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ORIGINAL RESEARCH

Helminth Control Practices in Sheep and Cattle in Urban and Peri-Urban Areas of Adea District, Central Ethiopia

Gebeyehu Alkadir, Dinka Ayana

Department of Veterinary Pathology & Parasitology, College of Veterinary Medicine & Agriculture, Addis Ababa University, Bishoftu, Ethiopia

Correspondence: Gebeyehu Alkadir, Email gebeyehu.alkadir@aau.edu.et

Introduction: Gastrointestinal helminth parasitism is an important problem of livestock in many places of the globe. Despite the fact that the disease is one of the leading causes of economic losses, there is little information on the occurrence of the infection in cattle and sheep in Ethiopia.

Methods: A cross-sectional study was conducted from June 2022 to February 2023 in urban and peri-urban areas of the Ada'a District with the objective of estimating the prevalence of gastrointestinal helminth parasites (GIHPs) in sheep and cattle and to assess the commercial anthelmintic utilization practices and associated risk factors in sheep and cattle. A total of 351 randomly selected fecal samples (192 cattle and 159 sheep) were collected from the rectum and examined using flotation and sedimentation. One hundred respondents were interviewed for questionnaire surveys on anthelmintic utilization practices.

Results and Discussion: The overall prevalence of GIHPs (61.25%) was recorded during the study. Among the animals, 55.21% and 68.55% prevalence of the infection was observed in cattle and sheep, respectively. There was a statistically significant difference ($P < 0.05$) in gastrointestinal helminth parasite (GIHP) infection between the study animal species, breeds, body condition of the animals, and production systems. However, there were no significant differences in gastrointestinal helminth parasite (GIHP) infection ($P > 0.05$) according to sex and age of the animals. A higher prevalence of strongyle (55.34%), fasciola (13.48%), and moniezia eggs (10.69%) was recorded. According to a questionnaire survey, ivermectin was found to be the most used anthelmintic drug. This study addresses the challenge of anthelmintic resistance (AR) against currently available anthelmintics; highly prevalent parasitic infections are causing tremendous economic losses to the animal industry.

Keywords: nematode, trematode, cestode, strongyle, fasciola, moniezia

Introduction

Over 57 million cattle heads and 58 million small ruminants constitute one of the largest ruminant populations in Ethiopia.[1–3] Parasite infection remains a major threat to livestock economies worldwide and is significant in many agro-ecological zones.[4] Large- and small-scale farmers in the developing world face serious challenges due to trematode (fluke) and gastrointestinal (GI) nematode infections in ruminant livestock.[5–7] In smallholder dairy farming communities, parasitic infections result in reduced productivity, mortality, and significant financial losses, which affect their earnings.[8–11] A significant portion of the daily meat and dairy products in cities and villages across the world are derived from ruminants, cattle, goats, and sheep, making them an important source of animal protein in many of these countries.[12] The prevalence of gastrointestinal helminth infection is high; reports of cases in domestic animals worldwide range from 0.72 to 84.1%.[2,9,13]

Gastrointestinal helminths are among the most important disease-causing agents in veterinary medicine, particularly in livestock. They cause economic losses by reducing the production of meat, milk, and wool.[7] Animals typically contract gastrointestinal helminth infections by consuming eggs or larvae during the infection stages. The source of transmission is the eggs and larvae released into the environment by the host through feces. Particularly in tropical regions, strongyle nematodes of the order Strongylida represent a significant group of gastrointestinal helminths that

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affect ruminant health.[9,14,15] Domestic livestock, especially cattle and sheep, are susceptible to fasciolosis, an economically significant illness that occasionally affects humans.[16] The two species most frequently identified as etiological agents of fasciolosis are Fasciola hepatica and F. gigantica.[9] Flatworm larvae, or cercariae, develop in the tissues of snails and use passive transmission (metacercaria) and active penetration to identify suitable secondary intermediate hosts or definitive hosts, such as people and animals.[5,17]

Previous studies conducted in cattle and sheep from different corners of Ethiopia indicated the distribution over a considerable extent for the presence of the following genera of parasitic helminths: Haemonchus spp., Trichostrongylus spp., Strongyloides spp., Oesophagostomum spp., Bunostomum spp. Toxocara vitulorum, Trichuris spp., Capillaria spp., Paramphistomum spp., Fasciola spp. and Moniezia spp.[16,18] The incidence, occurrence, and distribution of these parasitic helminths differ greatly depending on the local climate, humidity, rainfall, temperature, and vegetation cover.[19] Many local environmental factors, including humidity, rainfall, temperature, vegetation cover, and climatic conditions, have a significant impact on the presence, prevalence, and epidemiology of gastrointestinal helminth parasites in animals.[8]

In Ethiopia, gastrointestinal helminth parasitic infections are widespread in all parts of the country and are considered to be one of the most important diseases affecting cattle and sheep, as they are responsible for losses in productivity. Due to the management practices and year-round environmental factors that facilitate parasite survival and spread, sheep and cattle maintained under traditional management systems are more susceptible to parasitic helminth infections.[21] Numerous investigations have been carried out in Ethiopia to ascertain the prevalence of gastrointestinal helminths in various agroecologies in the country. According to reports, the prevalence of gastrointestinal helminths in cattle is 27.57% in Gondar,[22] 50.08% in Tulu district, West Harergae Zone,[23] 41.15% in Dire Dawa,[24] and 61% in the East Showa Zone.[25]

The majority of these studies have focused on determining the prevalence of gastrointestinal helminths in single animals using simple fecal egg examination rather than compiling with control practices. Species diversity and the frequency of parasites affecting individual animal species have been studied in Ethiopia's western, eastern, southern, and northern regions.[6,18,25–28] Parasitic illnesses, including those caused by nematode genera such as Haemonchus, Nematodirus, Fasciola, Dicrocoelium, and cestode spp., are among the major obstacles to the growth of the sheep and cattle industries. Therefore, the emergence of anthelmintic resistance has been suspected, and seeks to better understand how to select anthelmintic drugs to enhance an animal's ability to respond to helminth threats.[14,29] In vivo and in vitro studies of anthelmintic resistance were conducted by Kebede, Kumsa et al and Sheferaw et al[30–32] rather than variations in the doses given, which were most likely the cause of the observed disparities in the efficacy of the tested anthelmintics.

According to survey results, the benzimidazole family is the most commonly utilized anthelmintic family, followed by imidazothiazoles and macrocyclic lactones. Furthermore, it was demonstrated that the farmers in the research region were involved in a number of activities that might reduce the effectiveness of anthelmintics. Therefore, more thorough research is needed to elucidate the current state of efficacy of anthelmintics commonly used in Ethiopian agroecologies, animal species, and livestock management methods. There is a lack of information regarding the investigation of helminthiasis, anthelmintic utilization practices against gastrointestinal helminth parasites in cattle and sheep, and the description of specific risk factors unique to the area. Understanding the proper use of anthelmintics might be beneficial for strategically controlling and preventing livestock production in Ethiopia. Therefore, this study aimed to estimate the prevalence of gastrointestinal helminth parasitism in cattle and sheep and the associated risk factors and utilization practices of commercial anthelmintic drugs in the market.

Materials and Methods

Study Area

This study was conducted in selected areas of the Bishoftu and Ada'a districts of Central Ethiopia. The samples were selected from several urban and peri-urban regions of Ada'a district, including Bishoftu Town, as indicated (Figure 1). Bishoftu is located 45 km southeast of Addis Ababa, the capital city of Ethiopia. It lies 90N latitude and 400E longitude at an altitude of 1950 m above sea level. The average maximum and minimum temperature of the area is 34.7 °C and 8.5 °C respectively, and average relative humidity is 61.3%. The rainfall was bimodal. It receives an annual rainfall of 1151.6 mm

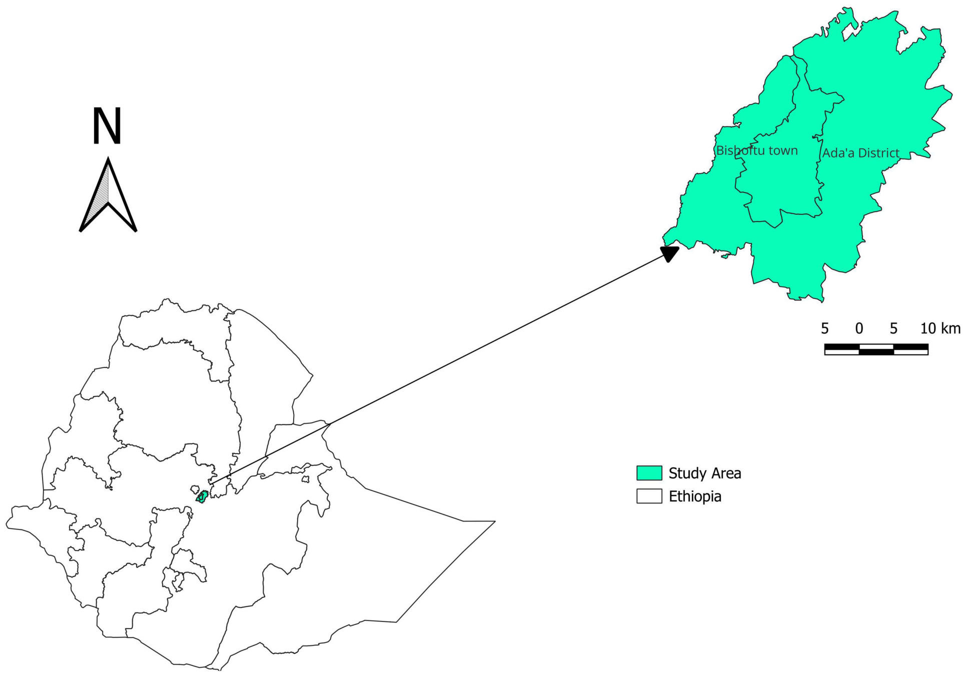

Figure 1 Study area.

of which 84% is received during the long rainy season from June to September and the remaining during the short rainy season extending from March to May. Five villages were purposively selected to represent peri-urban areas with mixed grassland and woodland vegetation.

Study Animals

The animals chosen for the study were sheep and cattle raised on small dairy farms and in the peri-urban areas of Bishoftu Town in the Ada'a district of Central Ethiopia. Both animals were kept under a traditional management system, and intensive management systems in the five selected villages and urban areas of Bishoftu Town were included in the study.

Study Design and Sample Size Determination

This cross-sectional study was conducted from June 2022 to February 2023 to gather information on gastrointestinal helminth parasites in sheep and cattle. Semi-structured interviews were conducted with farm owners whose animals were sampled during the sampling process to evaluate their anthelmintic utilization and gather basic information on the treatment methods in the study area. Animals were selected using a simple random sampling procedure. Based on a 50% expected prevalence, 99% confidence level, and 5% precision, the Thrusfield[33] calculation was used to establish the minimum sample size, which meant that a minimum of 351 animals needed to be sampled. The study animals were divided into three age groups: calf for cattle and lamb for sheep (less than one year), young (1–3 years), and adult (above 3 years), and were classified as either local breeds or crossbreeds in all of the peri-urban chosen villages and urban districts. Animal dentition patterns, as described by Frandson,[11] and owner comments were used to determine the ages of the animals. According to Heinon,[10] the body condition score (BCS) was evaluated using a score ranging from 1 to 5 as described by Frandson et al.[34] The BCS was then divided into three classes: bad, which corresponds to BCS up to 2; medium, which corresponds to BCS higher than 2 but less than 4; and good, which corresponds to BCS ≥ 4. Additionally, each sample was linked to sex and the day of sampling.

Fecal Sample Collection and Examination

Using disposable gloves, fecal samples were collected directly from the rectum of each animal. They were then placed in a universal container and permanently marked according to the identity of the animal. The collected and labelled fecal samples were then brought to the Veterinary Parasitology Laboratory, College of Veterinary Medicine and Agriculture, Addis Ababa University. Then, it was processed on the day of collection or stored in a refrigerator at +4 °C for be processed the next day. Fecal samples were processed and examined for the presence of gastrointestinal helminth parasite infection using qualitative techniques (flotation and sedimentation), as described by Aragaw et al, Hansen et al and Wyk et al.[35–37] Sodium chloride and zinc sulfate solutions were used as flotation fluids for nematode and cestode parasite egg recoveries. A simple flotation technique was employed to detect nematode and cestode eggs. The sedimentation technique was employed to detect trematode eggs, as described previously.[8,38]

Questionnaire Survey

A semi-structured questionnaire survey was designed for selected farmers whose animals were sampled to gather the required data on anthelmintic treatment practices. Questionnaire survey was conducted using face-to-face interviews on following questions; on use and type of anthelmintic drugs, frequency, who administers the drugs and the questions on source of anthelmintics were taken into account. Therefore, based on the scenario in[39] for the questionnaire survey, 100 participants were purposively selected. Accordingly, the answer item was scored 0/1 for no/yes, and the standard deviation (SD) was defined as SD = [p (1-p)/N] 1/2, where p is the proportion with a score of 1 and N is the sample size.

Data Analysis

The data collected were analyzed using IBM SPSS Statistics version 20 of statistical software, and statistical significance was set at $P < 0.05$. The exact confidence intervals (CI) for the prevalence rates at the 95% level were calculated. The prevalence of each gastrointestinal helminth parasite in sheep and cattle according to risk factors and comparison of infection prevalence rates of each helminth parasite in tested animals and anthelmintic utilization data were performed using the chi-square test ($\chi2$) test and Fisher's exact test with a threshold value of 0.05.

Result

Overall Prevalence of Gastrointestinal Helminth Parasite (GIHP) Infection

In this study, out of the 351 animals (192 cattle and 159 sheep) examined (61.25%), 215 were found to be infected with one or more gastrointestinal helminth parasites. Of the 215 animals (61.25%) identified as positive for different parasite eggs, 23 (10.69%) had two or more parasites, indicating mixed infections as indicated in (Figures 2-7). In contrast, the presence of eggs of Toxocara vitulorum in Cattle, trichuroid, strongyle, fasciola, paramphistomum, and moniezia were noted as single infections in the genera of nematodes, trematodes, and cestodes, respectively (Figures 2-7). Therefore, according to the finding, strongyle eggs were showed the highest prevalence (55.34%) followed by Fasciola eggs (13.48%), in animals. Similarly, a low prevalence of (2.79%) trichuroid and T. vitulorum eggs (2.79%) were recorded in the study animals.

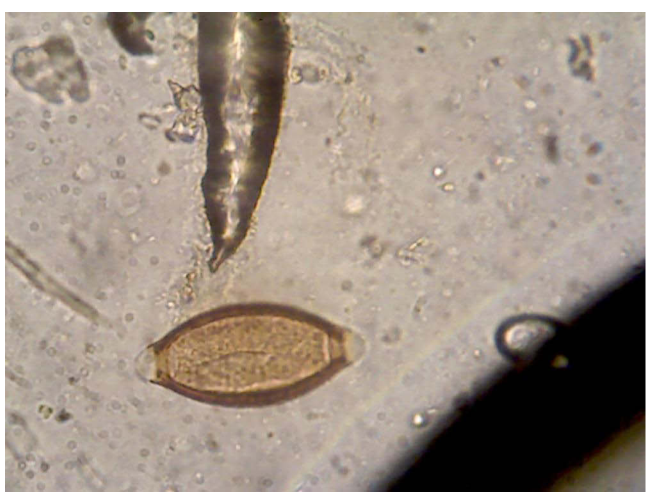

Figure 2 Trichuris egg.

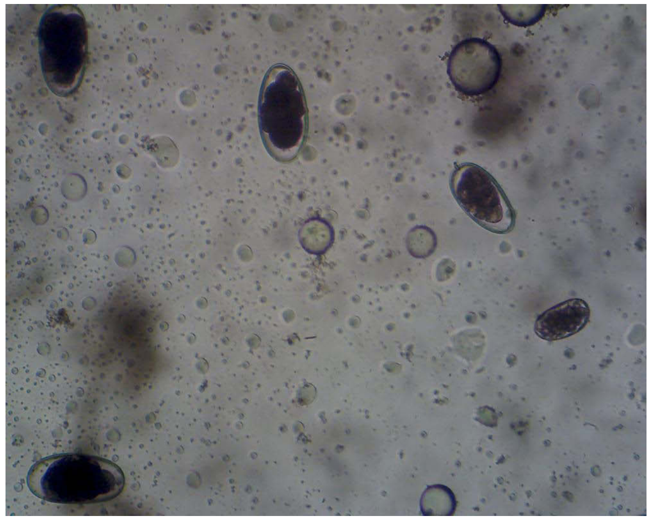

Figure 3 Strongyle eggs.

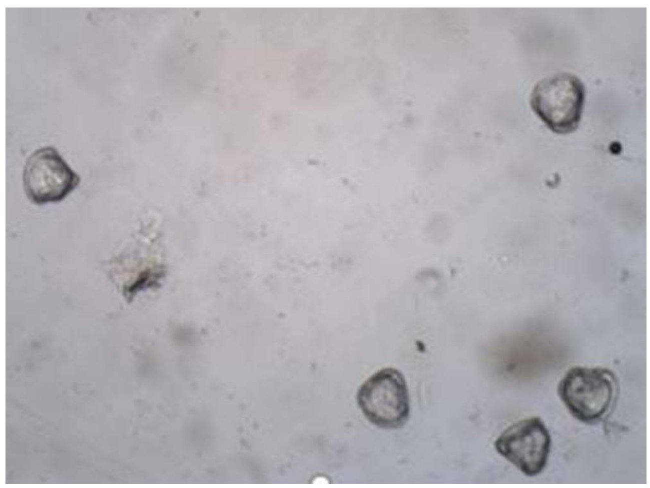

Figure 4 Moniezia eggs.

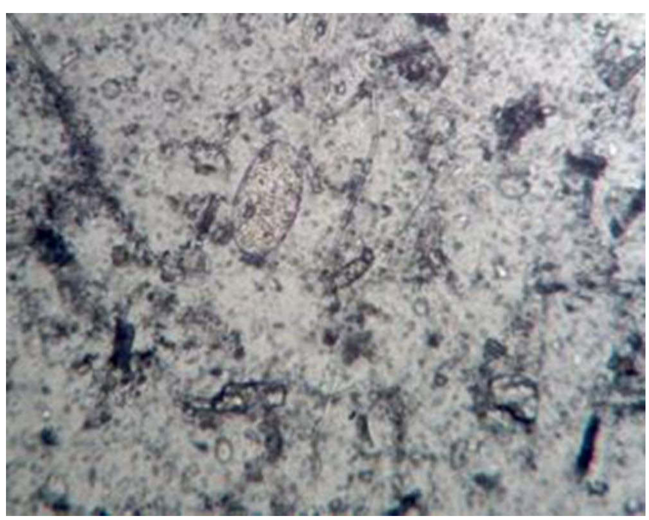

Figure 5 Paramphistomum egg.

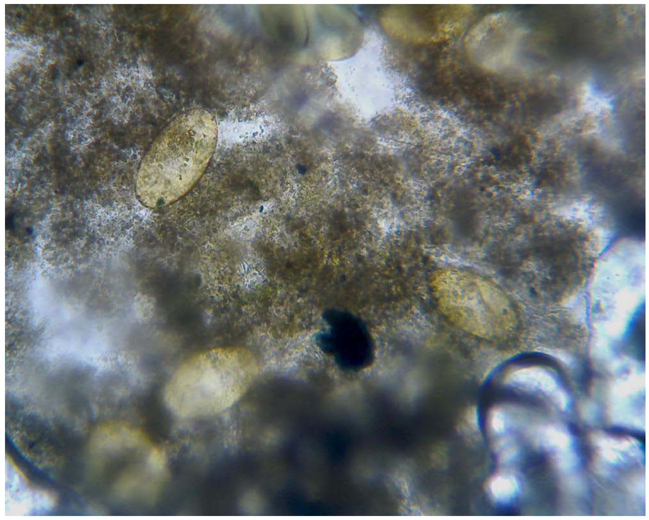

Figure 6 Fasciola eggs.

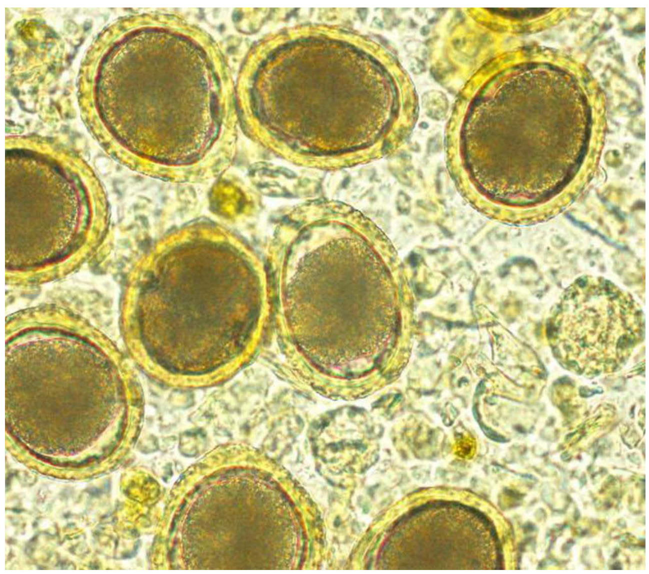

Figure 7 Toxocara vitulorum eggs.

However, moniezia eggs (10.69%) were recorded in animals with cestode helminth parasites (Table 1). Anorexia, diarrhea, emaciation, and anemia are the common clinical signs of gastrointestinal helminth parasite infection. Among the nematode genera, strongyle eggs showed a statistically significant variation ($p < 0.05$) in terms of the prevalence of gastrointestinal helminth parasites. However, no statistically significant variation ($p > 0.05$) was observed in terms of the trematode and cestode genera (Table 1).

Prevalence of Gastrointestinal Helminth Parasite (GIHP) Infection by Host Species

The prevalence of infection was significantly higher in sheep (68.55%) than that in cattle (55.21%) (Table 2). Strongyle-type eggs (55.34%) were the most predominant parasite type in both animals. Regardless of the variation in the degree of infection, trichuroid eggs and T. vitulorum eggs were observed to have relatively low prevalence in both cattle and sheep (Figure 8). The prevalence of Toxocara vitulorum, Fasciola, and Moniezia infections is higher in cattle than in sheep.

Table 1 Overall Prevalence of Gastrointestinal Helminth Parasite Infection (GIHP) in Animals

Gastrointestinal Helminth Parasite Eggs (GIHP)	Number Examined	Number of Positive	Prevalence (%)	Chi-Square (χ^2)	P-value
Toxocara vitolorum		06	2.79%		
Moniezia		23	10.69%		
Strongyle		119	55.34%	31.86	P<0.05
Trichuris		06	2.79%		
Fasciola		29	13.48%		
Paramphistomum		09	4.19%		
Mixed infections		23	10.69%		
Total	351	215	61.25%		

Table 2 Prevalence of GIHP Among Different Associated Risk Factors

Different Risk Factors		Number of Examined	Number of Positive	Prevalence	Chi-square	P-value
Species	Bovine	192	106	55.21%	31.86	P<0.05
	Ovine	159	109	68.55%		
Breed	Local	190	124	65.26%	21.631	P<0.05
	Exotic	159	90	56.60%		
	Cross	2	1	50.00%		
Sex	Male	247	139	56.28%	5.002	P>0.05
	Female	104	76	73.01%		
Age	Adult	133	72	54.14%	6.230	P>0.05
	Young	218	143	65.60%		
Body condition	Good	74	46	62.16%	39.118	P<0.05
	Medium	145	80	55.17%		
	Poor	132	89	67.42%		
Production system	Extensive	168	109	64.88%	50.055	P<0.05
	Intensive	175	99	56.57%		
	Semi intensive	8	7	87.5%		
Total		351	215	61.25%		

However, paramphistomum and mixed infections with two or more parasites were higher in sheep than in cattle (Figure 8).

Prevalence of Gastrointestinal Helminth Parasite (GIHP) by Breeds, Sex and Age

The local breed showed significant variation (P < 0.05) in the prevalence of gastrointestinal helminth parasite (GIHP) infection compared with cross and exotic breeds of animals. However, a higher prevalence of helminth infection was recorded in female animals, and no statistically significant difference (P > 0.05) was observed between the sexes. Moreover, even though the overall prevalence of helminth infection was found to be higher in young animals (65.60%) than in adult (54.14%) aged animals, no statistically significant differences (P > 0.05) were observed between the age categories, as presented in (Table 2).

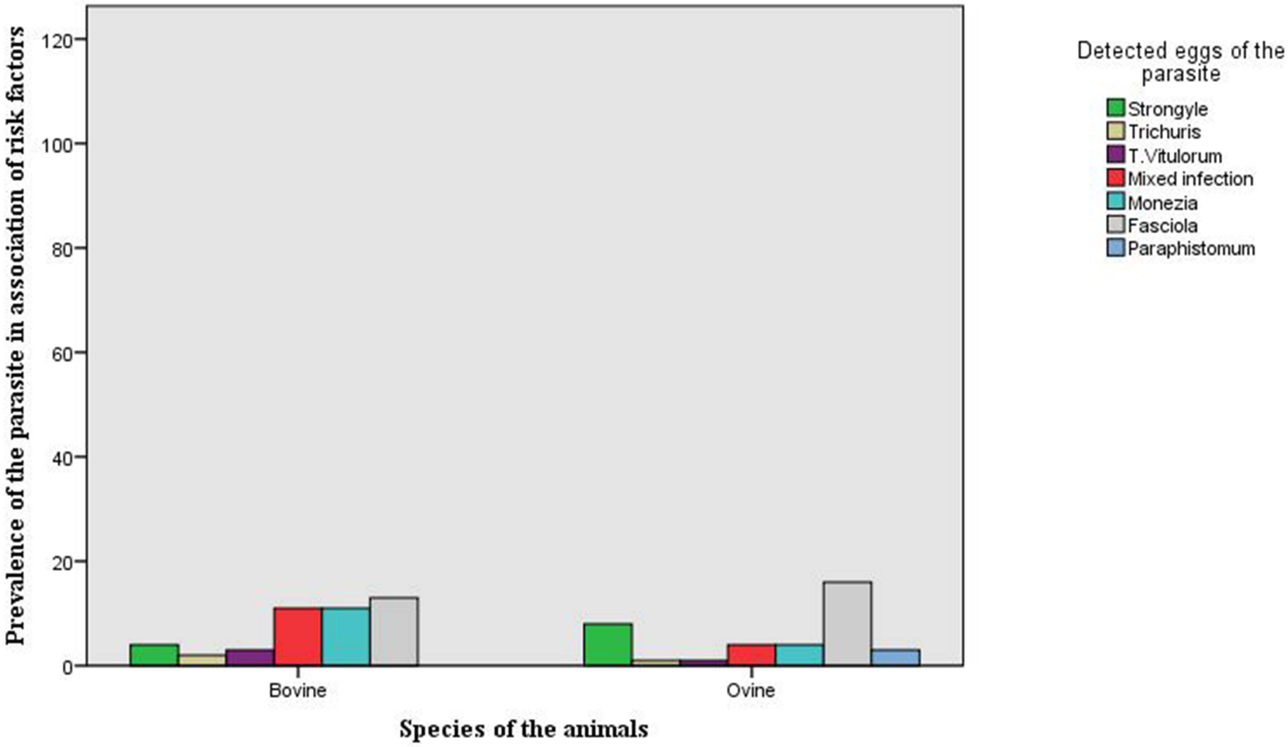

Figure 8 The potential risk factors for the parasite infection in the study animals: The parasite infection among animal species categories.

Prevalence of Gastrointestinal Helminth Parasite (GIHP) by the Body Condition Score

The prevalence of infection was significantly higher in animals with a poor body condition (67.42%) (Figure 9). However, due to concurrent infections, mixed infection eggs were frequently recorded in animals with poor body condition. In terms of helminth infection prevalence in various body-conditioned animals, poor body-conditioned animals had a higher prevalence (67.42%) than good (62.16%) and medium (55.17%) animals. Similarly, among the animals with varying body condition scores, a significant relationship ($P < 0.05$) in the prevalence of infection was observed. Based on this, animals with poor body condition scores had a higher relative chance of contracting gastrointestinal helminth parasites (GIHPs) than others, as presented in Table 2. However, helminth infection in terms of eggs for trichuroid, fasciola, paramphistomum, moniezia, and mixed infection showed variation between the three body condition scores (Figure 9). Strongyle-type eggs were the most dominant nematode genera among the body condition scores in animals. Fasciola eggs and moniezia eggs were the highest in animals with medium body-conditioned scores.

Prevalence of Gastrointestinal Helminth Parasite (GIHP) by the Production System

Similarly, animals managed extensively (64.88%) harbored a higher number of parasite eggs compared to the intensive and semi-intensive management systems (Table 2). Strongyle eggs were the most dominant parasites across the three production systems, followed by moniezia eggs. However, a higher prevalence of mixed-infection eggs was recorded in an extensive production system. Nevertheless, no fasciola or paramphistomum eggs were detected in the semi-intensive production system, as indicated (Figure 10).

The Questionnaire Surveys

According to the results of the questionnaire survey, owners of animals (95.00%) responded that they only used anthelmintics when their animals exhibited symptoms, such as poor body condition, diarrhea, or coughing. This information was analyzed to determine the respondents' awareness and basic knowledge of the treatment practices. Ivermectin (80.00%) was the most widely used anthelmintic drug, followed by albendazole (9%), levamisole (6%),

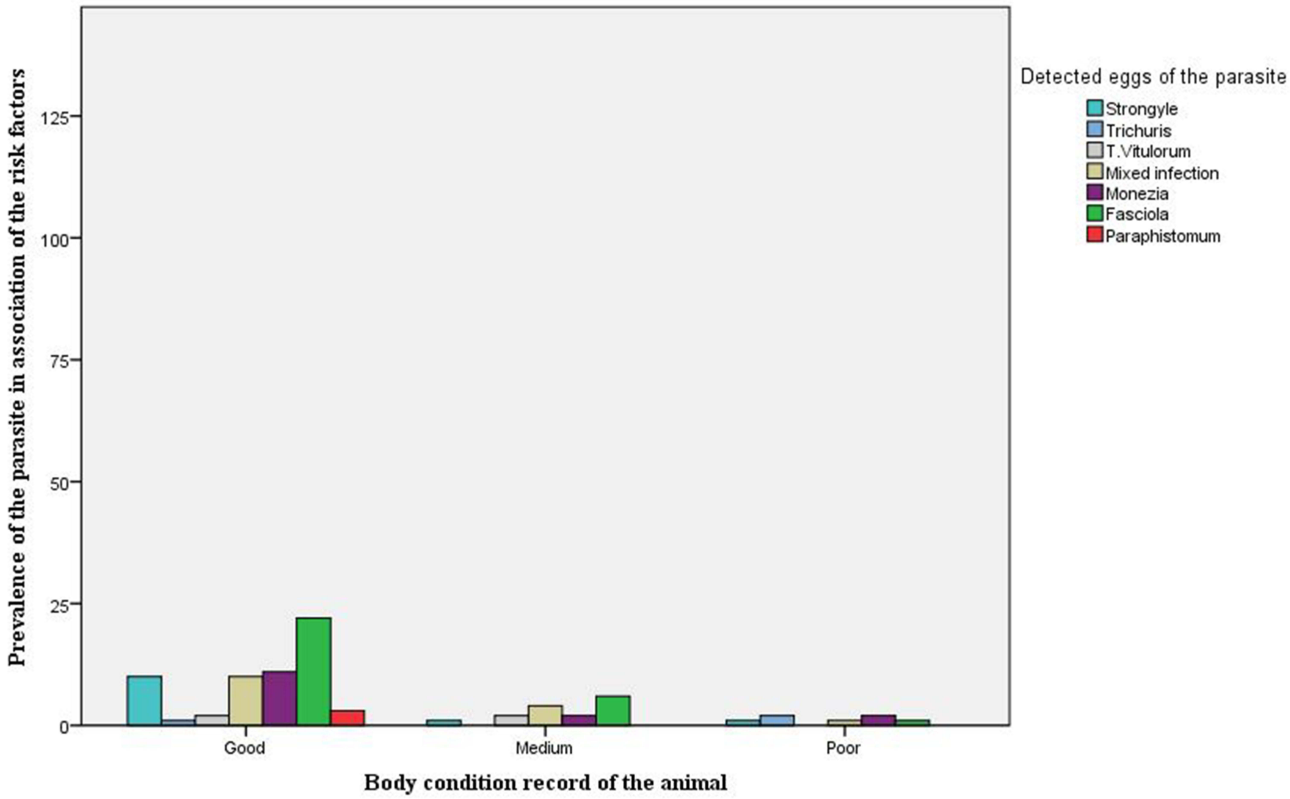

Figure 9 The potential risk factors for the parasite infection in the study animals: The parasite infection among animals' body condition categories.

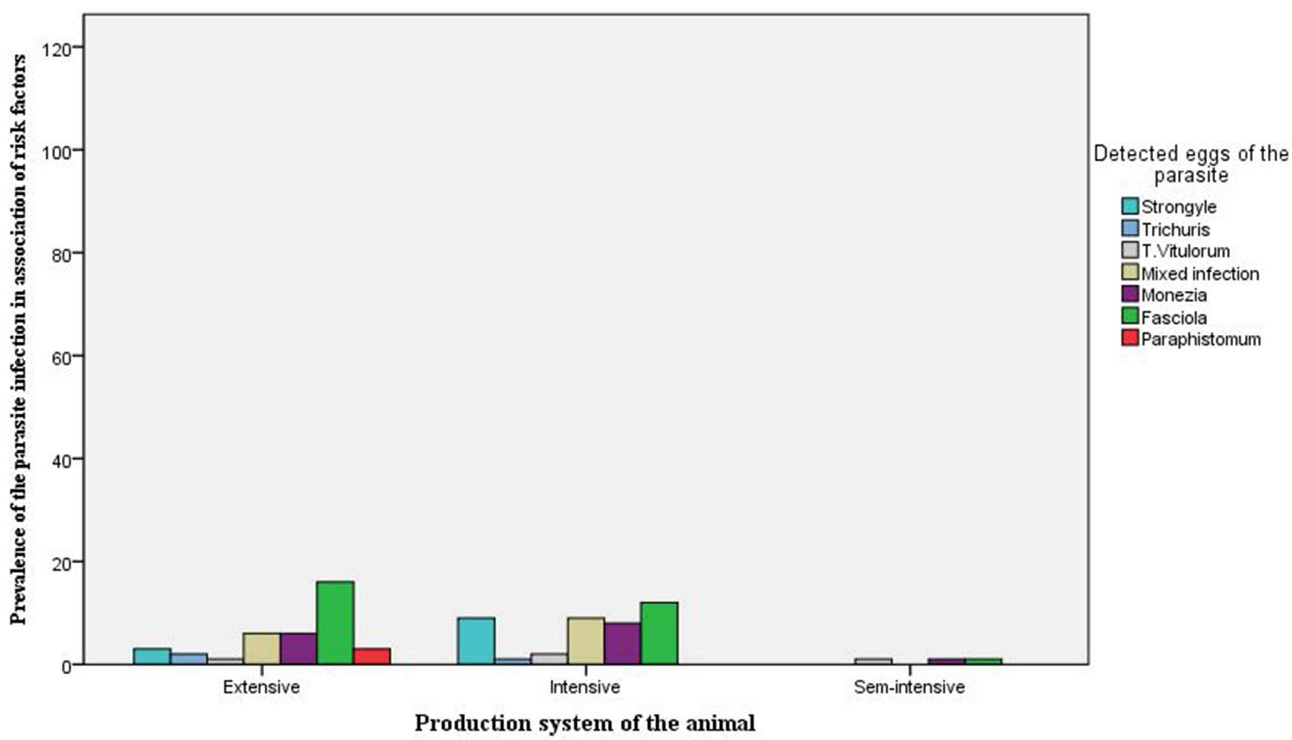

Figure 10 The potential risk factors for the parasite infection in the study animals: The parasite infection among different animals' production system categories.

Table 3 Responses of Farmers to a Questionnaire Survey on Anthelmintic Utilization Practice

Associated Risk Groups	List of items	Percent (%)
Anthelmintic use	No Yes	5.0 95.0
Type of commonly used	Albendazole Ivermectin Levamisole Tetramisole	9.0 81.0 6.0 4.0
	Mixed form	1.0
Who administers AH	Both Farmers by their own Professional	3.0 21.0 76.0
Frequency per year	Four times One time Three times Two times	1.0 28.0 33.0 38.0
Source of AH	Both private and government Government clinic Open market Private clinic	5.0 37.0 10.0 48.0
Total		100.00%

tetramisole (4%), and their mixed form (1.00%). They mostly used anthelmintics following prescription guidance from animal health professionals or owner's decisions. A significantly higher number of respondents were administered anthelmintics by animal health personnel (including all ivermectin injections) than those who did so on their own ($P < 0.05$). On average, the animals were frequently administered anthelmintics at least twice per year (Table 3). Regarding ivermectin injections, a considerably greater proportion of the respondents received anthelmintics from animal health professionals than from self-administration ($P < 0.05$). The animals frequently received anthelmintics at least twice a year on average (Table 3).

Discussion

Overall Prevalence of Gastrointestinal Helminth Parasite Eggs

This study was conducted to estimate the prevalence of gastrointestinal helminth parasitism in cattle and sheep, associated risk factors and anthelmintic utilization practices of commercial drugs that used to control helminth infections in urban and peri-urban areas of Ada'a district. Accordingly, an overall prevalence of gastrointestinal helminth parasite infection was 61.25%. This finding is consistent with those of Telila et al and Yohannes et al[40,41]; that has been conducted in cattle and in small ruminants in East Showa Zone and in and around Haramaya, Southeastern Ethiopia, respectively. Additionally, it exceeds the published study of Habtemichael et al[18] against cattle in Bishoftu town, Oromia region, central Ethiopia, which is 42.33%. However, it deviates from the findings of Awraris et al, Yohannes et al and Ayana et al[22,41,42] who reported the higher prevalence (74.04%) of gastrointestinal infections in small ruminants, with most dominant parasites of strongyle-type nematode genera. Moreover, along with helminth eggs, it's consistent with finding of different study areas across Ethiopia.[6,19,20,43] However, despite the level of incidence of the helminth infection, the strongyle-type nematode genera are more dominant parasites as described by Tibebu et al, Welay et al, Ayana et al, Tesfaye and Tongshoob et al.[23,24,42,44,45] The study showed that 68.55 and 55.21% of cattle and sheep, respectively, are infested with helminthes, which is consistent with finding of Zeryehun[46] conducted to assess helminthosis of sheep and goats in and around Haramaya, Southeastern Ethiopia.

The findings of this study also reported the occurrence of the strongyle-typed eggs of nematode genera; fasciola eggs and moniezia eggs are lower than report by Mpofu et al[47] in communal goats in South Africa for strongyle eggs (59.6%), fasciola eggs (16.74%) and moniezia eggs (36.6%) and higher than report by Ayana et al and Degefu et al[42,48] for fasciola eggs among trematode genera and lower level of mixed infection with two or more parasites reported by Income et al and Tongshoob et al.[7,45] So far many investigations have been conducted, the potential reason for the reduced rate of helminth infection in cattle was due to variation in host immunity as described by Coles et al and Seaton et al.[49,50] Besides to this, the difference may be due to the fact that study areas have extremely warm and receive scarce, erratic rainfall,[21,40] which is unfavorable for helminth parasite development, survival, and transmission. However, still, helminth infection remains a significant issue for animals.[51–53]

In Ethiopia, sheep, goats, and cattle have significant issues with health indices, reproducibility, and productivity owing to parasitic helminths.[48,51] Due to the availability of a wide range of agro-ecological conditions favorable for varied hosts and parasite species, gastro-intestinal helminth parasite infections are a global issue for both small- and large-scale farmers.[30,54] Compared to the 50.2% observed in Western Oromia,[27] the 49% reported in the West Arsi zone,[16] and the 39.6% reported in Southern Ethiopia,[41] and the finding of this study is higher. In line with a recent, report that found an overall prevalence of gastrointestinal helminths of 42.33% in and around Bishoftu[18] and 36.2% in the West Hararghe Zone,[55] as well as a previous study, the observation of 55.34% strongyle-type eggs was in both animals in the current investigation. Even though further study is needed, there is less prevalence of Toxocara vitulorum eggs (2.79%) than 12.4% report by Dorny et al[13] indicating the role of T. vitulorum infections in the overall clinical impact of illnesses in cattle animals. This result is also less than the 68.2% and 77.6% of the researchers finding by Haymanot et al[9] and Bedasa et al[51] at Holleta dairy farms in Southern Ethiopia's Kucha and the Agricultural Research Center, respectively. It is also in line with a previous report on the prevalence of gastrointestinal parasites in sheep and cattle in Northeastern Mountain Juan, Colombia.[53]

The various risk factors that have been evaluated also had an impact on the prevalence or distribution of different parasite genera. According to this study, the majority of parasite genera were significantly more common in sheep (68.55%) than in cattle (55.34%). As a result, the animal species was found to be potential risk factors for distributions of helminth infection that could be due to variation in host immunity as described by Albuquerque et al and McNeilly et al.[2,4] The high infections with gastrointestinal helminth parasite that have been seen are consistent with expectations.[15,43] The research was conducted by Hayder et al[8] on trematode infections and associated host risk factors in cattle in and around Bahir Dar, northwestern Ethiopia, where paramphistomum was highly prevalent trematodes and, in reported studies conducted in eastern Nigeria,[43] was not inconsistent with the studies on major gastrointestinal helminth parasites in cattle in Tulo District by Tulu et al[55] but was lower than those reported in studies on helminth incidence in goats in Morocco.[17]

Various studies may have varied research seasons, animal ages, management statuses, agro-ecologies, and climates of different study sites, which could all contribute to the discrepancies. Furthermore, there was a low prevalence of the infection in crossbreeds, which could be due to improved management system than local breeds grazing on communal pasture. Except for sex and age, the results of the study indicated the variables influencing the occurrence of helminth infections, such as animal species, bodily condition, and kind of production system as those described by Sissay et al.[56] Furthermore, species-wise prevalence showed a substantial difference in helminth infections between the animal groups, with sheep being more sensitive than cattle. These results supported other research[4] that suggested the development of immunity requires a significant amount of the animal's productive lifespan, which is a common characteristic of infections with the nematodes. For example, immunity to the most significant nematode parasite affecting cattle is typically only obtained during the second grazing season, whereas in small ruminants in temperate climates, it takes several weeks to develop with continuous contact to the parasite.[50] Moreover, immunity to these parasites is frequently insufficient, needing the parasite to be exposed continuously for maintenance[25] and it is rarely totally protective against re-infection.[57] It appears that these parasites are actively suppressing the host immune response while they are infecting because of the immune response's poor development.[2]

Utilization Practices of Anthelmintics for Deworming

Smallholder dairy farmers in the Ada'a district and its environs, including Bishoftu town, managed their herds with anthelmintic medication using intensive, extended, and semi-intensive farming methods. For instance, farmers treat parasitic illnesses using albendazole, ivermectin, levamisole, and tetramisole, either on the advice of animal health specialists or on their own volition. However, widespread development of anthelmintic resistance poses a practical issue. These factors include repeated use of the same class of anthelmintics, use of anthelmintics at suboptimal doses, prophylactic mass treatment of domestic animals, and frequent and continuous use of a single drug in each area. Based on the questionnaire responses, ivermectin was the most used anthelmintic, followed by albendazole, levamisole, and tetramisole. This is consistent with studies of Aga et al[1] on in vivo efficacy study of commercially available anthelmintics against isolates of *Haemonchus contortus* and also contradicts with study by Kumsa et al[31] and other reports that have shown that easily administrable anthelmintics in the form of bolli are preferable to injectable ivermectin.[21]

According to this survey, 10.0% of the respondents said they bought anthelmintics from open markets, in addition to buying them from official veterinary service providers or drug stores, indicating that it is possible to use commonly used anthelmintics abusively and irrationally. This observation aligns with findings from previous studies.[21,58] Of the respondents, 38% said they had dewormed their sheep twice a year, while 30.0% percent said they had done so three times. This is consistent with other studies[1,31,58] but contradicts earlier findings[1,31] assessing the effectiveness of common anthelmintics in the management of gastrointestinal nematodes in sheep in the Dabat district, Northwest Ethiopia. Thirty-seven percent of the respondents were under extensive production systems, with farmers lacking good knowledge and skills about anthelmintic use, preferring to use only their interests to the long term and based on the parasite load. However, dosing and continued use of one class of anthelmintics, irrespective of their efficacy status, could be the main risk factors and may accelerate selection dynamics. To preserve the efficacy of anthelmintics, targeted selective treatments traditionally practiced by farmers should be encouraged and supported by laboratory tests to identify the animals that require treatment.

Conclusions and Recommendations

In summary, like other previously documented Ethiopian regions, gastrointestinal helminth parasites (GIHPs) were the most common and numerous gastrointestinal parasites in the research area. Trematode helminth groups were more common than other parasite egg types, whereas Strongyle-type and Fasciola eggs specifically represented nematodes. Occasionally, Ascaris, Paramphistomum, and Trichuris eggs as well as mixed infection forms called Moniezia eggs. It was feasible to identify animals with poor body conditions, large production systems, and animal species as significant risk factors for most parasite taxa in this study. Consequently, animals with low body weight and clinical indications of gastrointestinal helminth parasite infection are more likely to be severely infected; this is something that farmers and other practitioners should be aware of. Moreover, a strong correlation was found between the prevalence of gastro-intestinal helminth parasite (GIHP) infection and BCS, indicating that this parameter may be considered and should treat their animals based on pharmacological knowledge of the drugs. Almost all methods of controlling parasites involve the use of anthelmintic chemical substances. However, one issue brought about by the widespread and careless use of anthelmintic products is the rise in drug resistance to these medications. This has serious ramifications for nations where sheep husbandry is a major economic activity.[42,57]

Antiparasitic control measures must not rely on chemicals due to the trend toward reducing medication residues in human food and the environment, which goes hand in hand with the issue of anthelmintic resistance. Developing targeted vaccinations against helminth parasites and using animal genotypes resistant to parasite infections are two of the suggested tactics. This represents a cost-effective strategy to increase animal productivity and prevent anthelmintic resistance. It is important to monitor anthelmintic efficacy at regular intervals to detect subtle changes as early as possible to avoid the establishment of anthelmintic resistance, which means, more frequent monitoring allows for earlier detection and adjustments to deworming strategies before resistance becomes widespread. This study was conducted to investigate the prevalence of gastrointestinal helminth parasitism and assess the anthelmintic utilization practices of farmers in the urban and peri-urban areas of Ada'a district with different animal farming systems. Some practices potentially predispose available anthelmintics to drug resistance. Farmers with extensive, semi-intensive, and intensive farming practices should be educated on parasitic infections related to production and economic value.

Overall, cattle and small ruminants in particular are known to be very susceptible to helminth infections, which significantly reduce livestock productivity. The majority of infections are subclinical, resulting in large financial losses from animal mortality, decreased output, and productivity. Besides, although resistant animals do not totally reject the illness, they have fewer parasites in their feces than susceptible animals, indicating a reduced parasitic load. This resistance is determined by each individual's immune system's capacity to fight off parasites, whereas the sheep exhibit significant levels of resistance to gastrointestinal helminth infections. Certain breeds can achieve productivity levels comparable to naturally resistant ones because they possess moderate or low resistance combined with relatively strong resilience. This research revealed a high incidence of helminth infections and a diverse range of helminth genera, indicating that helminth infections in cattle and sheep are a major cause for worry in Ada'a district and throughout Ethiopia. In this investigation, helminths of all classes were found, with nematodes being the most common and abundant. More than three-quarters of the animals under investigation had multiple or double helminth species.

Data Sharing Statement

The collection of data gathered and appraised during the study is not publicly available because of the confidentiality of the study participants, not distributed without the consent of the corresponding author, and is only available upon reasonable request.

Ethical Approval

The Ethics Committee of the Addis Ababa University College of Veterinary Medicine and Agriculture referenced from (Ref. VM/ERC/24/01/12/2022) was granted authoritative approval for the use of animals for fecal sample collection in the experimental procedures. However, approval was not mandatory for the questionnaire surveys. Informed consent was obtained from the participants or animal owners without harming the welfare of the animals.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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