International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
(A Peer Reviewed, Referred, Indexed and Open Access Journal)
DOI: 10.22192/ijarbs Coden: IJARQG (USA) Volume 9, Issue 11 -2022

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2022.09.11.010

Prevalence of GI nematodes of sheep and goats and associated risk factors in Dibate district, Metekel zone, Benishangul Gumuz regional state, Ethiopia

Geremew Haile Lemu,[1*] Dessalegn Muleta[2] and Yacob Hailu Tolossa[1]
[1]Addis Ababa University, College of Veterinary Medicine and Agriculture Bishoftu, Ethiopia
[2]DibateWoreda Agricultural office, Metekel zone, Benishangulgumuz, Ethiopia
Corresponding author: Geremew HaileLemu. **Email:** *geremew.haile@aau.edu.et*

Abstract

A cross-sectional study was conducted from September 2019 to May 2021 on 384 randomly selected sheep and goat in six purposively selected kebeles of Dibate district with the objective of determining the prevalence and assessing riskfactors associated with gastrointestinal nematodes infestation in sheep and goats. Fecal samples collected from all study animals were subjected to parasitological investigation including simple test tube floatation and fecal culturefor identifying gastrointestinal nematodes (GINs). The study found that the overall prevalence of gastrointestinal nematodes in sheep and goats was 33% (130/384). Among the identified nematodes parasites, Haemoncus63(48.5%) were the most prevalent followed by *Trichostrongylus* (28.5%), *Nematodirus* (17.7%), *Trichuris* (13.8%), *Teladosargia/Ostertagia* (11.5%), *Oesophagostomum/Chabertia* (8.4%) and mixed infection (6.1%) There was a significant difference ($P<0.05$) in prevalence of GINs between different body conditions and age of the study animals. Animals with poor body conditions 75 (65.2%) were highly infected than animals with medium 37 (23.3%) and good body condition 18(16.4%). The study revealed that the prevalence of nematodes significantly higher ($p<0.05$) in younger animals than in adults. However, there was no significant differences ($P>0.05$) in the prevalence of GINs in case of sex of animals and study sites. Season had a significant effect on the prevalence in which higher prevalence was recorded during the wet season 109(44.6%) compared to the dry season 21(15%).Hence, this finding indicated that GINs are more prevalent in the study area. Therefore, regular and strategic deworming programs should be implemented. Furthermore, further studies concerning wide geographical area, drug resistance and identification of species of GINs using molecular tools should be conducted.

Keywords: Dibate, goat, floatation, nematodes, sedimentation, sheep

Introduction

Livestock systems in developing countries are characterized by rapid change, driven by factors such as population growth, increases in the demand for Livestock currently contribute about 30 percent of agricultural gross domestic product in developing countries, with a projected increase to about 40 percent by 2030 (FAO, 2010) and is becoming the fastest-growing sub-sector of agriculture (Kefalewand Tegegne, 2012). Africa hosts 205 and 174 million sheep and goats representing 17 and 13 percent of the world total small ruminant population, respectively. The population of small ruminants in sub-Saharan Africa is estimated to be274 million (Samso and Frehiwot, 2010).Sheep and goats are the most numerous of man's domesticated livestock and are especially important in more extreme climates of the world. Over two-thirds of the total population of sheep and goats occur in the less developed countries where they often provide major contribution to farming enterprises (Tony, 2007). Among the small ruminants in Ethiopia, sheep are the dominant livestock, providing up to 63% of cash income and 23% of the food subsistence value obtained from livestock production (Zelalem and Fletcher, 1991).

Ethiopia possesses the highest number of livestock population in Africa, with an estimated 23.6 million sheep and 23.3 million goats; the productivity of this livestock is generally lower than the African average (CSA, 2002). Sheep and goats, requiring little inputs, play vital role in rural economy through provision of meat, milk, blood, cash income, accumulating capital, fulfilling cultural obligations, manure, and contribute to the national economy through the export of live animals, meat and skins (Bayou, 1992).Regardless of the large size of the small ruminants population in the country, productivity per animal and the contribution of this sub-sector to the national economy is relatively low due to multitude of constraining factors including malnutrition, diseases, improper health care and management problems (Haileleul, 2002; Kaplan, 2004).

Gastro-intestinal nematodes infection is one of the major health problems in the world. These nematodes infections affect the health of millions of people and animals, causing huge economic loss in livestock farming (Ahmed, 2010).Gastro intestinal nematodes of greatest importance in small ruminants are Haemonchus, Osophagustomum, Chabertia, Bunostomum, Ostertagia, and Trichostrongylus (Abebe and Esayas, 2001; Singh *et al*., 2002; Hassen *et al*., 2013).

Up to date there is no enough data on nematodes parasites and the type of parasitism, in Assosa particularly in Dibate district in order to determine the significance of parasite infections and to recommend the most beneficial and economically acceptable control measures. Therefore, the objectives of this study were to determine the prevalence and burden of nematodes parasites of small ruminants and identify the possible risk factors in and around Dibate district of Metekel zone, Benishangulgumuz, Ethiopia.

Materials and Methods

Study Area

Dibate Woreda is found in Benishangul Gumuz Regional State, Metekel Zone 505 km away from the regional capital city Assossa and 543km from Addis Ababa and Debatei administrative also encompass 29 kebele administration. The woreda is bordered by Mandura in the north, Yasso in the south, Bullen in the west and Awi zone in the east. The average annual temperature of the woreda ranges form 25-28 c˚ and receives an average annual rainfall of 857mm. The climate is 80% kola and 20% Woina Dega. Agro climatically conduction of the area is kola type. As the physiognomic vegetation classification of the area, dominates are savanna, savanna woodland and woodland. The woreda has animal population of 116687 cattle, 18555 sheep, 72183goats, 8501 equine (DibateWoreda Agricultural Office annual report, 2017).

Study Design

A cross-sectional study was conducted from September 2019 to May 2021 on 384 randomly selected sheep and goat in six purposively selected kebeles of Dibate district with the objective of determining the prevalence and assessing risk factors associated with gastrointestinal nematodes infestation in sheep and goats.

Study Population

A study was conducted on randomly selected sheep and goat. The study animals were local breed kept under extensive traditional husbandry condition grazing the communally owned pastureland throughout the year. Different sex and age groups was used in the study. The body condition of each of the study sheep and goat were scored as good, medium and poor. Simultaneously, their ages were determined based on the standards employed by Hansen and Pery (1994).

Sample Size Determination

Since there was no previous survey conducted at this district the required sample size for this study was estimated based on (Thrusfield, 2007) formula (the expected prevalence rate of 50% and absolute desired precision of 5% at confidence level of 95%). Thus the sample size is calculated using the following formula.

$$N = \frac{1.96^2 \times P\,exp\,(1- P\,exp)}{d^2}$$

Where

N= required sample size

P exp= expected prevalence rate 50%

d^2 =desired absolute precision (0.05) as a result, 384 sheep and goatwas selected to estimate the prevalence and burden of nematodes parasites of small ruminants and identify the possible risk factorsin the district

Sampling Technique

Six kebeles including Gallessa,Berber,Giriz, Parziet,Zigigh, and Dibate were purposively selected for their accessibility and large small ruminant population. Sheep and goat were sampled at their communal grazing area using simple random sampling.

Sample Collection and Laboratory Analysis

Approximately about 10gm of fecal sample was collected into from rectum of each sheep and goats those were not dewormed for at least three months and clearly labeled corresponding to detailed information recorded. After collection the fecal samples were transported to Dibate woreda veterinary clinic laboratory for coprological investigation. Any preservative chemicals were not used as preservation is not recommended for fecal culture. When samples were reached in the laboratory they were immediately stored in the refrigerator (4°C) until they were processed for further preservation. Parasitological techniques such as simple fecal floatation using saturated sodium chloride (40%) and fecal culture techniques were employed to identify eggs and larvae of nematodes based on their morphological appearance such as size, shape and color of eggs as well as cranial and tail structures of the larvae as described by Hansen and Perry (1994).

Data management and Analysis

Data generated from laboratory investigations were recorded and coded using Microsoft Excel spreadsheet (Microsoft Corporation) and analyzed using STATA statistical software version 14. Chi-square test and the p-value were used to determine the presence of association among the prevalence of GINs and risk factors such as sex, age, body condition, season and study sites. A p-value less than 0.05 were considered as having statistically significant.

Results

Out of 384 fecal sample of small ruminant examined by simple floatation technique and fecal culture, 130 sheep and goats were infected with gastrointestinal nematodes with an overall prevalence of (33%).The prevalence was slightly higher in sheep 60(42.25%)than in goats70(28.9%) however there was no significant difference (P>0.05) between the two species (Table 1). *Haemonchus* was the most identified genera (41.5%) followed by *Trichostrongylus* (28.5%), *Nematodirus* (17.7%), *Trichuris* (13.8%), *Teladosargia/Ostertagia* (11.5%), *Oesophagostomum/Chabertia* (8.4%) and mixed infection (6.1%) (Table 2).

The prevalence of gastrointestinal nematodes parasite was higher in female sheep and goats (36.3%) than male (30.8%).Likewise higher prevalence 59(36.4%) was observed in sheep and goats between 2-3 age group animals as compared to other age groups. In case of body condition animal with poor body condition more infected 65.2% compared to animal with medium body condition (23.3%) and good body condition 16.4%. Season has its effect on the prevalence in which higher prevalence was recorded during the wet season (44.6%) compared to the dry (15%). The risk factors such as age, BCS and season had a significant influence on the occurrence of GINs in the study area (P<0.05) (Table 4 and Table 5). However, there was no significant difference in the prevalence between sex of sheep and goats as well as between the selected study sites (p-value >0.05) (Table 3 and Table 4).

Table 1: Species wise prevalence of GINs in the study area

Species	No of examined	No of infected (%)	χ^2	P -value
Sheep	142	60(42.25%)	8.85	0.065
Goat	242	70(28.9%)		
Total	**384**	**130(33.9%)**		

Table 2: Major gastrointestinal nematodes identified from sheep and goats by floatation and fecal culture techniques

Type of parasite	No of infected	Prevalence (%)
Haemonchus	54	41.5%
Trichostrongylus	37	28.5%
Nematodirus	23	17.7%
Trichuris	18	13.8%
Telodarsagia (Oestertagia)	15	11.5%
Oesophagostomum/Chabertia	11	8.4%
Mixed infection	8	6.1%
Total	**130**	**33%**

Table 3: Prevalence of GINs on the basis of selected study sites

Study sites	**No of examined**	**No of infected (%)**	X^2	**P -value**
Berber	69	28(40.6%)	6.2	0.99
Galessa	70	24(34.3%)		
Debatie	77	21(27.3%)		
Parziet	60	21(35%)		
Zigih	61	20(32.8%)		
Girze	47	16(34%)		
Total	**384**	**130(33.9%)**		

No=Number, X^2 =chisquare

Table 4: Prevalence of GINs on the basis of sex, BCS and age of animals

Risk factors	**Categories**	**No of examined**	**No of infected**	**Prevalence**	X^2	**P -value**
Sex	Male	172	53	30.8%	2.89	0.578
	Female	212	77	36.3%		
Age	<2	114	51	44.7%	28.55	0.000
	2-3	162	59	36.4%		
	>3	108	20	18.5%		
BCS	Poor	115	75	65.2%	111.6	0.000
	Medium	159	37	23.3%		
	Good	110	18	16.4%		
Total		**384**	**130**	**33%**		

Table 5: Prevalence of GINs on basis of season

Season	**No of examined**	**No of infected(%)**	χ^2	**P -value**
Dry	140	21(15%)	35.19	0.000
Wet	244	109(44.6%)		
Total	**384**	**130(33%)**		

Discussion

Gastrointestinal nematodes are the leading causes of productivity losses in small ruminant production in Ethiopia (Basaznew *et al*., 2014). The current study revealed that among 384 sheep and goat examined for the presence or absence of GINs in DibateWoreda130 of them were being parasitized at least by one type of gastrointestinal nematodes with an overall prevalence of 33 %. The current finding were comparable with the previous study reported by Abebe *et al*. (2018) and Basaznew *et al*. (2014) who reported 36.7% prevalence GINs in sheep in Horro district and 43.2% in small ruminant in Denbiya district respectively. However, the result of this finding was lower than the results of previous surveys in sheep and goats (Sis *et al* 2011;Nigatu, 2008;Rossanigo and Grunder, 1995) from different parts of Ethiopia. This differences could be due to extensive use of anthelmintic, difference in agro-climatic conditions that could support prolonged survival and development of infective larval stage of most nematodes (Regassa *et al*., 2006). Furthermore management system of animals could also contribute in the difference of the prevalence (Diriba and Birhanu 2013).

The result of this study indicated that, infections with *Haemonchus* were the dominant one with the prevalence of 41.5%followed by *Trichostrongylus* (28.5%), *Nematodirus* (17.7%), *Trichuris* (13.8%), *Teladosargia/Ostertagia* (11.5%), *Oesophagostomum/Chabertia* (8.4%) and mixed infection (6.1%). This agrees with several studies conducted in Ethiopia (Tesfaye, 1998; Abebe and Esayas, 2001;Assefa and Sisay, 1998)who reported proportion of GINs infection in above similar patterns. This might be due to the fact that ruminants have different level of resistance for different species of parasitic infections and some parasites may not produce eggs due to several reasons. The current study has shown the presence of mixed infection with two or more nematodes parasites which agrees with the findings of other researchers in the country and elsewhere (Abebe and Esayas, 2001; Basaznew et *al*., 2014; Yimer*et al*., 2016). These mixed infections have been suggested to be an important cause of morbidity and loss of production in the small ruminants because mixed infection could weaken host immune system of the host and increase their susceptibility to other diseases or parasites.

Age wise observation revealed statistically significant difference in infestation of GINs between the age groups with higher prevalence (44.7%) in sheep and goats below two years (young)than other age categories. The present finding agrees with most literatures that young animals are more susceptible to parasite infection than adult one. For instance, Tesfahiwet (2012) reported higher prevalence in young animals. This could be justified as adult animals may acquire immunity to the parasite through frequent challenge and expel the ingested parasite before they establish infection (Raza*et al*., 2007). Several authors have documented that adult and old animals develop acquired immunity against helminth infections as they get mature due to repeated exposure (Demelash*et al*., 2006). But the finding is disagrees with reports from Gambia and Semi-arid part of Kenya that indicated that GIT helminthes affect both ages equally (Fritsch *et al*., 1993; Waruiru*et al*., 2005).

Body condition score result shows a significant difference in relation to nematodes infection where a higher prevalence of gastrointestinal nematodes parasites was recorded in poor (65.2%) and moderate (23.3%) body conditioned animals as compared to animals having good (16.4%) body condition. This finding agrees with findings of Abebe and Esayas (2001); Knox *et al*.(2006); Yimar *et al*. (2016) who reported that higher infection rate of parasites in sheep and goats with poor condition This might be due to either parasitic diseases are chronic in nature which results in poor weight gain or might be due to well-fed animals have good immunity against parasitic infection. However, this finding is inconsistent with the result reported by (Basaznew et *al*., 2014) who reported the absence of significant relation between the prevalence of GIT nematodes infection and body condition score ($p>0.005$). This difference might be due to difference in proportion of animals sampled in relation to body condition scores.

Season wise analysis of the current study shows the presence of significance association between season and parasite in which higher prevalence of GINs was recorded during the wet season than the dry one. This result is consistent with the previous result of Tesfaheywet (2012) who reported higher prevalence in wet season than the dry season. This indicates that animals are expected to acquire high number of infective larvae during rainy season and harbor higher prevalence of nematodes. But contrary result has been reported from in and around Haramaya University by Yimer *et al.* (2016) which shows absence of statistical significant association with season. This might be due to the fact that animals do have an access to ample amount of pasture which would increase the plane of nutrition and consequently increase the immunity of the animals, thereby reducing the fecundity which prevents the rise in nematodes infection during the wet season.

The present study shows no statistically significant differences (P > 0.05) between two sex groups, male (30.8%) and female (36.3%). This finding agrees with the previous reports (Abebe *et al*., 2018) and Assefa and Sissay, 1998), in which there was relatively equal susceptibility of male and females to gastrointestinal helminths. The absence of association between sexes is inconsistent with previous reports ((Nigatu, 2008; Odoi *et al*., 2007) who reported a higher prevalence of helminth infection in female animals. It is assumed that females are more prone to parasitism during pregnancy and per-parturient period due to stress and decreased immune status (Demelash *et al*., 2006).

Conclusion and Recommendations

The gastrointestinal nematodes of small ruminant are one of the important parasitic diseases that obviously result in reduced productivity of sheep and goat. High prevalence of gastrointestinal nematodes infection was observed in the Dibate woreda indicating that there is potential contribution of these parasites in limiting the productivity and compromised wellbeing of the animals. Risk factors such as age, body condition scores and season had significant effects on the prevalence of GINs. Therefore, regular de-worming program using broad spectrum anthelmintic and good management practices should be implemented to minimize pasture contamination with larvae. Further epidemiological and anthelminthic resistance study should be conducted in the area. Detailed study should be conducted to clearly identify nematodes parasites using molecular techniques.

Acknowledgments

We are very much grateful to Wallaga University, the School of Veterinary Medicine and Dibateworeda veterinary clinic staff for their provision of materials, valuable advice, encouragement, and cooperation in different aspects for the success of this work.

References

Abebe, T., Yobsan, T., Debela, A. (2018): Prevalence of Major Gastrointestinal Nematodes and Degree of Parasite Infestation in Sheep of Bako Agricultural Research Center Community Based Breeding Program Project Small Holder Farms at Horro District. *Dairy and Vet Sci J.* 2018; 8(3).

Abebe, W., Eseyas, G. (2001): Survey of ovine and Caprine gastrointestinal Helminthosis in eastern part of Ethiopia during the dry season of the year. *Revue Med Vet* 152: 379-384.

Ahmed, M.A. (2010): Gastrointestinal nematodes infections in small ruminants: Epidemiology, anthelmintic efficacy and the effect of wattle tannins. Animal Science Discipline of Animal and Poultry Sciences, School of Agricultural Sciences and Agribusiness University of KwaZulu-Natal Pietermaritzburg, pp: 1-6.

Assefa, D., Sissay, L. (1998): Preliminary investigation on the seasonal occurrence of parasites around Sheno. In: 5th national conference of society of animal production ESAP, Addis Ababa Ethiopia, pp: 123-137.

Basaznew,B., Jejaw,M., Mersha C. (2014):Major Gastrointestinal Nematodes of Small Ruminants inDembia District, Northwest Ethiopia *Europ. J. Appl. Sci.*, 6 (2): 30-36.

Bayou,A. (1992): Prevalence of Gastrointestinal Helminths of Small Ruminants in Illubabor. DVM Thesis, FVM, AAU, 1992.

CSA (Central Statistics Authority): The 2001/2002 Ethiopian Agricultural Sample Enumeration (EASE), Executive Summary, Addis Ababa, Ethiopia, 2004.

DebatieWoreda Agricultural Office annual report (2021).DebatiWoreda, Metekel zone, Benishangulugumuz, Ethiopia.

Demelash, B., Yilma, J., Hassen, C. (2006): Ovine Helminthosis is Major Health Constraints to Productivity of Sheep in

Ethiopia. Faculty of Veterinary Medicine, Awassa University, Awassa, Ethiopia.

Diriba, L., Birhanu, A. (2013): Prevalence of ovine gastrointestinal nematodes in and around Asella, South Eastern Ethiopia. *J Vet Med Anim Health*5: 222-228.

FAO (2010).Food and Agriculture Organization.Breeding strategies for sustainable management of animal genetic resources.Animal Production and Health Guidelines, No.3, Rome, Italy.

Fritsch, T., Kaufmann, J., Ptister, K. (1993):Parasite spectrum and seasonal epidemiology of gastrointestinal nematodes of small ruminants in Gambia. Vet Parasitol 49(2-4): 271-283.

Haileleul. N. (2002):Study on prevalence of GIT helminths of small ruminants in and around WolaytaSoddo, southern Ethiopia. DVM Thesis Faculty of veterinary medicine, Addis Ababa Thesis, Debre-Zeit, Ethiopia.

Hansen, J.W., Perry. B.D. (1994):The epidemiology, diagnosis and control of helminth parasites of ruminants. A hand book, (2nd edn), ILRAD, Nairobi, Kenya p: 1–79.

Kaplan, R.M. (2004): Drug resistance in nematodes of veterinary importance: a status report. TRENDS in Parasitology 20: 477- 481.

Knox, R., Torres-Acosta, F., Aguilar-Caballero, J. (2006): Exploiting the effect of dietary supplementation of small ruminants on resilience and resistance against gastrointestinal nematodes. *Vet Parasitol* 139(4): 385-393.

Nigatu, K. (2008): Gastrointestinal Helminthosis of Sheep in Awi Zone, northwestern Ethiopia. *Global Veterinaria*, 12: 121-129.

Odoi, A., Gathuma, M., Gachuiri, K., Omore, A. (2007): Risk factors of gastrointestinal nematodes parasite infections in small ruminants kept in smallholder mixed farms in Kenya. *BMC Vet Res* 3(6): 1186-1746.

Raza, M.A., Iqbal, Z., Jabbar, A., Yaseen,M. (2007): Point prevalence of gastrointestinal helminthiasis in ruminants in southern Punjab. *Pakistan. J Helminthol* 81: 323-328.

Regassa, F., Teshale, S., Reta, D., Yosef, K. (2006): Epidemiology of gastrointestinal parasites of ruminants in Western Oromia, Ethiopia. *Int J Appl Res Vet Med* 4(1): 51-57.

Rossanigo, C.E., Grunder, L. (1995): Moisture and temperature requirements in feces for the development of free living stages of gastrointestinal nematodes of sheep and cattle and deer. *J. of Helminthol*, 67: 357-362.

Singh, H., Rai, H.S., Singh, N.K., Kaur, A. (2002): Prevalence of helminthic infection in sheep in Ludhiana. *J Vet Parasitol* 19(2): 97- 101.

Sis, N.M., Semsari, M.C., Eshratkhah, B.,Sadaghian, M.,Gorbani, A.,Hassanpour, S. (2011): Evaluation of the effects of Quebracho condensed tannin on faecal egg counts during naturally acquired mixed nematodes infections in Moghani sheep, Department of Animal Sciences and Veterinary Medicine Shabestar Branch, Islamic Azad University, Shabestar, *Iran*, *Annals of Biol. Res.*, 2: 170-174.

Tesfaheywet, Z. (2012):Helminthosis of sheep and goats in and around Haramaya, southeastern Ethiopia,*J. Vet. Med. Anim. Health*, 4: 48-55.

Tesfaye, H. (1998): Ovine and bovine helminthiasis in Kelela, South Wollo. In: Proceedings of EVA conference, Addis Ababa, Ethiopia, p. 30.

Thrusfield, M. (2007): Veterinary Epidemiology. Blackwell Science Limited, USA, pp: 180-181, 224-225.

Tony, W. (2007): The veterinary epidemiology and economics research unit (VEERU), School agriculture, policy and development. The University of reading, United Kingdom.

Waruiru, R.M., Mutune, M.N., Otieno, R.O. (2005): Gastrointestinal parasite infections of sheep and goats in a semi-arid area of Machakos District, Kenya. *Bull Anim Health Prod Afr* 53(1): 25-34.

Yimer, M., SabkeberM., NegesseM. (2016): Prevalence and Burden of Nematodes Parasites of Small Ruminants in and Around Haramaya University**.** *World ApplScie. J.* 34 (5): 644-651.

Zelalem, A., Fletcher, I., (1991): Small ruminant productivity in the central Ethiopian mixed farming systems. In: IAR, Addis Ababa, Ethiopia: (4th edn), Tumwasorn, Livestock Improvement Conference, 141-147.

Access this Article in Online	
	Website: www.ijarbs.com
Quick Response Code	Subject: Veterinary Sciences
DOI:10.22192/ijarbs.2022.09.11.010	

How to cite this article:
Geremew Haile Lemu, Dessalegn Muleta and Yacob Hailu Tolossa. (2022). Prevalence of GI nematodes of sheep and goats and associated risk factors in Dibate district, Metekel zone, Benishangul Gumuz regional state, Ethiopia. Int. J. Adv. Res. Biol. Sci. 9(11): 88-96.
DOI: http://dx.doi.org/10.22192/ijarbs.2022.09.11.010