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Prevalence of Gastrointestinal Nematode Parasites in Cattle in and Around Menesibu District

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ABSTRACT

A cross sectional study was conducted from August 2021 to October 2021 in and Around Menesibu district, West Wollega, Oromia, Ethiopia with the objectives of estimating the prevalence of cattle gastrointestinal nematode parasites and determine the associated risk factors. Accordingly, during the study period, a total of 384 cattle fecal samples were collected and examined for the presence of the egg of nematodes by floatation technique using saline solution. The study revealed that an overall of 61.7% (237/384) cattle were infested by gastrointestinal nematode parasites during the study period. The risk factors considered were age, sex, body condition and Management. Gastrointestinal nematode parasites were predominant ($P<0.05$) in poor body condition cattle, female and in extensive management system. In conclusion, the present finding has demonstrated that gastrointestinal nematode parasites are one of the important pathogens in cattle in the study area. Therefore, appropriate monitoring and control of the disease is advisable in the study farms.

Keywords: Cattle; GIT Nematodes; Menesibu District; Prevalence; Risk Factor

Introduction

Agriculture plays an important role in Ethiopia's political, economic and social development. It forms one of the largest components of the Ethiopian economy, contributing 34% of the country's gross domestic product (GDP) and 71% of employment. Crop production makes up 72% percent of the total agricultural GDP, whereas livestock accounts for 20% to GDP and accounting for about 45% to the total value of agricultural production and supporting the livelihoods of a large share of the population [1]. This rises to about 21% of the national GDP and 49% of the agricultural GDP, if the contribution of processing and marketing is taken into account. If the indirect contribution in organic fertilizer and traction is taken into account the contribution of livestock to the GDP will rise to 25.3% [2].

Ethiopia possesses the largest livestock population in Africa with an estimated population of 47.5 million cattle, 7.8 million equines, 1 million camels, 39.6 million chickens, 26.1 million sheep and 21.7 million goats [3]. The extensive livestock resource is not exactly exploited because of many constraints, of which poor animal production and management, improper evaluation of public health importance due to various individual parasitic diseases and inadequate knowledge of epidemiology of parasites which otherwise is of great relevance where the distribution of the disease determines the type and scope of control measures to be applied [4]. The Gastrointestinal tract (GIT) of cattle harbor a variety of parasites particularly helminthes, which causes clinical and subclinical parasitism. These parasites adversely affect the health status of animals and cause enormous economic losses to the livestock industry [5]. Almost mature worms produce toxins that destroy red blood cells, leading to unthrifty anemic condition. Immature worms migrating through the body tissues and open the way for bacteria and fungi complication. Other economic losses are poor work performance, involuntary culling, lower milk production, treatment costs and mortality in heavily parasitized animal [6].

The nematodes, or 'round worms', make up a large assemblage of relatively simple structure with a wide spread distribution, their cylindrical non segmented bodies distinguishing them easily from other helminthes. They occur in fresh water, in the sea and in soil and are among the most successful parasites of plants and animals. Most of the free- living nematodes are microscopic, as are many of the parasitic species invading the body fluids such as the blood or lymph

channels of their hosts. These species which live in the intestine are generally larger, while some in tissue habitats (e.g., the kidney) grow to relatively enormous lengths [7]. Adult female nematodes produce eggs that are passed out of the host with the faeces. Under optimal conditions in the external environment, first- stage larvae (L) can develop and hatch egg 1 s within 24 hours. L1 grow and develop to second-stage larvae (L2), which in turn grow and develop in to third -stage larvae (L3). In general, the third stage larvae are the infective. After ingestion, L3 develop in to fourth-stage larvae (L4), which then develop in to immature adults. Sexually mature adult nematodes develop within 2 to 4 weeks after ingestion of the L3unless arrested larvae development occurs [8].

Diagnosis of nematodes based on the fecal examination of faeces beyond the clinical sign, the presence of worm eggs or larvae is the most common routine aid to diagnosis. The egg and larvae of nematodes are most often diagnosed done faecal floatation and faecal culture [9]. Flotation technique using floatation fluid in which the specific gravity is higher than that of the eggs. The latter will float up to the surface because nematode and cestode eggs float in a liquid with specific gravity of between 1.10 and 1.20; trematode eggs which are much heavier, require a specific gravity of 1.30-1.35. Mostly the floatation solutions used for nematode and cestode eggs are mainly based on Sodium chloride or sometimes Magnesium sulphate and also fecal culture for identification of larvae to differentiate strongyle type of egg nematode to the genera level [10]. Cattle are important contributors to the society by providing meat, milk and generation income. However, the economic importance of endoparasites occurring in cattle causes substantial economic losses by reducing the production, productivity and reproduction performance. Even though there was a huge cattle population in Menesibu district, west Walaga zone, Ethiopia, no studies had been so far carried on the types of gastrointestinal nematode parasites occurring in cattle cause substantial prevailing in the area and their magnitude of infestation under natural conditions. Therefore, the overall objective of the study will be identifying gastrointestinal nematode parasites of cattle and thereby to assess the associated risk factors in study area.

Materials And Methods

Description of Study Area

The study was conducted in and around Menesibu district, which is found in western Wollega zone of Oromia regional state, Ethiopia. This area has a latitude and longitude of 9048'N and 35o6'E respectively and an elevation of 1583 meters above sea level. It is the administrative center of ManasibuWoreda. Manasibu is bordered on the south by Jarso, on the South West by Begi on the North by the BenishangulGumuz Region and on the south west by Nedjo. The town is approximately 596 km away from Addis Ababa to west direction [11].

Study Animals

The study animals were cattle of both sexes, different age groups (young and adult) and different body conditions from study area.

Determination of Sample Size

Since no studies have been done on the gastrointestinal nematode parasites of cattle in the present study area, 50% expected prevalence will be assumed for sample size determination. So, the sample size will be calculated according to [12] sample size calculation, ninety five percent confidence levels, 5% precision and 50% expected prevalence used for the computation. Though, the required sample size was computed to be 384. Therefore, the total sample size will be 384 cattle of different species, age and sex group was examined and it will be proportionally allocated based on population of small ruminants living in selected kebele (peasant association).

$$N = 1.96\frac{2\left(P_{ex}\left(1-P_{ex}\right)\right)}{d2}$$

Where,

N= required sample size

Pex= expected prevalence,

d2= precision

Sampling Techniques and Sample Collection

The sample was collected from farms of extensive production system. Detailed examination of animals that are selected as samples from selected area was done and different body condition of animals and different sex and age group (young and adult) was recorded. Systematic random sampling method was used at each stage to select households and individual animals from the household. Accordingly, every 4th household from a PAs and all 3rd animals from the selected household were included in the sample.

Study Design

A cross sectional study will be carried out from August 2021 to October 2021 by collecting data on events associated with gastrointestinal nematode of cattle in and around Menesibu district.

Fecal Material Collection

During the study period a total of 384 cattle were sampled and fecal material were collected per rectum with gloves. Fecal material collected from each animal will be put into fecal sample bottles and labeled for different age, sex and origin and kept cool prior to transportation to veterinary laboratory where the sample will immediately be examined or stored at refrigerated temperature (4°C) for a maximum of one day before processing. Larvae identification though culturing fecal sample was carried out in the laboratory.

Parasitological Technique

The faecal samples were collected per rectum and put into faecal pots, labeled and kept cool prior to transportation to the laboratory where they were examined immediately or stored in refrigerator (4 0c) or a maximum of 6 hours before processing. The samples will be processed by Standard Flotation and Sedimentation techniques to investigate the eggs of helminthes parasites as described by [13].

Data Analysis

The collected data was first entered and managed into Microsoft Excel worksheet and analyzed by a statistical software namely, SPSS version 20. Prevalence will be determined by the formula described by [12] as the rate of number of infested animals and total number of animals in population. Associations between explanatory variables (species of animals, age, sex, season, and agro ecology) and prevalence will be done by chi-square test and P<0.05 was set to indicate significance.

Results

Overall Prevalence of Gastrointestinal Nematodes of Sheep

Of the total 384 sheep examined, 237 (61.7%) were found infected with different types of gastro-intestinal nematodes. Of the total positive cases, 167 (43.5%) were infected with strongyles, 12 (3.1%) were infected with Strongyloides species. and 58 (15.1%), were infected with strongyles and strongyloides species (Table 1).

Table 1: Prevalence of gastrointestinal nematodes of sheep encountered in the study area.

Type of eggs	Number of Animal examined	Positive sample of nematode egg	Prevalence (%)
Strongyles	384	167	43.5
Strongyloides	384	12	3.1
Strongyles and Strongloides	384	58	15.1
Total	384	237	61.7

Prevalence of the GIT Nematodes Species by Different Age Groups

Of the total 384 of cattle examined coprologically for gastrointestinal nematode eggs, 237(61.5%) were found positive. The prevalence was 71 (49.3%) in young, 105 (66.0%) in adult and 61(75.3%) in old. There was no significant difference (P>0.05) in prevalence of gastrointestinal nematode between the different ages (Table 2).

Table 2: Prevalence of GIT nematode based on different risk factors.

Risk factors	No examined	No positive	Prevalence	X^2	P- value
Age					
Young (<1 year)	144	71	49.3%		
Adult (1-3 year)	159	105	66.0%	9.080	0.169
Old (>3 year)	81	61	75.3%		
Sex					
Female	176	126	71.6%		
Male	208	111	53.3%	11.390	0.010
Body condition score					
Poor	105	94	89.5%		
Medium	202	115	56.9%	44.391	0.000
Good	77	28	36.4%		
Conjunctiva of mucous membrane					
Pink	270	164	60.7%		
Pale	114	73	64.0%	1.045	0.790
Management System					
Intensive	115	46	40.0%		
Semi-Intensive	83	34	41.0%	67.119	0.000
Extensive	186	157	84.4%		

Prevalence of GIT Nematodes Species by Sex Groups

Of the total 384 of sheep examined coprologically for gastrointestinal nematode eggs, 237 (61.7%) were found positive. The prevalence was 126(71.6%) in female and 111(53.3%) in male. There was significant difference (P < 0.05) in prevalence of gastrointestinal nematode between the two sexes (Table 2).

Prevalence of the GIT Nematodes Species by Different Body Condition Score

Of the total 384 sheep examined, 105, 202 and 77 were categorized as having poor, medium and good body condition scores, respectively. Infection prevalence was significantly higher in animal with poor body condition when compared to that of medium and good body condition scores (P<0.05). The overall infection prevalence according to body condition grades, 89.5%, 56.9% and 36.4% with poor, medium and good, respectively (Table 2).

Prevalence of GIT Nematodes by Management System

Based on the types of management system; prevalence was 46 (40.0%) from intensive, 34 (41.0%) semi intensive and 157 (84.4%) from extensive animals. The difference in isolation rate of different nematodes eggs based on management system was statistically significant (P<0.05) (Table 2).

Prevalence of GIT Nematodes Based on Conjunctival Mucous Membrane

Based on Conjunctiva of mucous membrane of animals; prevalence was isolated 164(60.7%) pink and 73(64.0%) for pale. The difference in isolation rate of different nematodes eggs based on Conjunctiva of mucous membrane was not statistically significant (P>0.05) (Table 2).

Discussion

The gastrointestinal nematodes parasites of cattle are one of the important parasitic diseases that obviously result in reduced productivity of cattle raised by smallholders using traditional husbandry management system in and around Menesibu district. The coprological examination done for this study using direct faecal floatation method revealed an overall gastrointestinal infection prevalence of GIT nematodes of cattle in Menesibu district was 61.7%. This result was lower than that found in Asella 68.1% [14] and in Meskan district, Gurage zone 76.3% [15]. These relative differences in prevalence of nematode parasites may arise due to existence of different climatic or environmental factors that could support survival and development of infective larval stage of most nematodes [16].

The present study shows 43.5% strongyles, 3.1% for strongyloides and 15.1% for both strongyles and strongyloides species. This finding was more or less agrees with the report of previous study conducted in Dembia district, Northwest part of Ethiopia 41.9% strongyle species [17]. However, this finding disagrees with previous studies Bedelle 66.6% strongyles type and 3.3% Trichuris species [18], 70.2% strongyles type and 4.5% Trichuris species in Western Oromia [19] and also this report was much lower than 97.03% strongyles type, 45.22% strongyloides and 30.25% Trichuris species in eastern part of Ethiopia [20].The current study has shown the presence of mixed infection characterized by the presence of two or more nematodes genera in cattle and this is in agreement with the findings of other researchers in some parts of the country [17,19,20-23]. This study showed that strongyles having direct life cycle were the most prominent among those that were higher prevalence in gastrointestinal nematode parasites of animals.

In this study, a significant difference was observed in nematodes infection in relation to body condition where a higher prevalence of nematodes was recorded in poor body condition animals when compared to other groups. This agrees with [24] this poor body condition might be due the current parasitic infection which lead to poor immunological response to infective stage of the parasites. Difference in body condition score was statistically significant (P< 0.05) with gastrointestinal nematode infection such that shedding of nematodes eggs increased with poor body condition (89.5%) than in good body condition (36.4%). This finding agrees with [25] who suggest that well-fed animals develop good immunity that suppresses the fecundity of the parasites. In the present study, when infection rate on age was subjected to analysis, animals with old age seems to have slightly higher prevalence of nematodes, which could be related to their higher susceptibility to infection than young age animals but it was not statistically significant (p>0.05).This can be attributed to the failure of acquired immunity in old age animals. A similar finding of higher intensity of infection in older sheep has also been reported from a study in semi-arid parts of Kenya [26]. On the contrary, [27] have documented that adult and old animals develop acquired immunity against helminth infections as they get mature due to repeated exposure.

The overall prevalence of nematodes was higher in females than males in cattle and it was statistically significant (p>0.05). This might be due to female animals may suffered from immunosuppression due to lactation and calving. It is assumed that sex is a determinant factor influencing prevalence of parasitism [28]. This study did agree with previous report prevalence of nematode was higher in females than in males because females are more prone to parasitism during pregnancy and per-parturient period due to stress and decreased immune status [29]. The overall prevalence of nematodes in different grazing system was higher in extensive (84.4%) than in intensive (40.0%) management system. It was significant for prevalence (p<0.05) of gastrointestinal nematode infections. The higher prevalence nematode parasites found in extensive management system could indicate that animals have frequent exposure to communal grazing pasture that has been contaminated by feaces infected animals. In this study disagrees with report with [30] in open grazing system; the low prevalence observed could indicate that animals freely grazed in the extensive grazing field had less exposure to infective larvae on the pasture.

Conclusion and Recommendations

In general, high prevalence of strongyles and stronyloides species of nematodes parasites were found in the study area. Those high gastrointestinal nematodes parasite indicates to be important health problem of cattle. Strongyles and stronyloides species combining with the prominent risk factors like management system, season, sex and body condition leads to major problems that hampered efficient utilization of the available cattle resources, manifested by reduced

rate of reproduction as well as severe economic impact due to slower growth rate or death of infected individuals.

Based on the above conclusive remarks, the following recommendations are forwarded:

a) Strategic anthelminthic deworming should be given at the beginning of wet season and at the end of dry season.

b) Adoption of intensive management system should be introduced in order to avoiding communal grazing.

c) Definitive diagnosis should be conducted by clearly isolating and identifying parasitic infection through coprological examination in the study area.

d) Further study should be carried out on the efficacy and the anthelminthic resistance.

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