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Identification and Prevalence of Small Ruminant Gastrointestinal Nematode Parasites in and around Shirka District, South Eastern Oromia, Ethiopia

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ABSTRACT
Small ruminant production is the integral part of livestock production with major economic significance in Shirka district. However, their productive and reproductive performance is very low which could be associated with parasitic infections. Cross sectional study was conducted to identify and determine the prevalence with its associated risk factors of major GIT nematodes in small ruminants circulating in and around Shirka district, South Eastern Ethiopia. A total of 384 randomly selected small ruminants were examined using standard parasitological diagnostic methods including direct fecal smear, floatation techniques and fecal culture. The total prevalence of GIT nematodes in small ruminants in the study area was 41.7% (160/384) out of the total sampled animals based on coprological examination. The current study revealed 54.4% (147/270) and 11.4% (13/114) prevalence rates in sheep and goats respectively. The major identified parasites on the current study area were Haemonchus (14%), Mixed infec tions with two or more parasites (12.8%), Ostertagia (10.7%), Trichostrongylus (6.4), Capilari a (3.7%), Strongyles (2.1%), Nematodirus (1.6%) and Monezia (0.8) respectively. The study revealed significantly higher ($p<0.05$) prevalence of nematodes in sheep and, old aged, poor body conditioned and previously non treated animals whereas, sex did not show statistically significant difference ($p>0.05$) with prevalence of identified GIT nematodes. In conclusion, more nematode parasites were identified circulating with high prevalence rate in the study area, which implies nematodes are the major constraints for production and productivity of small ruminant animals. Therefore, economically feasible, effective management and strategic deworming of animals should be implemented by giving emphasis on the efficacy and development of drug resistance for the prevention and control of these parasites.

Key words: Floatation, Gastrointestinal nematodes, Identification, small ruminant, Prevalence, Shirka

1. INTRODUCTION

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) (Seyoum, 2018; Lemma and Abera, 2023).

Almost all the indigenous sheep and goat breeds in Ethiopia are primarily owned and managed by resource-poor smallholder farmers and pastoralists under traditional and extensive production systems. The population of sheep and goats in Ethiopia has been on an increasing trend. According to (CSA, 2021), the total sheep and goat population in Ethiopia is estimated at 95.4 million where 42.9 million are sheep and the remaining 52.5 million are goats. The indigenous small ruminant breeds are comparatively worthy for some traits like heat tolerance, disease resistance, and the ability to withstand poor management conditions. These breeds flourish and produce on messy, marginal, and often uncultivable tremendously high and low lands. Unfortunately, a large number of these animals provide reduced resources due to parasitic diseases and poor breed improvement programs (Tibebu and Abdeta, 2018; Tesfaye, 2021).

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 noninfectious diseases. Among these factors, widespread and extensive prevalence of different parasites worsen the growth, production, reproduction and the income generated by small ruminants (Tylor and Coop, 2015). 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 (Kumsa *et al*., 2010; Abebe, 2018).

However, poor animal production and management coupled with infections and parasitic disease had led to decreased productivity of small ruminants (Seyoum *et al*., 2018). Small ruminants managed under extensive production system are extremely susceptible to the effect of endoparasites (Abebe *et al*., 2010). Gastrointestinal (GIT) nematodes of sheep and goats are among the endoparasite infections that are responsible for economic loss through reduced productivity and increased mortality. The different efforts needed to be harmonized, and pilot activities are taken to scale to bring about sustainable change to the lives of rural people (Lema *et al*., 2013). These potentials make the country prominent repository for animal genetic diversity and disease control and preventive strategy (Dilgasa *et al*., 2015). Small ruminants are among the major economically important livestock in Ethiopia, playing an important role in the livelihood of poor farmers and they are integral part of livestock keeping in sub-Saharan Africa (SSA) that are mainly kept for immediate cash sources, milk, meat, wool, manure, and saving or risk distribution (Zeryihun *et al*., 2012; Bates, 2012).

Parasitic gastroenteritis is a worldwide problem and important cause of production losses in sheep and goat production (Muluneh *et al*., 2014). These productivity losses due to nematode parasite infection of small ruminants could be due to changes in feed intake, impaired gastrointestinal tract function, competition for the host's essential nutrients and damages during parasite feeding; and these losses include the direct effects of severe clinical signs such as anaemia, oedema, diarrhoea, and anorexia; which can easily result in poor general performance and even mortality particularly in the young aged and immunosuppressed (stressed) individuals (Roeber, 2013; Tylor and Coop, 2015).

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 (Aga *et al*., 2013; Constable *et al*., 2017; Win *et al.,* 2020).

Although, considerable work has been done on endoparasites of sheep and goats in many parts of Ethiopia (Admasu and Nurlign, 2014; Dagnachew *et al*., 2011) and losses from clinical and sub-clinical level including losses due to inferior weight gains, lower milk yields, condemnation of organs and carcasses at slaughter and mortality in massively parasitized due to nematode parasitic diseases were documented (Worku, (2017); Haile *et al*., 2022). However, very limited and non-documented or no report so far has been done on the identification and prevalence of small ruminant helminthiasis with associated risk factors that influence their transmission which can in turn give us the basis for developing an effective strategic preventive and control measures of these parasites adopted by small landless marginal farmers in and around Shirka district has not yet done. Thus, identification of the major and most commonly circulating and economically important gastrointestinal nematodes and determining the prevalence with its associated risk factors in small ruminant in and around the selected area was found very crucial.

Therefore, the objectives of this study were:

- To identify the major small ruminant gastrointestinal nematodes circulating in and around the selected area (Shirka district) and,

- To determine the prevalence rate and associated risk factors of gastrointestinal nematodes in small ruminants in that area.

2. STUDY MATERIALS AND METHODS

2.1. Geographic Description of Study Area

The present parasitological study was conducted in and around Sirka district in the south Eastern part of Oromia region in central eastern part of Ethiopia which is located 492 km away from South East of Addis Ababa (center of Ethiopia). Its latitude and longitude are 7° 37'N and of 39° 30'E respectively, and its elevation is 2353 meters above sea level, which is sub-tropical highland with an average altitude of 2450 meters above mean sea level. The average temperature is 18°C which varies between 10°C to 25°C, with an annual average rain fall of around 1000 mm. The livestock population of the district is estimated to be 244,000 cattle, 70,320 sheep, 63,200 goats, 16,668 horse, 23,300 donkeys, 7568 mules, 96363 chickens based on Arsi zone livestock and fishery resource development office, (2018). The community of this area practiced mixed agricultural crop and livestock production. The map of the study area (Shirka district) is indicated from figure 1 below.

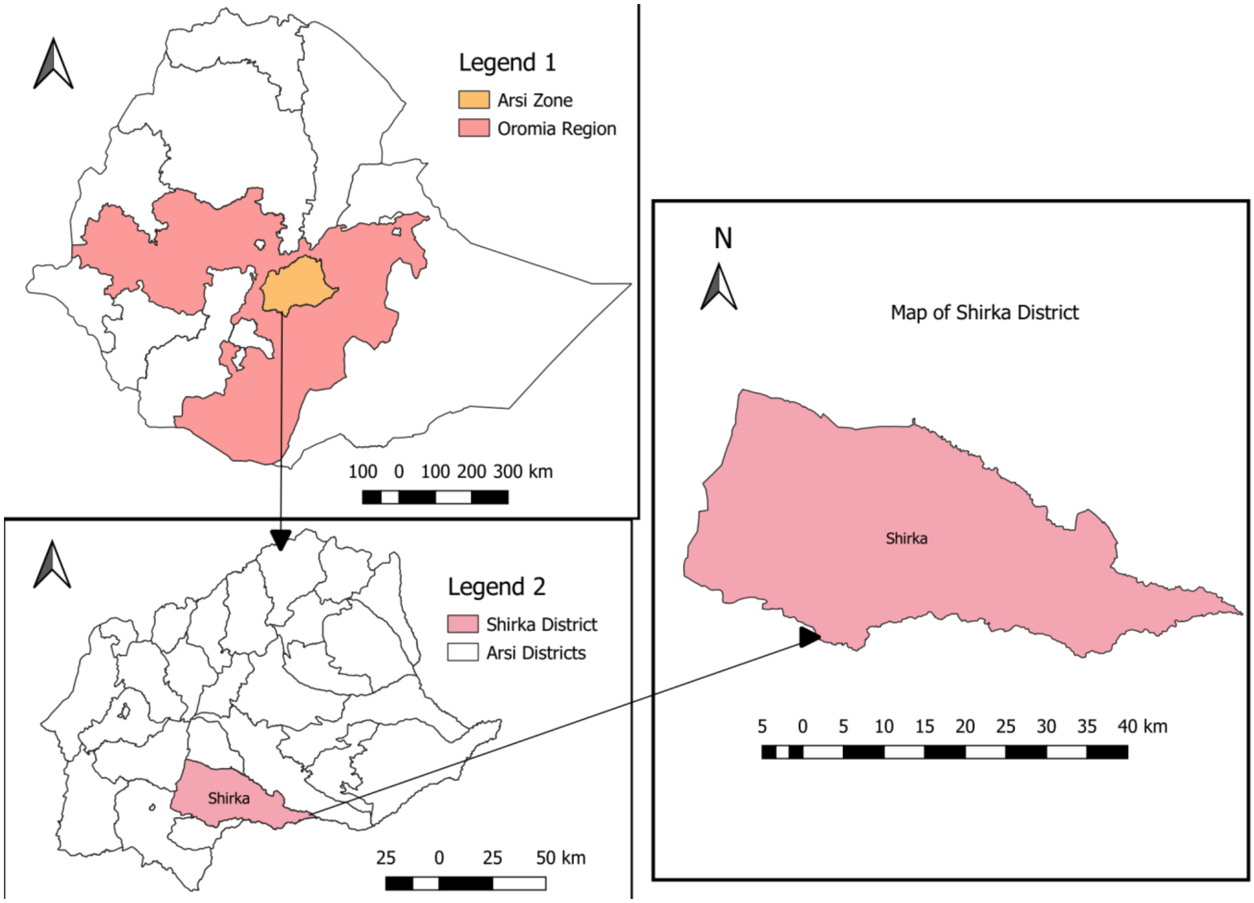

Figure 1: Map of the study district

2.2. Study Population

A total of 384 local breads of small ruminants (114 goats and 270 Sheep) were randomly selected from Sirka district, south eastern Oromia, Ethiopia and subjected to the qualitative (direct smear, floatation and faecal culture) parasitological laboratory investigation for the examinations of GIT nematodes. From the total, the males were 144 and the females were 240, during the study. The age of study animals was categorized into different groups as follows; young, adult (1-3 years) and old (< 3 years) based on Sarah *et al*., (2022) where as sex groups were male and female, and the body condition groups were categorized as poor, medium and good body condition score based on Thompson and Howard (1994), deworming status was also grouped as previously treated and not treated before two weeks of sample collection by considering the preventive efficacy of most antihelminths and reinfection of major nematodes circulating in the study area. All samples were clearly and properly labeled with the date of sampling, sex, age, body condition score and previous deworming status. Age of animal was gathered from the owners and dentation structures.

2.3. Study Design

A cross-sectional study was conducted from June 2023 to February 2024 in and around Shirka district for identification and determination the prevalence of gastrointestinal nematodes with their associated risk factors in randomly selected local breed small ruminants, reared under extensive system. Their sex, age, body condition, previous therapy or deworming status before two weeks of sample collection and health status to the sheep and goat were considered as the risk factors. Age of sheep and goats were determined using information from the owner's support by observation of the incisor teeth of sheep and goat.

2.4. Sampling Method and Sample Size Determination

Simple random sampling technique was carried out to collect the fecal samples directly from the rectum of the individual animal. Since, there was no record of previous prevalence and identification of GIT nematodes in the study area, the sample size was determined by taking 50% expected prevalence using the formula describe by Thrusfield (2018). $N=1.96^2\ Pexp(1-Pexp)/d^2$; Where, N= required sample size. Pexp = expected prevalence. 1.96^2 = z -value for 95% confidence interval. Using this formula, the estimated sample size will be 384 sheep and goat. For selecting peasant associations within the district, purposive sampling was employed for logistic reasons.

2.4.1. Laboratory techniques

Faecal samples were directly collected from the rectum of the sampled animals and transported to Shirka district veterinary laboratory. Direct smear was used to demonstrate and identify the presence of eggs of helminth in feces by examining under low power objective of microscope (Sloss *et al.,* 1994). Flotation technique with magnesium sulphate and sugar mixed with sodium chloride solutions that have higher specific gravity than parasite egg, was also carried out for identification of prevalent genera of the parasites (Taylor *et al.,* 2015; Maff *et al.,* 2006). Fecal culture was used to differentiate parasites whose eggs can't be differentiated by examination of fecal floatation. It was conducted by incubating faecal eggs at 27 ^{0}c for 7 days and at room temperature for 17 days to hatch, so that the larvae hatched can be easily identified. Following this procedure identification of the parasite genera and species was made based on development of third stage larvae (L3) (Chaudic and Gupta, 2003).

2.5. Data management and Analysis

All data obtained from the study was entered in to MS Excel data sheets and coded properly. Then it was imported and analyzed using R software version 4.3.3. Percentages (%) were used to measure prevalence of parasites as described by Hansen and Perry (1994) and chi-square (x^2) was used to measure association between prevalence and various independent variables including species of animal, age, sex, status of previous deworming before two weeks of sampling and body condition scores. Logistic regression analysis was conduct to examine the association between outcome variable and the factors. Regression coefficients were used to estimate odds ratios for each of risk factor variables. Odd ratios (OR) with (95%) confidence interval (CI) was used to assess the level of association of the prevalence and risk factor variables. In all analysis, a 95% confidence interval and p-value of less than 0.05 ($P > 0.05$) was set for significance of statistical associations between the prevalence and associated risk factors.

3. RESULT AND INTERPRETATION

From 384 total samples (270 sheep and 114 goats) examined during the study, 160 (41.7%) were infected with different types of gastrointestinal nematodes (table 1). From this study 147/270 (54.4%) of sheep and 13/114 (11.4%) of goats were infected by different nematode parasites circulating in the area. Of the total positive cases, 26 (10.4) were infected with Trichostrongylus 25 (6.4%), Haemonchus, 54 (14%), Mixed infections with two or more combinations of nematode parasites 49 (12.8%), Ostertagia 41 (10.7%), Capilaria 14 (3.7%), Strongylus 8 (2.1%), Nematodirus 6 (1.6%) and Monezia 3 (0.8%) respectively as indicated from table 6 below. GIT nematodes were identified in both sexes of animals that were examined in this study. 105 (43.8%) were identified out of 240 in male and 55 (38.2%) out of 144 in females from examined animals (table 2).

Table 1; Number of animals examined and the overall result

	Animal species		
Prevalence	**Ovine**	**Caprine**	**Total**
Positive	147	13	160
	54.4%	11.4%	41.7%
Negative	123	101	224
	45.6%	88.6%	58.3%
Total	270	114	384
	100	100.00	100

Table 2; The result of examined animals in relation to sex

Prevalence	Sex of the animal		
	Female	**Male**	**Total**
Positive	105	55	160
	43.8%	38.2%	41.7%
Negative	135	89	224
	56.2%	61.8%	58.3%
Total	240	144	384
	100	100	100

The GIT nematodes were identified from different age (young, adult and old) groups of the examined small ruminants. From the total (384) examined animals, 21 (25.3%) out of 83, 13 (17.3%) out of 75 and 126 (55.8%) out of 226 were found positive in young, adult and old animals respectively as indicated from table 3 below.

Table 3; The result of examined animals in relation to age

Prevalence	Age of the animals			
	Young	**Adult**	**Old**	**Total**
Positive	21	13	126	160
	25.3%	17.3%	55.8%	41.8%
Negative	62	62	100	224
	74.7%	82.7%	44.2%	58.2%
Total	83	75	226	384
	100	100	100	100

From the total (384) examined small ruminants, different number or percentage of gastrointestinal nematodes were also identified in different body conditioned animals. 108 (71.5%) out of 151, 49 (32.7%) out of 150 and 3 (3.6%) out of 83 animals were examined positive in poor, medium and good body conditioned animal respectively (table 4).

Table 4; The result of examined animals in relation to body condition

Prevalence	Body condition			
	Poor	**Medium**	**Good**	**Total**
positive	108	49	3	160
	71.5%	32.7%	3.6%	41.8%
Negative	43	101	80	224
	28.5%	67.3%	96.4%	58.2%
Total	151	150	83	384
	100	100	100	100

In relation to therapeutic or deworming status, 129 (56.6%) from 228 previously non treated or dewormed small ruminants were examined positive and 31 (19.9%) from 156 previously treated small ruminants within two weeks before sample collection was also revealed positive results (table 5).

Table 5; Relation of result with previously treated and non-treated animals

	Previous treatment		
Prevalence	**No**	**Yes**	**Total**
positive	129	31	160
	56.6%	19.9%	41.7%
Negative	99	125	224
	43.4%	80.1%	58.3%
Total	228	156	384
	100	100	100

Table 6; The identified Parasites during the study

Identified Nematode Parasites	Freq.	Percent	Cum.
Trichostrongylus	25	6.4	6.5
Cappilaria	14	3.7	10.2
Haemonchus	54	14	24.2

Mixed infection	49	12.8	37
Ostertagia	41	10.7	47.66
Monezia	3	0.8	48.4
Strongylus	8	2.1	50.5
Nematodirus	6	1.6	52.1
No	184	47.9	100
Total	384	100	

In this study, body condition showed significant difference (P<0.05) on the prevalence and identification of gastrointestinal nematode parasites of small ruminants sampled as described in table 7. Highest prevalence rate of gastrointestinal parasites was observed in poor body conditioned small ruminants. Out of 384 animals examined 108 (71.5%) out of 151 from poor followed by medium 49 (32.7%) out of 150 and 3 (3.6%) out of 83 good body conditioned animals respectively (table 4). Treatment or deworming not given two weeks previously to sample collection has also showed a significant difference (P<0.05) on the prevalence and identification of gastrointestinal nematode parasites of small ruminants (table 7). The highest prevalence of gastrointestinal parasites was observed from previously non treated animals 162 (80.6%) as compared to previously treated one 39 (19.4%) (table 5) but also infections were observed from previously treated or dewormed animals which could be resulted due to anthelmintic drug resistance. More infection rate was also showed from sheep as compared to goats which could be associated with the feeding habit of sheep to graze on the contaminated land where as goats take leaves of a tree to eat above the ground that may reduce the risk of nematode parasite eggs or larval contaminations.

Table 7; Association of risk factors with the result

Prevalence	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Animal species	.719	.262	2.74	.006	.205	1.233	***
Age of animal	-.905	.111	-8.12	0	-1.123	-.687	***
Sex of animal	.197	.183	1.08	.281	-.161	.556	
Body condition	1.203	.153	7.88	0	.904	1.501	***
Previous treatment	.619	.206	3.01	.003	.216	1.022	***

Constant	-1.717	.523	-3.28	.001	-2.743	-.692	***

Mean dependent var	0.583	SD dependent var	0.494
Pseudo r-squared	0.452	Number of obs	384
Chi-square	235.883	Prob > chi2	0.000
Akaike crit. (AIC)	297.737	Bayesian crit. (BIC)	321.441

**** p<.01, ** p<.05, * p<.1*

Table 8; Association of prevalence with the risk factors

Prevalence	**Coef.**	**St.Err.**	**t-value**	**p-value**	**[95% Conf**	**Interval]**	Sig
Animal species	1.2	.47	2.55	.011	.279	2.12	**
Age of animal	-1.568	.204	-7.68	0	-1.969	-1.168	***
Sex of animal	.361	.325	1.11	.267	-.276	.997	
Body condition	2.131	.293	7.27	0	1.557	2.706	***
Previous treatment	1.064	.367	2.90	.004	.344	1.783	***
Constant	-3.012	.947	-3.18	.001	-4.869	-1.156	***

Mean dependent var	0.583	SD dependent var	0.494
Pseudo r-squared	0.449	Number of obs	384
Chi-square	234.468	Prob > chi2	0.000
Akaike crit. (AIC)	299.153	Bayesian crit. (BIC)	322.857

**** p<.01, ** p<.05, * p<.1*

3.1. Graphical Representation of the study Results

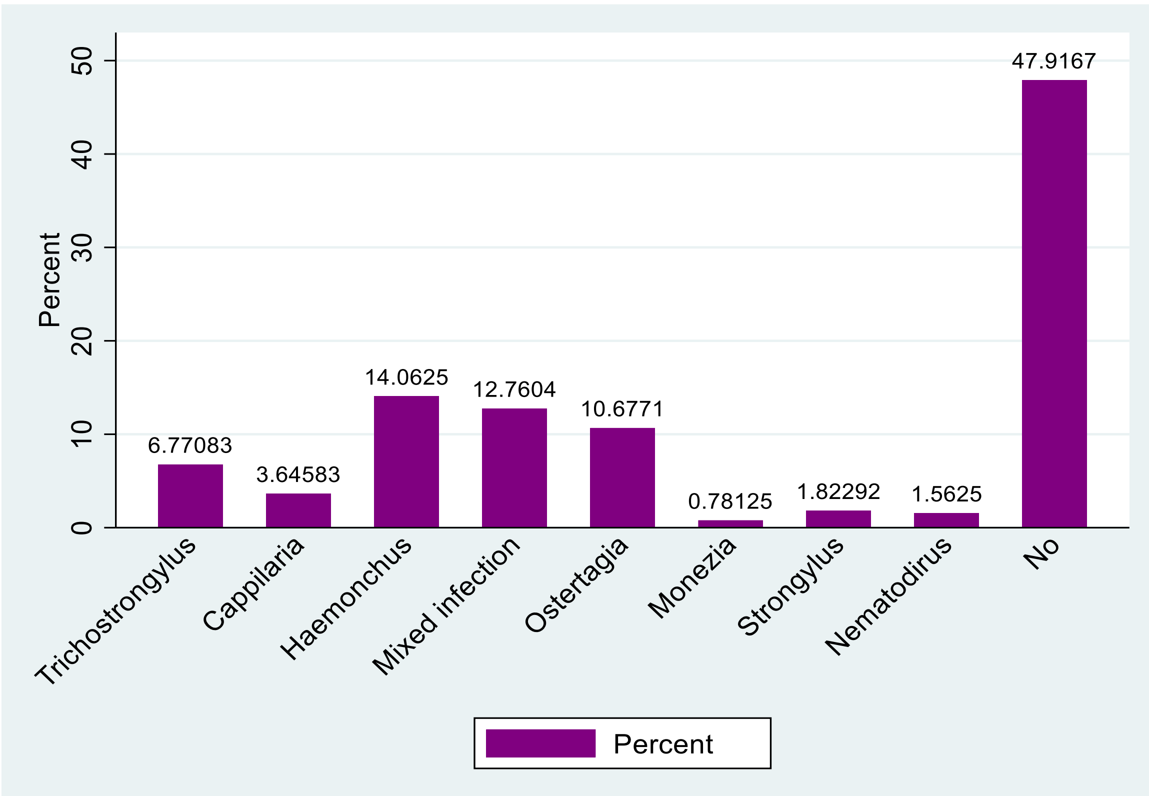

Figure 1: Graphical representation of identified Parasites with bar chart

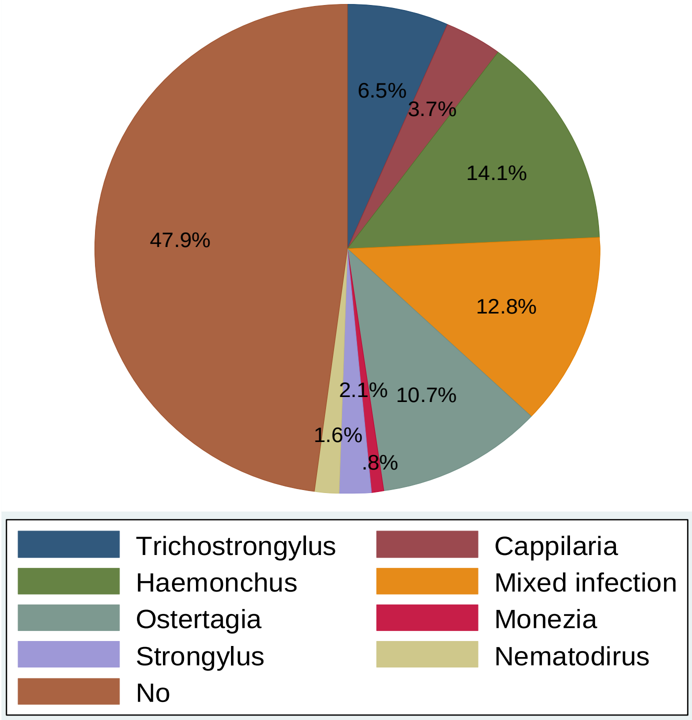

Figure 2: Graphical representation of identified Parasites with pie chart

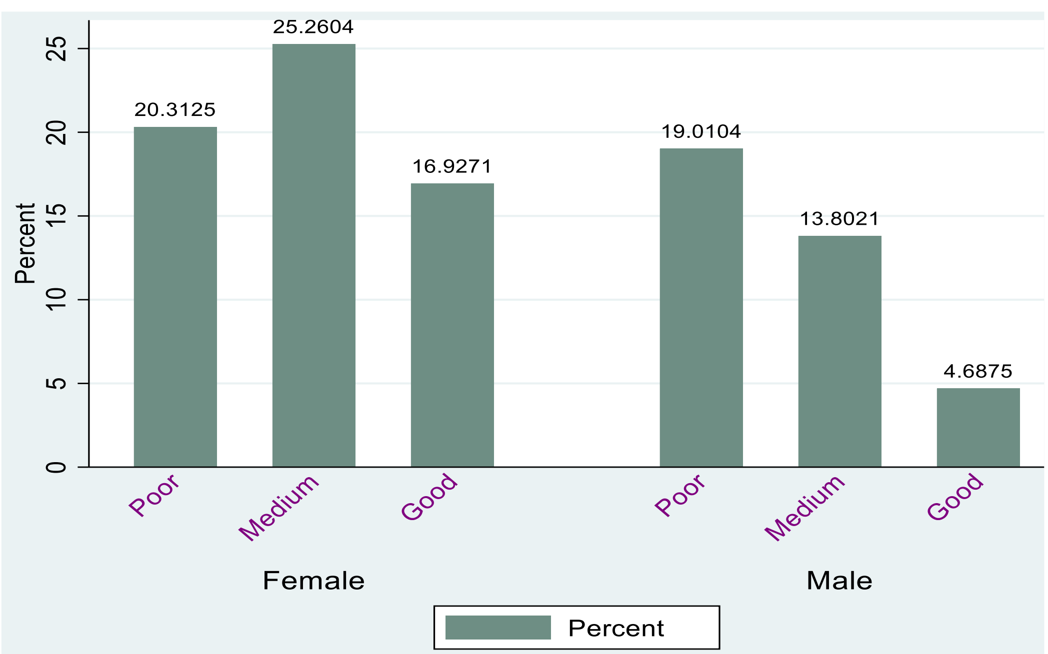

Figure 3: Graphical presentation of relationship of identified parasites with sex and age

Test tube faecal floatation and larval culture examination techniques in the present study revealed that an overall gastro-intestinal nematode infection rate of 41.7% of small ruminants originating from the study area in different management systems. In this study, infections with Haemonchus were the dominant one among the examined animals followed by mixed infections with two or more combinations different nematode parasites circulating in the study areea. Trichstrongylus, Ostertagia, Capillaria, Strongylus, Monezia and Nematodirus infections were also identified with different proportions and prevalence rates accordingly. This could be due to small ruminants have different level of immune resistance for different species of parasitic infections and numerous nematode parasites produce egg similar with strongyle that can be only identified on larval stage by fecal culture.

4. DISCUSSION

Many research findings showed that gastrointestinal nematodes are the major causes of losses in production and productivity of small ruminant production in different parts of Ethiopia and the world (Roeber, 2013; Lemma and Abera, 2023). The overall prevalence of gastrointestinal nematode infection in small ruminants with different forms as single and mixed infections in the present study revealed 41.7% which is in line with the works of Chali and Hunde, (2021) who has found 44% of prevalence in Wayu Tuka and Diga District in Oromia region, Tesfaye (2021) who conducted a cross-sectional study in southern Omo zone and found 40% of prevalence of nematode parasites in sheep and goats, Aram, (2020) conducted coprological study and found a result of 40.6% in Sulaymaniyah Province, Kurdistan Region, Iraq, Lema *et al.,* (2023), found 58.3% in Holeta dairy farms, Nana, (2016) also 39.7% in Guragae zone and Lemma and Abera, (2023) conducted 73% in and around Asella that have higher prevalence rates. But there is a relative difference in prevalence of nematode parasites that may arise due to existence of different climatic or environmental factors that could support survival and development of infective larval stage of most nematodes.

The prevalence rate (41.7%) of the present study was considerably lower than the works of the other authors like Negash *et al*., (2023) 57.9% in Mirab Abaya of Southern Ethiopia, Moje *et al*., (2021) 79.7% in and around Alage ATVET college, Mohammed *et al*., (2015) 64.6% in Gursum Woreda of Eastern Hararghe, Mekonnen, (2020) 64% in Boloso Sore District of Wolaita Zone, Shiferaw *et al.,* (2021), in highland and midland areas of Ethiopia who reported 83%% and Terfassa *et al*., (2018) 49.9% in and around Ambo Town of Western Shoa. The grounds of low prevalence in this study could be attributed to the development of careful management, establishment of open-air clinic and increasing awareness of farmers to deworm their small ruminants for parasitic infections in the current study area apart from geographical variations.

But the result of the present work was higher than the findings of other works; Haile *et al*., (2022) 33% in Dibate district of Metekel zone, Beyene, (2016) 34.6% in and around Horoguduru of Wollega, Tigist *et al*., (2012) 27.6% in and Around Gondar Town of Amhara Region, Desalegn and Berhanu (2023) 36.8% at Dale farm and abattoir, Tesfaye (2021) 40 and 56.3% by coproscopic and eggs per gram examinations respectively in North Gondar zone and Usman and Ziyad (2022) 35.2% in and around Hirna town. The differences in the prevalence of GIT nematodes of small ruminants between the current study and the above studies might be associated with nutritional status, level of immunity, method used for the detection of the larvae, management and regular deworming practices of the animal, rainfall, humidity, temperature and altitude differences, or difference in the study areas of topography, which has conducive environment for the survival of larvae and intermediate hosts which can influence the larvae in the respective study areas.

In the present finding, both sexes showed equal chance of susceptibility (when they are allowed to graze at the same pasture) to infection with GIT nematodes, hence sex dependent variation was not encountered during this study. Tesfaye, (2021) have also reported the same finding but Lema *et al.,* (2023) and Mekonnen, (2020) have reported different significant result. The gastroinstinal infection prevalence was found to be significantly not associated with the sex of the study animals ($p > 0.05$).

The gastroinstinal infection prevalence was found significantly associated with body condition of the study animal ($p < 0.05$). Higher infection rate was observed in animals having poor body condition as compared to other body conditioned animals. Statistically significant difference was also observed in the infection rate among poor (71.5%) medium (32.7%) and good (3.6%) body condition 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*., (2023), Haile *et al*., (2022) and Shiferaw *et al.,* (2021) who reported that the prevalence was significantly higher in animals having poor body conditions than medium or good body conditions in their study. The achievable explanations for this investigation could be due to immune-suppression in small ruminants with poor and medium body conditions, concurrent infection by other parasites including GIT helminths and/or malnutrition (Taylor and Coop, 2015). 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*., (2017) and Win *et al.,* (2020).

Regarding age, higher prevalence of GIT nematode infection in the study animals was observed in the groups of older animals (55.8%) as compared to age groups of adults (17.3%) and younger animals (25.3%). The result showed statistically significant result ($p < 0.05$). This might be associated with the frequent grazing behavior of old animals those expose and graze continuously on the nematode egg and larvae contaminated pasture following having long life span as compared to younger and adult animals which have higher natural immunity obtained and developed. Older age group animals may develop antihelmentic resistance due to frequent administration of these drugs by the veterinarians and animal owners and appropriate environmental climatic conditions for egg hatching and larval development can also contribute to higher rate of infection when small ruminants moved as a result of being sold to or bought from different agro-climatic conditions which agrees with the findings by Dar, 2012; Taylor and Coop, 2015).

From the current study, previous treatment given to small ruminants was found statistically significant ($p<0.05$) and higher infections were observed from 129/228 (56.6%) from previously non treated small ruminants as compared to previously treated small ruminants 31/156 (19.9%) within two weeks before sample collection was conducted. This is in agreement with the findings of Taylor and Coop, (2015) and Constable *et al* (2017) 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, (2015, Besier and Aucamp, (2016) and Negash *et al*., (2023).

The coprological and larval occulture examination done for this study revealed that an overall gastro-intestinal nematode infection prevalence of 41.7% of small ruminants which were being parasitized with gastrointestinal nematodes. In this study, infections with Haemonchus (14%) were the dominant one among the examined animals. Mixed infections with two or more parasite combinations (12.8%), Ostertagia (10.7%) Trichstrongylus (6.4%), Capillaria (3.7%), Nematodirus (1.6%) and Monezia (2.1%) infections were also identified with different proportions accordingly. This could be due to sheep and goats have different level of immune resistance against different species of parasitic infections and numerous nematode parasites produce egg that is similar with strongyles which only can identified on the larval stage by fecal culture (Taylor and Coop, 2015; Yimer and Birhan, 2016). This results higher in Trichostrongyle type and smaller than the previous studies conducted in different parts of Ethiopia such as 36.6% Strongyles and 15% Trichuris in Debrezeit (Tigist, 2008) but higher than the study investigated by Tesfaye (2021) on prevalence, species composition, and factors associated with small ruminant nematode infection in South Omo zone, South-western Ethiopia.

5. CONCLUSSION AND RECOMENDETIONS

The result of the present study indicated that nematode parasites are one of helminthiasis of small ruminants in the study area. The prevalence of nematode infection was higher in those animals having poor body conditions than in those with medium and good body conditions. The infection in older animals is higher than other age groups. Haemonchus was the dominant nematode parasite identified in the study area followed by mixed infection. It can also be concluded that the infections caused by gastrointestinal nematode parasites are significantly common in the study area and are important health problems of small ruminants which is speculated to cause heavy economic loss. High prevalence rate emphasizes the need for effective control and preventive strategies to minimize the impact of these parasites on small ruminant health and productivity. These parasites affected all different age, sex and body conditions with variable degrees. Infections were also higher in nontreated or nondewormed animals as compared with previously dewormed one, but infections were also identified from regularly dewormed animals which could be associated with drug resistance.

Therefore, depending on the above conclusions the following recommendations were forwarded:

- Good management and adoption of intensive farming of animals should be adopted.
- Awareness creation for animal owners and other stakeholders on regular de worming of small ruminants should be conducted.
- Strategic deworming with broad spectrum anthelminthic at the beginning of rainy and at the end of dry season should be practiced.
- Pasture management by rotational grazing system for different seasons and separating the most susceptible age group animals should be implemented.
- Epidemiological study should be conducted to promote sustainable, effective and strategic prevention of nematode infection in small ruminants.
- Further studies on anthelmintic efficacy and resistance should be conducted.

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