



Received: 28-06-2023
Accepted: 08-08-2023

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Incidence of Gastrointestinal Helminth Parasite of Cattle in Ambo District, West Shoa, Ethiopia

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Abstract

In Ethiopia, parasitic infections are among major constraints to animal production. Gastro-intestinal tract (GIT) parasites are one of the cause huge of economic losses (direct or indirect) to livestock. There is lack of well documented information regarding the prevalence and associated risk factors of GIT helminth parasite in the current study area. A cross-sectional study was conducted from November, 2017 to April, 2018 with the objective determining the prevalence of GIT helminth parasite of cattle in Ambo District, west Shoa, Ethiopia. A total of 384 fecal samples from different peasant associations of Ambo district were examined using flotation and sedimentation techniques. Out of 384 examined animals 182 animals were found positive for different GIT helminth parasite while 202 were found free from any gastrointestinal helminth parasite. The study

revealed that the overall prevalence of gastrointestinal helminthoses was 47.4%. Strongyles were the most prevalent parasites encountered in the area followed by Fasciola spp, and Monezia was the least prevalent. Prevalence of gastrointestinal helminth parasite was higher in young, female, local and extensively managed animals. Age, sex, breed, management and body condition of the animals were shown to have statistical significance ($p < 0.05$) with prevalence of GIT helminth parasites. This study showed that, GIT helminthes are major health problems of cattle in the study area. Therefore, during the control and treatment of cattle gastrointestinal helminthoses age, sex, body condition, breed and management system of the animals should be considered as potential risk factors for the occurrence of the disease in the study areas.

Keywords: Ambo, Cattle, Fecal Sample, GIT Helminthes, Prevalence

Introduction

The growing demand for the meat and milk in developing world, changing function of livestock and changing consumers perspectives are the major driving forces in the global livestock sector during the next two decades^[1]. Remarkable increase in human population and the movement of people from rural areas to urban centers will increase the demand for food of animal origin. By the year 2020 the global population is projected to consume about 120 million tons of meat and 220 million tons of milk above the current consumption^[1, 2].

Livestock farming is central to the sustainability of rural communities around the world, as well as being socially, economically, politically highly significant at national and international levels and also back bone for agricultural activity. Ethiopia is an agricultural country with over 85% of its population engaged in agricultural activity. The country has diverse agro-ecological zones which contributes to the evolution of different agricultural production systems. Animal production forms an integral part of agricultural system in almost all ecological zones of the country^[3].

Ethiopia is known for its high livestock population, being the first in Africa and tenth in the world. The recent livestock population estimated that the country has 59,486,667 heads of cattle, 30,697,942 of sheep, 30,200,226 of goats, 2,158,176 of horses, 409,877 of mules, 8,439,220 of donkeys and 59,495,026 of poultry^[4]. It performs multiple functions in the country's economy by providing food, input for crop production and soil fertility management, raw material for industry, cash income as well as in promoting saving, fuel, social functions and employment^[5]. The animal production systems are extensive, semi-intensive and intensive^[6, 7].

However, full exploitation of cattle resource is mainly constrained and impeded at a great extent by parasitic diseases^[8]. The gastrointestinal tract of animals harbor a variety of parasites particularly helminthes, which causes clinical and sub clinical parasitism. These parasites adversely affect the health status of animals and cause enormous economic losses to the livestock industry. Gastrointestinal parasitic infections are world-wide problem for both small and large-scale farmers, but their impact is greater in Sub-Saharan Africa due to the availability of a wide range of agro-ecological factors suitable for diversified hosts

and parasite species [9]. The direct losses caused by these parasites are attributed to hyperacuteness and death, premature slaughter and rejection meat inspection whilst indirect losses include the reduction in productive potential such as decreased growth rate, weight loss, diarrhea, anorexia and anaemia [10, 11, 12].

Gastrointestinal parasites not only affect the health but also affect the productive and reproductive performance of the cattle. Gastrointestinal worms are recognized as by far the most significant part of diseases in livestock sector [13] and [14]. It has been established that parasitic infestation results in considerable losses in milk production in cattle [15].

Most of the losses caused by GIT helminthes are brought by stomach and intestinal worms that do have its own detrimental effect on all groups of animals [16]. These groups of parasites are widespread in almost all tropical and sub-tropical countries and are considered as responsible factors for deteriorating animal health and productivity. For example, *Haemonchus contortus* and other genera/species of nematodes belonging to the group of *Trichostrongylids* are of the major concern because of its blood-sucking feeding habits which causes anemia and resulting in the death of animals [17].

The prevalence of gastrointestinal parasites, the genera of helminth parasites involved, species, and the severity of infection also vary considerably depending on local environmental conditions, such as humidity, temperature, rainfall, vegetation, and management practices [18]. There are other associated risk factors influencing the prevalence and severity of GIT helminthes. These include age and sex of the animal [19].

Even though gastrointestinal helminth parasite is one of the most prevalent cattle diseases in Ethiopia, little attempts have been made in the past to study the prevalence and its risk factors. Lack of well-established data on the prevalence and predisposing factors of cattle on GIT helminthes is being observed as the major problem in most part of the country, including the current study area. Therefore, the objective of this study was to identify the major gastrointestinal helminthes parasites, their prevalence and associated risk factors in cattle in Ambo district, West Shoa zone, Ethiopia.

Materials and Methods

Study Area

The study was conducted in Ambo district which was found in Western Showa zone of Oromia regional state. Ambo is located 115 km West of Addis Ababa, and the area is found at a longitude of 37° 32' to 38° 3' E, and latitude of 8° 47' to 9° 20' N and the altitude range is from 1900 to 2275 meters above sea level. The climatic condition of the area is 23% highland, 60% mid altitude, and 17% lowland. It has an annual rainfall and temperature ranging from 800 to 1000 mm and 20 to 29°C respectively. The rainfall is bi-modal with the short rainy season from February to May and long rainy season from June to September. Agriculture is the main occupation of the population of the area. The agricultural activities are mainly mixed type with cattle rearing and crop production under taken side by side [20].

Study Population

The study population includes both indigenous and cross breeds of different age, sex and body condition categories of cattle. The ages of the cattle will be estimated based on the

owners' response and by looking to the dentition pattern of the cattle [21]. They were grouped as young (1-3 years) and adults (> 3 years) based on [22] (annex 2) classification methods. Body condition was classified into poor, medium and good according to [23] (annex 1).

Study Design and Sample Size Determination

A cross-sectional study design was selected to determine the prevalence of GIT helminthes in study area and the animals were sampled by using simple random sampling method. Four peasant associations were selected from Ambo district purposively because of their high cattle head, road access and transportation accessibility. Since the prevalence of GIT helminth parasite of cattle in Ambo district has not been reported, 50% expected prevalence rate, 95% confidence interval and 5% desired absolute precision was used. Total required sample size was calculated using formula given below [24].

$$n = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{d^2}$$

Where:

n = required sample size

P_{exp} = expected prevalence

d = desired absolute precision

Sample Collection and Methodology

Fecal samples were collected directly from rectum of randomly selected cattle by hands protected by rubber gloves, using two fingers (i.e., middle and index fingers) or from the ground with strict sanitation when the animals were seen defecating. During collection of sample age, sex, body condition, management, PA and bottle number were recorded. After collection, samples were transported in ice box to Ambo University Parasitology laboratory for examination. Those samples, which were not examined within 24 hours, were stored in a refrigerator at 4°C. Fecal samples were processed and examined by flotation and sedimentation techniques as described by [25] and parasitic eggs were identified using ova identification keys provided by [26]. The flotation solution used was a saturated solution of sodium chloride [27].

Data Management and Analysis

All the collected data was entered to MS excel sheet and analyzed by using SPSS version 20. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test was used to determine any association between the prevalence of GIT parasites with age, sex, management, breed, body condition and PA. Chi-square test at P<0.05 (2-tailed) was considered as significant. Data was presented by table.

Results

Prevalence

Out of 384 fecal samples examined 182 (47.4%) were found positive for eggs of different GIT helminthes parasites and the rest 202 (52.6%) samples were found negative for parasitic eggs. Of these 182 positive samples 148 had single infection and 34 had mixed infection. The prevalence of different type of parasites in cattle recorded were 44(24.2%) *Strongyle* type eggs, 34(18.7%) *Fasciola* spp, 28(15.4%) *paraphistomum*, 23(12.6%) *Toxocara species*, 9(4.9%)

Moniezia, 10(5.5%) *Schistosoma*, and 34(18.7%) mixed infection (Table 1).

Association of Risk Factors with Parasite Prevalence

Comparison was made on the prevalence GIT helminth parasites with in different age group in order to investigate any association. The cattle were categorized into two age groups, young up to 3 years old and adult greater than 3 years old. In the present study the prevalence Of GIT helminth parasite is greater in cattle less than 3 years old (60.9%) higher than those recorded in cattle greater than 3 years old(38.6%) and it was found significant (p<0.05) (Table 1). The present study also tried to identify any association between the prevalence GIT helminth parasite of cattle and sex. The prevalence of GIT parasite observed was 52.3 % in female and 40.9% in male. However, there was statically significant sex related difference (p<0.05) (Table1).

Higher prevalence was observed in poor (62.4%) than medium (45.7%) and good (29%) body condition animal. Thus, significant association (p<0.05) in prevalence was observed among animals with different body condition (Table1).

In present study type of management system had significantly association (p<0.05) in prevalence was shown among animals with different management system. In this study higher prevalence of GIT helminth parasite was observed in extensively (51.8%) and intensively (31.3%) managed animals respectively. Thus, an extensively managed animal was associated with high risk of being infected with GIT helminth parasite than intensively managed animals (Table1).

Table 1: Association of risk factors with prevalence of GIT helminthes parasite

Risk factors		No. Examined	No. positive	χ^2	p-value
Age	Young	151	92(60.9%)	18.276	0.000
	adult	233	90(38.6%)		
sex	Female	220	115(52.3%)	4.914	0.030
	male	164	67(40.9%)		
BCS	Poor	101	63(62.4%)	17.731	0.000
	Medium	221	101(45.7%)		
	good	62	18(29%)		
Breed	Local	305	157(51.5%)	9.896	0.002
	Cross	79	26(31.6%)		
Management	Extensive	301	156(51.8%)	10.968	0.001
	Intensive	83	26(31.3%)		

Table 4: The prevalence of different GIT helminthes in cattle within different PA

Selected PA	Types of parasite						
	<i>Strongyle</i>	<i>Fasciola</i>	<i>Paraphistomum</i>	<i>Toxocara</i>	<i>Monezia</i>	<i>Schistosoma</i>	<i>Mixed</i>
Wadessa	17(9.3%)	13(7.1%)	8(4.4%)	5(2.7%)	2(1.1%)	3(1.6%)	12(6.4%)
Kisose	5(2.7%)	7(3.8%)	5(2.7%)	3(1.6%)	2(1.1%)	3(1.6%)	7(3.7%)
Senkele	7(3.8%)	6(3.3%)	3(1.6%)	4(2.2%)	0(0%)	1(0.5%)	1(0.5%)
Gosu Kora	15(8.2%)	8(4.4%)	12(6.6%)	11(6.0%)	5(2.7%)	3(1.6%)	13(7%)

Discussion

The overall prevalence GIT helminth parasite of cattle in current study is 47.4%. This finding of the study is comparable with result of other researchers who have reported prevalence rate of 49.0% in west Arsi [28], 50.8% in Western Hararghe [29] and 52.4 % in Western Oromia [30], 51.3% in University of Maiduguri research farm, Nigeria [31], 54.2% in Ejere District, West Shoa [32], overall prevalence of 44.4% and 37.0% for large and small scale dairy cattle,

Comparison has also done on the prevalence of GIT helminth parasite between the local and exotic breed. The study revealed that higher prevalence (p<0.05) was recorded in local (51.5%) than cross (31.6%) breed (Table1).

Significant association (p<0.05) was observed in the prevalence of GIT helminth parasite of cattle between different peasant association. The result of study showed that 58.8%, 52.3%, 39.7%, and 33.3% prevalence rate was observed in wadessa, Gosu kora, Senkele and kisose peasant association respectively (Table 2).

Table 2: Overall prevalence of GIT helminthes parasite in selected PA in Ambo district

PA	No. Examined	No. Positive	χ^2	p-value
Wadessa	102	60(58.8%)	15.608	0.001
Kisose	96	32(33.3%)		
Senkele	58	23(39.2%)		
Gosu kora	128	67(52.3%)		
Total	384	182(47.4%)		

In this study there were different types of GIT helminth parasite observed. Out of 384 examined fecal samples, 182 (47.4%) were found positive for one or more types GIT helminth parasite egg.

Out of 182 positive animals, 148 (81.3%) animal was infested with single infection whereas 34 (18.7%) mixed infection (Table 3).

Table 3: Percentage of single and mixed infections GIT helminthes parasite in cattle

Type of parasite	No. positive animals'	Percentage (%)
<i>Strongyle</i>	44	24.2
<i>Fasciola</i>	34	18.7
<i>Paraphistomum</i>	28	15.4
<i>Toxocara</i>	23	12.6
<i>Monezia</i>	9	4.9
<i>Schistosoma</i>	10	5.5
<i>Mixed infection</i>	34	18.7
Total	182	100

The prevalence or distribution different parasites genera were also different from one PA to another. The prevalence of most parasite genera were higher in Gosu kora PA than the prevalence recorded in Wadessa, Senkele and Kisose PA, except *Strongyle* and *Fasciola* which was found higher in wadessa PA (Table 4).

respectively in Tanzania [33].

The finding of present study is lower than the report of [34] in dairy cows in and around Holeta (82.8%),77.6% in small dairy farms of Jimma town [35], 97.2% in Tanzania [36], 71% in Asella and its surrounding high lands [37], and 64.2% in Bedelle district [38]. The difference of prevalence in different study area could be due to difference in management system, climatic condition, geographical location, period of investigation and number of the study samples [39, 40, 41].

Regarding the age prevalence of GIT helminth parasite of cattle, the present study indicated that the prevalence in young and adult was 60.9% and 38.6% respectively. There was statistical significant association ($p < 0.05$) between age and prevalence of parasite. This higher prevalence of GIT parasitic infection in young animal is might be due to a limited previous exposure and immaturity of the immune system that resulted in higher development of the parasite [40]. This result is in line with previous reports in Gedebario Gutazer Wolane district, Ethiopia by [42] and in Tulo District, West Hararghe zone by [29]. But the findings of this study are inconsistent with reports in Ethiopia [32] and in Zimbabwe [43].

In current study there is higher prevalence of GIT helminth parasite in female (52.3%) animals than male (40.9%) animals. The sex-wise prevalence of GIT helminth infection was found statistically significant ($P < 0.05$). The current finding is in agreement with high prevalence of the parasitic egg in female than male was previously reported by [44] from Ethiopia. The justification why the parasitic eggs prevalence were higher in female than male is related the biological activity of the animals. Females' immunity is depressed during pregnancy and lactation in comparison to male. However, current finding is not in agreement with prevalence of GIN Parasite in male (45.86%) greater than female (41.4%) explained in the previous in finding of [45] and [46] due to males is mostly exposed to graze than female. The finding of this study also indicated there was a significant difference in prevalence of GIT helminth infection between different body condition score ($P < 0.05$). The prevalence was 62.4%, 45.7%, and 29% in poor, medium, and good body condition cattle respectively. This is because of the well-fed animals develop a good immunity that suppresses the fecundity of the parasites [40]. This present study also indicated the higher prevalence rate of GIT parasites in extensively managed than intensively managed animals. This might be extensively managed animals have greater exposure to parasite on the contaminated pasture.

In the current study there is significant association ($p < 0.05$) between breed of cattle and prevalence of GIT helminth parasite. The prevalence of parasitic egg was 31.6% in cross breed and 51.5% in local breed. Higher prevalence of GIT parasite in local breed is in line with the report in Ejere District, West Shoa, Ethiopia [32]. However, this report disagrees with the finding in west Arsi Zone, Oromia Regional state [28] and with finding of Ferede [44].

According to the current study result which indicated the prevalent helminths egg with respect to their genera were *Strongyle* (24.1%), *Fasciola* (18.7%), *Paraphistomum* (15.4%), *Toxocara* (12.6%), *Monezia* (4.9%), and *schistosoma* (5.5%) (Table 3). Regarding the most prevalent genera of parasite, current finding disagree with the previous reported studies [34, 47], trematodes were found to be the dominantly prevalent than *Strongyle* species and agree with the finding in East shoa zone, central Ethiopia [48]. The prevalence difference among the genera of helminths in different study area indicates that the topography and climatic condition of each study area vary from one another in supporting infectivity of different parasite and development of their intermediate hosts.

In this study six genera of GI helminth parasite were identified. From these 24.2 % (n=44) were *Strongyle spp.*, 18.7%(n=34) were *Fasciola spp.*, 15.4%(n=28) were

Paraphistomum spp., 12.6%(n=23) were *Toxocara spp.*, 4.9%(n=9) were *Monezia spp.* and 5.5%(n=10) were *Schistosoma spp.* The previous reported prevalence of *Fasciola spp.* (17%) and *monezia* (5.6%) in Ejere district [32] was agreed with current finding.

The prevalence of different type parasites was also different from one PA to another (Table 4). The finding of this study indicates there was a significant association in prevalence of GIT helminth infection between the study sites (PA) ($P < 0.05$). The prevalence of the GIT Parasite in cattle of different PA indicates that it was higher in cattle of wadessa PA (58.3%) while the least prevalence was recorded in cattle of kiso PA (33.3%). The highest prevalence of helminth parasite in wadessa PA might be due to veterinary clinic is not found at vicinity and little awareness of people for their animal and also due to sample size difference collected from each area.

Conclusion and Recommendations

The result of this study clearly demonstrated that GIT helminth parasites are highly prevalent in cattle and are important cattle health problems in the study area. The present study was based solely on the fecal examination for detection of helminth eggs. This study revealed that the GIT helminthes parasites investigated in selected peasant association of Ambo district were *Strongyle*, *Fasciola*, *Paraphistomum*, *Toxocara*, *Monezia*, and *Schistosoma*. Among the investigated GIT helminthes *Strongyle* spp egg (24.2%) was found to be the most prevalent helminth parasite, whereas *Monezia* (4.9%) was the least prevalent GIT helminthes parasite. Age, sex, Breed, body condition, and management system are considered as risk factors for GIT helminthes infection in the study area. Thus, Young cattle should receive great attention since, more susceptible and also strategic treatment and awareness creation should be adopted.

Conflict of Interests

All authors have declared that no competing interests exist.

Acknowledgements

The authors would like to thank Wollega University, School of Veterinary Medicine, administrations of the West Shoa Zone, animal owners and all individuals who render help during the study period.

Authors' Contributions

Naol Haile and Dereje Abera designed the methodology and created the survey instrument. Naol Haile has participated in the data collection, on drafting of the manuscript and has analyzed the data whereas; Dereje Abera and Naol Haile checking up for collected materials and writing the manuscript, Dereje Abera, Yilkal Kebede and Feyissa Bekuma contributed to Reviewing the manuscript to be ready for publication. All authors read and approved the final manuscript.

References

1. World Bank. Livestock Development Report, World Bank, Washington DC USA, 2001.
2. Ibrahim H, Olaloku E. Improving Cattle for Milk, Meat and Traction ILRI (International Livestock Research Institute), Manual 4, Nairobi, Kenya, 2000, 135.
3. Tegegne A, Crawford T. Draft animal power in

- Ethiopia: Draft Animal News. No. 33 Center of Tropical Veterinary Medicine University of Edinburgh, 2003.
4. Central Statistical Agency (CSA). Agricultural, Report on Livestock and Livestock Characteristics (private peasant holding). 2017; 2:37-188.
 5. Ayele S, Assegid W, Orkalemahu M, Jabbar M, Ahmed, Belachew H. Livestock marketing in Ethiopia: A review of structure, performance and development initiatives Socio economics and Policy Research. Livestock Marketing Authority the Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia. International Livestock Research Institute (ILRI), 2003.
 6. CSA. Central Statistical Agency of the Federal Democratic Republic Of Ethiopia. Agricultural Sample Survey of 2011/12 (2004 E.C). Report on Livestock and Livestock Characteristics (Private Peasant Holdings), Central Statistical Agency, Addis Ababa, Ethiopia. 2014; 2:1-28.
 7. Gashaw T, Asresie A, Haylom M. Climate change and livestock production in Ethiopia. *Academia Journal of Environmental Sciences*. 2014; 2(4):59-62.
 8. Tonamo A. A review on cattle husbandry practices in Ethiopia. *International Journal of Livestock Production*. 2015; 7(2):5-11.
 9. Fikru R, Teshale S, Reta D, Yosef K. Epidemiology of gastrointestinal parasites of ruminants in western Oromia, Ethiopia. *Int. J. Applied. Res. Vet. Med*. 2006; 4:51-57.
 10. Soulsby E. *Helminths, Arthropods and Protozoa of Domestic Animals*. 7 th edn. The English Language Book Society and Bailliere Tindall, London, 1986.
 11. Nahed Q, Lopez G, Mendoza AA, Trigo. Epidemiology of parasitosis in the Trozil sheep production system. *Small Rum. Res*. 2003; 49:199-206.
 12. Gonzalez R, Gonzalez AC. Alternatives for the control of gastrointestinal nematodes in sheep. *Conf. EEPF Matanzas, Cuba*, 2004.
 13. Waller PJ, Waller. Anthelmintic, resistance. *Vet. Parasitol*. 1997; 72:391-405.
 14. Waller PJ, Waller. International approaches to the concept of integrated control of nematodes parasites of livestock. *Int. J. Parasitology*. 1999; 29:155-164.
 15. Hayat CS, Hayat B, Ashfaq M, Muhammad K. Bottle jaw in Berberi (Teddy) goat. *Pak.Vet. J*. 1984; 4:p183.
 16. WHO. Research Priorities for Helminth Infections. Technical Report of the TDR Disease. Reference Group on Helminth Infections WHO Library Cataloguing in Publication Data, Geneva, Switzerland, 2012, p196.
 17. Barragán RM, Ruiz VA, Rodríguez JR, Márquez LJG. Grazing sheep poisoned by milkweed *Asclepias curassavica* or gastrointestinal nematosis. Case report findings *Veterinaria México*. 2009; 40(3):275-281.
 18. Teklye B. Epidemiology of endoparasites of small ruminants in sub-saharan Africa. Proceedings of Fourth National Livestock Improvement Conference. Addis Ababa, Ethiopia, 1991, 7-11.
 19. Khan SM, Ijaz MA, Shraf K, Ali MM, Khan MZU. Infection Rate and Chemotherapy of Various Helminthes in Diarrheic Sheep in and Around Lahore, Department of Clinical Medicine and Surgery, University of Veterinary and Animal Science, Lahore. *J. Anim. Plan. Sci. Pakistan*. 2009; 19:13-16.
 20. Ambo Agricultural Bureau (AAB). West showa zone, 2015. Available at: [https://en.wikipedia.org/wiki/Ambo, Ethiopia](https://en.wikipedia.org/wiki/Ambo_Ethiopia).
 21. Johnson RF. *The Stockman's Handbook* by Ensminger 2 ed, 1998, p539.
 22. De-Lahunta A, Habel R. *Teeth applied veterinary anatomy*. W.B. Saunders Company, 1986, 4-6.
 23. Nicholson M, Butter W. *A Guide to Body condition scoring of zebu cattle*. International livestock center for Africa, Addis Ababa, Ethiopia, 1986.
 24. Thrusfield M. *Veterinary epidemiology*. 3 Ed. London: Philadelphia, 2005, 27-28.
 25. Hansen J, Perry B. *The Epidemiology, Diagnosis and Control of Helminth Parasite Ruminants*. A handbook, ILRAD, Nairobi, Kenya, 1994.
 26. Soulsby E. *Helminths, Arthropods and Protozoa of Domesticated animals*, 7th Edition. The English Language Book Society and Ballière Tindall, London, 1982.
 27. Karki K. Protocol for parasite egg identification in faecal samples in parasitology unit Central Veterinary Laboratory, Tripureshwor, Nepal, 2008, 1-9.
 28. Bacha A, Haftu B. Study on Prevalence of Gastrointestinal Nematodes and Coccidian Parasites Affecting Cattle in West Arsi zone, Oromiya Regional State, Ethiopia. *Veterinary Science and Technology*. 2014; 5(5):207-213.
 29. Tulu D, Lelisa K. Study on Major Gastro-Intestinal Helminths Parasites of cattle in Tulo District, West Hararghe Zone, South-Eastern Ethiopia. *Austin J Vet Sci & Anim Husb*. 2016; 3(2):p1027.
 30. Fikru R, Teshale S, Reta D, Yosef K. Epidemiology of gastrointestinal parasites of ruminants in western Oromia, Ethiopia. *Int. J. Applied. Res. Vet. Med*. 2006; 4:51-57.
 31. Biu A, Eteng F. Some parasites causing diarrhoea amongst kid goats in Maiduguri, Nigeria. In: Proceedings of the 6th Annual Conference of Animal Science Association of Nigeria. September 17th-19th, 2001 University of Maiduguri Convocation Square, 2001, 232-233.
 32. Solomon L, Ibrahim N, Temesgen M. Prevalence of gastrointestinal helminth parasite of cattle in Ejere district, West Shoa, Oromiya Region, Ethiopia. *World Journal of Agricultural science*. 2016; 12(5):364-371.
 33. Keyyu JD, Kassuku AA, Msaliilwa PL, Monrad J, and Kyvsgaard NC. Cross-sectional Prevalence of Helminth Infections in Cattle on Traditional, small-scale and Large-scale Dairy Farms in Iringa District, Tanzania. *Vet. Res. Commun*. 2006; 30:45-55.
 34. Etsehiwot W. Study on bovine gastrointestinal helminthes in dairy cows in and around Holetta. DVM thesis, AAU, Bishoftu, Ethiopia, 2004.
 35. Hailu D, Cherenet A, Moti Y, Tadele T. Gastrointestinal helminthes infections in small-scale dairy cattle farms of Jimma town, Ethiopia. *Ethiopian Journal of Applied Science and Technology*. 2011; 2(1):31-37.
 36. Kayyu JD, Kyvsgaard NC, Kassuku AA, Willingham AL. Worm control practices and anthelmintic usage in traditional and dairy cattle in the southern highlands Tanzania. *Vet Parasitol*. 2003; 114:51-61.
 37. Manaye MU. Study on Bovine Gastrointestinal Helminthes in Asella and Surrounding Highland Area.

- DVM Thesis, FVM, AAU, Bishoftu, Ethiopia, 2002.
38. Moti Y, Derara B, Dalasa D, Senbeta, Degefu D. Bovine trypanosomosis and gastrointestinal helminthosis in settlement villages of Bedelle district, South-western Ethiopia. *Ethiopian Veterinary Journal*. 2013; 17(1):41-45.
 39. Urquhart GM, Armour J, Duncan JL, Dunn AM, Jennings FW. *Veterinary Parasitology*, 2nd ed. Blackwell Science, United Kingdom, 1996.
 40. Regassa F, Sori T, Dhuguma R, Kiros Y. Epidemiology of Gastrointestinal Parasites of Veterinary Ruminants in Western Oromiya, Ethiopia, *International Journal Applied Research and Veterinary Medicine*. 2006; 4(1):51-57.
 41. Waruiru R, Weda E, Munyua W. Seasonal occurrence of gastrointestinal helminthes of cattle in Kiambu District, Kenya. In: *Proc. of the 2nd Seminar on the DANIDA funded RHRP in Nairobi, Kenya, 1993*, 18-21.
 42. Kemal J, Terefe Y. Prevalence of gastrointestinal parasitism of cattle in Gedebano Gutazer Wolene district, Ethiopia. *Journal of Veterinary Medicine and Animal Health*. 2013; 5(12):365-370.
 43. Pfukenyi D, Mukaratirwa S, Willingham A, Monrad J. Epidemiological studies of amphistome infections in cattle in the highveld and lowveld communal grazing areas of Zimbabwe. *Onderstepoort J. Vet. Res.* 2005; 72:67-86.
 44. Ferede Y. Epidemiology of gastrointestinal Helminthiasis of crossbred calves in selected sites of bahir dar zuria and gozamen districts of amhara region, Northwest Ethiopia. *International Journal of Pharma Medicine and Biological Science*. 2013; 2(3):18-27.
 45. Berhanu T. Study on the prevalence of Gastro intestinal nematodes infection of cattle in and around Gonder, North western Ethiopia, 2011.
 46. Wondimu A. Study on prevalence of Gastro intestinal nematodes in Dairy cattle at Haramaya university dairy farm. DVM thesis, 2009.
 47. Derib Y. The Study on Endoparasite of Dairy Cattle in Bahir-Dar and its Surrounding, DVM Thesis, FVM, AAU, Debre Zeit, Ethiopia, 2005.
 48. Telila C, Birhanu AL, Diriba E, Eyob. Prevalence of gastrointestinal parasitism of cattle in East Showa Zone, Oromiya Regional State, Central Ethiopia. *Journal of Veterinary Medicine and Animal Health*. 2014; 6(2):54-62.