

GASTROINTESTINAL PARASITES OF SHEEP AND GOAT IN AND AROUND GONDAR TOWN, NORTHWEST, ETHIOPIA

Olifan Fayisa, Ararsa Duguma, Melkamu Temesgen, Fethu Lemma

Haramaya University, College of Veterinary Medicine, P.O.Box. 138 Diredawa, Ethiopia
Correspondence author: Ararsa Duguma, ararsad@yahoo.com
Original scientific paper

Abstract: A cross sectional study was conducted from November 2018 to April 2019 to determine the prevalence and risk factors associated with sheep and goat gastrointestinal (GIT) parasites in and around Gondar town, Northwest of Ethiopia. A total of 384 sheep and goats fecal samples (313 sheep and 71 goats) were collected and examined using standard parasitological techniques. The present study revealed that an overall prevalence of 56.77% with prevalence rate of 185 (59.11%) and 33(46.48%) in sheep and goats respectively. From the examined samples mixed infection was recorded with about 21.35%. The parasitic species identified were *Strongyle spp*s (22.14%), *Trichuris spp*s (0.52%), *Monezia* (2.5%), *Emeria spp*s (0.260%). Female animals were found with higher prevalence of helminthes infection rate than male animals with a prevalence of 48.98% and 61.60%, respectively. Higher prevalence was observed in young animals (69.61%) than adult animals (45.32%). Body conditions and production system also showed significance difference ($P<0.05$) in the occurrence of GI parasites of sheep and goats in the study area. It can be concluded that, in the study area there was high prevalence of GIT parasites in sheep and goats with age, sex, body condition and production system as important risk factors. Therefore, strategic uses of anthelmintics drugs and good management should be given for the control and prevention of GIT parasites as well as further studies to determine burden of the parasites and seasonal variation is recommended.

Keywords: GIT parasite, Gondar town, Risk Factor, prevalence, Ethiopia

Introduction

In Ethiopia small ruminants represent the most important part of the Ethiopian livestock system. These animals are almost entirely managed by the poor small-holder farmers and pastoralists (*Sissay, 2007*). Sheep and goat are playing an important role in the livelihood of resource poor farmers and provide a vast range

of products and services such as meat, milk, skin, hair, manure and food security, gifts, religious rituals and medicine. However, the full exploration of this production was hindered due to traditional husbandry and management system, poor genetic potential of local breeds and the presence of numerous animal diseases (Mtenga et al., 1994).

Gastrointestinal parasite infections are a world-wide problem for both small and large-scale farmers, but their impact is greater in sub-Saharan Africa in general and particularly in Ethiopia due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species. Gastrointestinal parasites causes economic losses due to lowered fertility, reduced work capacity, involuntary culling, lower weight gains, treatment costs and mortality in heavily parasitized animals (Fikru, 2006).

Helminthes and coccidia are mentioned to be the most common and important gastro-intestinal parasites in small ruminants. In the tropics, the most important nematode species affecting small ruminants are *Haemonchus contortus*, *Trichostrongylus* species, *Nematodirus* species, *Cooperia* species, *Bunostomum* species and *Oesophagostomum* species (Khan, 2005; Smith, 2009). Coccidian parasites of the genus *Eimeria* contribute to enteric disease especially in young or stressed goats under poor farm management that leads to high mortality in goat kids (Ratanapob et al., 2012).

Even some work has been done on gastrointestinal parasites of sheep and goats in northern Ethiopia, most of the studies were restricted to estimate its prevalence than determination of potential risk factors and effect of management system on occurrence of GIT parasites to develop possible prevention and control strategies. Therefore, this study was designed with the objectives of:

- ✓ To estimate status of GIT parasites of sheep and goat in Gondar town
- ✓ To determine effect of management system and other possible risk factors on prevalence of GIT parasites in the study area

Materials and Methods

The Study Area

The present study was conducted in and around Gondar town which is located 750 Km away from Addis Ababa, in north Gondar zone, northwest Ethiopia. Geographically, the study area is located on 35°7' N and 13°8' E and an altitude of 2200 meter above sea level. The annual mean temperature of the area was between 15°C and 26°C respectively. It receives a bimodal rainfall with short rainy season occur during the months of March, April, and May while the long ones extend from June to September with mean annual rain fall of 1172 mm (CSA, 2012). The soil type of the area consists of vertisoil and sandy type of soil with vegetation type

which varies from larger tree to bushes. The area is characterized by mixed crop livestock production farming system.

Study Animals and management

The study animals were local breeds of small ruminants (sheep= 313 and goat=71) kept in and around Gondar town. Species, sex, body condition, production system and age groups of local origin were included in this study. Adults are above one year with young less than one year was considered in the study according to (*Yami and Merkel, 2008*) and owner information. Body condition can be also classified as poor, medium and good according to (*Yami and Merkel, 2008*). The production system is classified based as intensive, semi intensive and extensive production system.

Despite the presence of studies on gastrointestinal parasites of sheep and goats in the study area, there was no comprehensive data showing the status of all GIT parasites in different management systems. Thus, the sample size was determined based on formula given by *Thrusfield, (2007)* with expected prevalence of 50% and 5% absolute precision at a 95% confidence interval (CI). Accordingly, 384 sheep and goat were sampled (313 sheep and 71 goats).

Study design

A cross-sectional study design was used to estimate the prevalence of GIT parasite of sheep and goat in and around Gondar town based on coprological examination. Households were selected purposively based on easy of accessibility and interest of owners. Simple random sampling technique was used to select study animals in examined flocks. Species, age, sex, body condition and production system considered as risk factors for the occurrence of GIT parasite in sheep and goat.

Sample Collection and Laboratory Examination

A fresh fecal sample of approximately 5-10 gram was collected directly from the rectum of sheep and goat by using gloved fingers. Collected fecal samples placed in plastic bottles and transported to the University of Gondar parasitology laboratory for fecal examination. All the necessary information including body condition, sex, age and management systems were labeled. Samples were immediately stored in the refrigerator at 4°C until it was processed. The collected samples were subjected to qualitative flotation and sedimentation parasitological techniques. Identification of egg/ oocysts was performed by their characteristic morphological features as described by (*Soulsby, 1982*).

Data Management and Analysis

The collected data from field level and laboratory investigation was organized and entered in to MS excel work sheet. Data analysis was done using STATA version

12. Descriptive statistics were used to determine the prevalence of the parasites and Chi-square test (χ^2) was used to determine any association between the prevalence of GIT parasites with risk factors. In all data analyses, confidence level was held at 95% and $P < 0.05$ for significance value.

Results

In the present study, the species prevalence of 185 (59.11%) and 33(46.48%) in sheep and goats, respectively were infected at least by one parasite species, and these give an overall prevalence of 56.77% in both species. Females and males were found to be infested with a significant variation ($P < 0.05$); accordingly, higher prevalence of GIT parasites was observed in female animals (61.60%) as compared to males (48.98%) between the two sexes. Young and adult animals were found to be infested with a prevalence of 69.61% and 45.32%, respectively with Significant difference ($P < 0.05$). Body condition scores and production system also significantly affect the outcome of GIT prevalence (Table 1).

Table 1. Overall prevalence of GIT parasite and its associated factors in sheep and goat

Risk factors	No. examined animals	Number of positive (%)	χ^2	p-value
Species				
Sheep	313	185 (59.11)	3.7596	0.053
Goat	71	33 (46.48)		
Sex				
Male	147	72 (48.98)	5.8913	0.015
Female	237	146 (61.60)		
Age				
Young	181	126 (69.61)	23.009	0.000
Adult	203	92 (45.32)		
Body Condition				
Poor	139	125 (89.93)	128.22	0.000
Medium	169	84 (49.70)		
Good	76	9 (11.84)		
Production System				
Extensive	246	204 (82.93)	192.32	0.000
Semi Intensive	84	12 (14.29)		
Intensive	54	2 (3.70)		
Total	384	218(56.77)		

The predominant GI parasites identified in sheep and goats were *strongyle types*, *trichuris spp*s, *monesia* and, *Emeria spp*s as a single and mixed infection. *Strongyle types* were the most frequently 85(22.14%) recovered GIT parasites eggs followed by *Emeria spp*s 48(12.35%), *Trichuris spp*s 2(0.26%) and *Monesia* 1(0.26%) (Table 2).

Table 2. Prevalence of GIT parasites of sheep and goat with egg /oocyst types

Parasite species	No. examined animals	Positive samples	Prevalence (%)
<i>Strongyle types</i>	384	85	22.14
<i>Trichuris spp</i>	384	2	0.52
<i>Monesia spp</i>	384	1	0.26
<i>Emeria spp</i>	384	48	12.50
Mixed type	384	82	21.35
Total	384	218	56.77

Out of the total 219 positive cases, 136 (35.42%) were infected with one parasite eggs type and 82 (21.35%) were infected with two or more parasite eggs type. Among these, *strongyle type* eggs and *Emeria oocyst* coexist most of the time, with an overall prevalence of 69 (17.97%) followed by *strongyle types* and *monesia* 4 (1.04%).

Discussion

In the present study, the overall prevalence of GIT parasites was 56.77%. The current finding is lower than the report of *Tefera et al. (2010)* from Bedelle, *Nuraddis et al. (2014)* from Jimma, *Bikila et al. (2013)* from Illubabor, *Dabasa et al. (2017)* from Bale and *Tesfaye et al. (2019)* from Benishangul Gumuz who indicated prevalence rate of 91.9%, 87.2%, 77.8% and 67.7%, respectively. However, it is slightly higher than the report of *Kedir and Asfew (2017)* from south eastern Ethiopia, *Negasi et al. (2012)* from North Ethiopia and *Dagnachew et al. (2012)* from northwest Gondar, who closed prevalence rate of 52.78%, 48.21 and 47.67% respectively. This variation may be due to management system and level of production, individual animal factors, origin, season and differences in study methods.

The study showed that higher prevalence of GIT parasite was observed in poor body condition animals as compared to medium and good body condition animals and the difference was statically significant ($p < 0.05$). This agrees with previous reports of *Welemehret et al. (2012)* in Northern Ethiopia, *Diriba and Birhanu (2013)* in south eastern Ethiopia, *Kedir and Asfew (2017)* in South Eastern Ethiopia and *Tesfaye et al. (2019)* in Northwest Ethiopia. This might be due to either well-fed animals have good immunity for parasitic infection.

The higher prevalence of GIT parasites reported in females than in males ($P < 0.05$). This finding agrees with the report of different researchers (*Mihreteab and Aman, 2011; Bashir et al., 2012; Emiru et al. 2013*). This may be due to female animals are exposed to more stress than male animals in different times such as during pregnancy and peri-parturient period as stress decreased immune status (*Gauly, 2006*).

The study was also undertaken to observe the prevalence of GIT parasites in age groups and the finding revealed that young animals were highly infected when compared to that of adult animals ($p < 0.05$). This finding was in agreement with the finding of some researcher in different parts of Ethiopia (Fikru et al., 2006; Diriba, 2013; Dilgasa et al., 2015) who reported higher prevalence in younger animals. This is due to young animals are more susceptible to parasite infection due to immunological immaturity and immunological unresponsiveness (Urquhart et al., 1996).

The study showed that higher prevalence of GIT parasite was observed in extensive production system as compared to semi intensive and intensive production system and the difference was statically significant ($p < 0.05$). This is in agreement with different findings (Waller, 2004; Iyad, 2012; Sangama et al., 2013) who reported high prevalence rate in extensive as compared to semi-intensive and intensive production systems. The possible explanation is that animals kept under extensive production systems, there is continuous infection and re-infection from heavily contaminated pastures rendering anthelmintic treatment of limited value compared to the situation under semi intensive and intensive production systems. This could be due the fact that the animals kept under semi-intensive system and intensive production system are properly managed and routinely dewormed.

The major GIT parasite that has been observed in this study were *Strongyle* type of species *trichuris spp*s, *monesia spp*s and *coccidian spp*s of parasites. The current prevalence of *Strongyles spp*swas 22.14% which is lower with reports of previous studies conducted in different parts of Ethiopia (Temesgen 2008; Ragassa et al., 2006). The prevalence of coccidian parasites in the present study was 12.50% which is in line with the findings of Nuraddis et al. (2014) in and around Jimma town who reported 11.7% prevalence. Among the Cestoda, Monezia was the only observed species in the present study with prevalence of 0.26%. This difference in prevalence rate may be attributed to the difference in agro ecology and variation in management practice of anima.

The current study has shown the presence of mixed infection (polyparasitism) characterized by the presence of more than one GIT parasite in sheep and goat of the study area. This agrees with the findings of other researchers in the country (Abebe and Esayasu, 2001; Regassa et al., 2006; Tefera et al., 2010). These mixed infections have been suggested to be an important cause of morbidity and loss of production in sheep and goat (Kumsa et al., 2011). Moreover, the presence of interaction and compromization of the immune system of the host by mixed infections increase their susceptibility to other diseases or parasites (Wang et al., 2006).

Conclusion

Gastrointestinal parasites are the major animal health constraints in sheep and goat production and contributing loss in productivity and economy. In the present study an overall prevalence of GIT parasites were high with occurrence of mixed infection. The predominant GIT parasites identified were *Strongyle spp.*, *Trichuris spp.*, *Monesia spp.* and *Emeria species*. Risk factor like ages, sex, body condition and production system were found determinant factors for the occurrence of GIT parasites. From the above findings and conclusions, strategic use of anthelmintics and good management should be practice to control the gastrointestinal parasites infection with further study on Seasonal variation and burden of parasites in the study area.

Gastrointestinalni paraziti ovaca i koza u gradu Gondar i okolini, severozapadna Etiopija

Olifan Fayisa, Ararsa Duguma, Melkamu Temesgen, Fethu Lemma

Rezime

Istraživanje je sprovedeno od novembra 2018. do aprila 2019. godine kako bi se utvrdila prevalenca i faktori rizika povezani sa gastrointestinalnim parazitima ovaca i koza (GIT) u i oko grada Gondar, severozapadna Etiopije. Ukupno su prikupljena i ispitana 384 uzorka fekalija ovaca i koza (313 ovaca i 71 koza), koji su korišćeni standardnim parazitološkim tehnikama. Ova studija je otkrila da je ukupna prevalenca od 56,77% sa stopom prevalencije 185 (59,11%) i 33 (46,48%) kod ovaca i koza. Od ispitivanih uzoraka zabeležena je mešovita infekcija sa oko 21,35%. Identifikovane parazitske vrste su *Strongile spp.* (22,14%), *Trichuris spp.* (0,52%), *Monezia* (2,5%), *Emeria spp.* (0,260%). Utvrđeno je da su ženska grla sa većom stopom prevalencije helminta u odnosu na muška grla sa prevalencijom od 48,98%, odnosno 61,60%. Veća prevalenca primećena je kod mladih životinja (69,61%) od odraslih životinja (45,32%). Stanje tela i proizvodni sistem takođe su pokazali značajnu razliku ($P < 0,05$) u pojavi GI parazita ovaca i koza na istraživanom području. Može se zaključiti da je u istraživanom području bila velika prevalenca GIT parazita kod ovaca i koza, uzrast, pol, stanje tela i proizvodni sistem kao važni faktori rizika. Zbog toga treba obezbediti stratešku upotrebu lekova protiv glista i dobro upravljanje za kontrolu i prevenciju GIT parazita, kao i dalje studije za utvrđivanje opterećenja parazita i sezonskih varijacija.

Ključne reči: GIT parazit, Gondar, faktor rizika, prevalenca, Etiopija

Acknowledgement

The authors acknowledged Haramaya University for financial support. Communities of the study area were also well acknowledged for their interest and support in giving full information in data collection and using their animals for this study.

References

- ABEBE W., ESAYAS G. (2001): Survey on ovine and caprine gastro-intestinal helminthosis in eastern part of Ethiopia during the dry season of the year. *Revue Veterinary Medicine*, 152, 379-384.
- BASHIR A. L., CHISHTI F. A., HIDAYATULLAH T. (2012): A Survey of Gastrointestinal Helminthes Parasites of Slaughtered Sheep and Goats in Ganderbal, Kashmir. *Global Veterinary*, 8, 338-341.
- BIKILA E., YESHITLA A., WORKU T., TEKA F., BENTI D. (2013): Epidemiology of gastrointestinal parasites of small ruminants in Gechi District, Southwest Ethiopia. *Advances in Biological Research*, 7, 169-174.
- CENTRAL STATISTICAL AGENCY, CSA. (2012): Annual surveillance report. Addis Ababa, Ethiopia.
- DABASA G., SHANKO T., ZEWDEI W., JILO K., GURMESA G., ABDELA N. (2017): Prevalence of small ruminant gastrointestinal parasites infections and associated risk factors in selected districts of Bale zone, south eastern Ethiopia. *Journal of Parasitology and Vector Biology*, 9, 81-98.
- DAGNACHEW S., AMAMUTE A., TEMESGEN W. (2011): Epidemiology of gastrointestinal helminthiasis of small ruminants in selected sites of North Gondar zone, Northwest Ethiopia. *Ethiopian Veterinary Journal*, 15, 57-68.
- DILGASA L., BIRUHTEFA A., SURAFEL K. (2015): Prevalence of Gastrointestinal Nematodes of Small Ruminants in and Around Arsi Negele Town, Ethiopia. *American-Eurasian Journal of Scientific Research*, 10, 121-125.
- DIRIBA L., BIRHANU A. (2013): Prevalence of ovine gastrointestinal nematodes in and around Asella, South Eastern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 5, 222-228.
- EMIRU B., AHMED Y., TIGRE W., FEYERA T., DERESSA B. (2013): Epidemiology of gastrointestinal parasites of small ruminants in Gechi District, Southwest Ethiopia. *Advance Biomedical. Research*, 7, 169-174.
- FIKRU R., TESHALE S., RETA D., YOSEF K. (2006): Epidemiology of gastrointestinal parasites of ruminants in Western Oromia, Ethiopia. *International Journal Applied Research Veterinary Medicine*, 4, 451-57.

- GAULY M., SCHACKERT M., HOFFMANN B., ERHARDT G. (2006): Influence of sex on the resistance of sheep lambs to an experimental *Haemonchus contortus* infection. *Deutsche Tierärztliche Wochenschrift*, 113, 178-181.
- IYAD B., RUBA A., RATEB A., WAEL A., JABER A. (2012): Prevalence and Diversity of Gastrointestinal Parasites in small Ruminants under Two Different Rearing Systems in Jenin District of Palestine - Najah University, *Journal Research*, 26.
- KEDIR K. E., ASFAW M. G. (2017): Prevalence and Risk Factors of Gastrointestinal Parasites of Small Ruminants in Sinana and Dinsho Districts of Bale Zone, South Eastern Ethiopia *European Journal of Biological Sciences*, 9, 01-08.
- KHAN C.M. (2005): Merck veterinary manual. 9edition. USA: A Merck and Aventis National Publishing, 258-260.
- MIHRETEAB B., AMAN A. (2011): Ovine Lungworms in Tiyo District, South-East Ethiopia: Prevalence, effect of altitude and major host related risk Factors. *Global Veterinary*, 7, 219-225.
- MTENGA L.A., KIFARO G.C., BERHANU B. (1994): Studies on factors affecting reproductive performance and mortality rates of small East African goats and their crosses. *Small Ruminants Research and Development in Africa. Proceedings of the second Biennial Conference of African Small Ruminants Research Network. AICC, Arusha Tanzania, 7-11 December 1992. LCA/TCTA, September 1994. Addis Ababa, Ethiopia, Network Workshop, 69-73.*
- NURADDIS I., MULUGETA T., MIHRETEAB B., SISAY A. (2014): Prevalence of gastrointestinal parasites of small ruminants in and around Jimma town, Western Ethiopia. *Acta parasitologica globalis*, 5, 26-32.
- RATANAPOB N., ARUNVIPAS P., KASEMSUWAN S., PHIMPRAPHAI W., PANNEUM S. (2012): Prevalence and risk factors for intestinal parasite infection in goats raised in Nakhom Pathom Province, Thailand. *Tropical Animal Health Production*, 44, 741-5.
- REGASSA F., SORI T., DHUGUMA R., KIROS Y. (2006): epidemiology of gastro-intestinal parasites of small ruminants in western Oromia, Ethiopia. *International Journal of Veterinary Medicine*, 40, 387-394.
- SISSAY M. (2007): Helminthes parasites of sheep and goats in eastern Ethiopia. Epidemiology, and anthelmintic resistance and its management. Doctoral thesis, Swedish University of Agricultural Science, Uppsala, Sweden.
- SOULSBY E.J.L. (1982): *Helminths, Arthropods and Protozoa of Domesticated Animals*, 7th Edition. London: Baillere Tindall, pp. 707-735.
- TEFERA M., GEREMEW B., T., BITEW M. (2010): Prevalence of Gastrointestinal Parasites of Sheep and Goats in and Around Bedelle, South-Western Ethiopia. *The Internet Journal of Veterinary Medicine*, 8, 2.
- TESFAYE D., ABYI A., WODAYINEW W., W/MECHAL G., FENTAHUN B., GURMESSA K., WODAJNEW B. (2019): Study on Prevalence and Its Potential

Risk Factors of GIT Parasite in Small Ruminants in Metekel Zone, Dangur, Dibate and Mandura Districts, *Journal of American Science*, 15, 2.

THRUSFIELD (2007): *Veterinary Epidemiology*. 3rd ed. Oxford, UK: Blackwell Sciences Ltd.; pp: 232-245.

URQUHART G., AREMOUR J., DUNCHAN J., DUNN A., JENINIS F. (1996): *Veterinary parasitology* 2 edition. The University of Glasgow, Blackwell Sciences, Scotland, pp 3-137.

Waller P.J. (2004): Management and control of nematode parasites of small ruminants in the face of total anthelmintic failure. *Tropical Biomedical*, 21, 7-13.

WANG C., QUI J., ZHU X., HAN X., NIH B., ZHAO J., ZHOU Q., ZHANG H., LUN Z. (2006): Survey of Helminths in adult sheep in Heilogjiang Province, People Republic of China. *Veterinary Parasitology*, 140, 378-38.

WELEMEHRET N., BASAZNEW B., MERSHA C. (2012): Helminth parasites in small ruminants: prevalence, species composition and associated risk factors in and around Mekelle town, Northern Ethiopia. *European Journal of Biological Sciences*, 4, 91- 95.

YAMI A., MERKEL R.C.C. (2008): Ethiopia Sheep and Goat productivity Improvement Program (ESGPIP). *Sheep and Goat Production Handbook for Ethiopia*, 1-349.

Received 10 March 2020; accepted for publication 25 June 2020