | 200                | 52.10%     | --                 |         |

**Table 3.** Prevalence of gastrointestinal nematodes by considering sex of animals.

The prevalence of gastrointestinal nematodiasia in different body condition score of the study animals was also presented in Table 4. The higher prevalence of nematode infection was observed in poor

body condition animals (71.4%) followed by medium (51.5%) and good (43.5%) body conditioned animals. There was statistically significant difference ( $p < 0.05$ ) between medium and good body conditioned animals.

| Body condition | Number of examined | Number of infected | Percentage | X <sup>2</sup>      | p-value |
|----------------|--------------------|--------------------|------------|---------------------|---------|
| Poor           | 70                 | 50 <sup>a</sup>    | 71.40%     |                     | -       |
| Medium         | 167                | 86 <sup>a</sup>    | 51.50%     | 14.822 <sup>a</sup> | 0.001   |
| Good           | 147                | 64                 | 43.50%     | -                   | -       |
| Total          | 384                | 200                | 52.1%      | -                   | -       |

**Table 4.** Prevalence of gastrointestinal nematodes by considering body condition of animals.

## Discussion

The carpological examination performed for this study revealed the existence of nematodiasis in small ruminates with an overall prevalence of 52.1%. The study showed that 52.6% and 50.5% of sheep and goats respectively harbour nematode eggs which agrees with the report. This finding is lower than the result of other surveys in small ruminants in Western Central, Northern and southern Ethiopia. The high prevalence observed in different parts of Ethiopia could be ascribed to over stoking poor nutrition (starvation). Management practice of the animals, lack of sanitation and frequent exposure to the communal grazing lands that have been contaminated. The decrease in the GIT nematodiasis prevalence in the present study compared with the other studies in the country be due to the existence of unfavourable climatic or environmental factors that could support prolonged survival and development of infective larval; stage of most nematodes.

In the present study, a higher prevalence of GIT nematode was observed in sheep than in goats which is in agreement with the other reports in Ethiopia in and around Nekemte and Berry, in and around Yabello district, who reported the prevalence of GIT nematode to be more in sheep than in goats Kenya. that shows higher GIT parasite prevalence is more common in sheep than in goats due to the grazing habit of sheep. Higher prevalence of nematodes in sheep than in goats as indicated by the result of this study could be due to the fact that the sheep have frequent exposure to communal grazing land (pasture) that have been contaminated by faces of faces of infected animals. Goats are browsers in behaviour but sheep are grazers from the ground where the GIT-nematode egg hatches and reaches the infective stage.

This observation however, disagrees with report from western. North western and eastern Ethiopia which showed higher prevalence in goats than in sheep? These authors reported their observation to the most of the goats in their study were from lowland and mid altitude areas, which are thought to be suitable for survival of the larval stage of the parasites. Age was considered as an important risk factor I GIT nematodiasis significantly higher prevalence rate of nematodiasis was found in younger small ruminants ( $p < 0.05$ ) than adult animals. This is in agreement with reports of higher prevalence in young animals in Ethiopia (77.1%) and in Tanzania (69.6%). Several authors have documented that adult and old animal develop acquired immunity against helminthic infections as they get mature due to repeated exposure and this will help expel of the parasite before it establishes itself in the GIT.

In the present study, higher prevalence of GIT nematodes infection was observed in female animals (53.6%) as compared to male animals (48.1%) but the difference in prevalence between the sexes was not statically significant ( $p > 0.05$ ). This indicated that male and female animals were found to be equally susceptible to infection with

GIT helminthic parasites, which is in agreement with the survey. Who 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.

This is in contrast with the surveys authors had documented higher prevalence of nematode infection in males. Differences between females and males in susceptibility to parasite infection are probably caused by a difference in behaviour, morphology or physiological status of sex suggested that the different hormonal status of sexes may affect the immunological responses.

The study further revealed that small ruminants with poor body conditions score have higher prevalence rate of nematodiasis infection, which agrees with the previous reporty from Asella who reported a prevalence rate of 79.6%in poor animals. This might be due to either well-fed animal have (good body condition) good immunity.

## Conclusion

Gastrointestinal nematode parasites are the major animal health constraints in sheep and goats' production and contributing loss in productivity and economy. Thaw present study showed that gastrointestinal nematode of small ruminants is prevalent disease in the study area affecting the wellbeing of the animals. The role of age and body condition in the occurrence of GIT nematodes in the study area found to be statistically significant ( $p < 0.05$ ). However, species and sex of the animals have no significant difference on the prevalence of nematodiasis ( $p > 0.05$ ). Altogether the finding suggests that demote sore district is conducive for the successive maintenance and subsequent transmission of nematodiasis to susceptible animals. Therefore, based on the above conclusion the following recommendations are forwarded:

- The parasites detected as strongly-type should be identified at genus and species level by using further laboratory techniques.
- Age and body condition in the occurrence of GIT nematodes in the study area found to be significant. Therefore, during the treatment and control of small ruminant nematodiasis, age and body condition should be considered as potential risk factors for the occurrence of the disease.
- Strategic treatment of small ruminants with anthelmintic should be practiced in the study area.

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