



Prevalence of Gastrointestinal Parasites of Small Ruminants in and around Nekemte Town, Western Ethiopia.

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Abstract:- A cross-sectional study was conducted from November 2014 to April 2015 with the objectives of determining the prevalence, identifying the species involved and assessing risk factors of gastrointestinal parasites in small ruminants in Nekemte town. In this study, Postmortem examinations were conducted to appreciate the adult parasites by collecting intestinal contents from slaughtered sheep and goats in different restaurants found in Nekemte town. Faecal samples were also collected to detect some parasites those are not morphologically appreciated easily. From a total of 384 animals (260 sheep and 124 goats) examined, overall of 261(67.9%) individual animals were harboring one or more GIT parasites. The study found that 172(70.4%) sheep and 89(63.5%) goats were found to harbor eggs of GIT parasites. The prevalence of various types of parasites like *Haemonchus* 23.7%, 9.3%; *Paramphistomum* 9%, 6.4%; *Fasciola* 8.6%, 2.8%; *Trichostrongylus* 5.7%, 12%; *Eimeria* 7%, 5.7%; *Monezia* 5%, 6.4%; *Chabertia* 4.5%, 3.6%; *Strongloides* 3.3%, 4.3%; *Ostertagia* 2%, 3.6%; *Trichuris* 1.6%, 8.6% were existed in sheep and goats, respectively. Prevalence rates of GIT parasites according to the species of were 70.4% and 63.5% sheep and goats, respectively. There was statistically significant difference in prevalence of GIT parasites between of animals ($P<0.05$, $OR=2.50$). This result shows *Ovine* species were more likely to be affected by GIT parasites more than two times as compared to that of *Caprine* species. Sex-wise prevalence of GIT parasite was also observed and it was higher in female (81.4%) as compared to the male (60.4%) with statistically significant difference ($P<0.05$, $OR=2.87$) between sex groups. Based on age of animals, prevalence of GIT parasite was higher in the young (92.7%) than in adult (59.7%). The study showed that GIT parasites are major problems of Small ruminants in the study area. Therefore, awareness creation to the farmers should be instituted in the study area on the effect of gastrointestinal parasites of small ruminants and its control and strategic deworming of small ruminants should be practiced.

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1. Introduction

The livestock sector accounts for about 30% of the agricultural GDP in Sub-Saharan Africa and nearly 60% of the value of edible livestock products is generated by cattle. Over 90% of Africans small ruminants are found in east and West Africa. Small ruminants are mainly found in arid and semi-arid areas of sub-Saharan Africa. Compared to cattle and camels, sheep and goats contribute a larger proportion of readily available meat in the diets of pastoralists (WHO, 1995).

They have been estimated to provide up to 30% of the meat and 15% of the milk supplies in sub-Saharan Africa where thrive in a wide range of ecological regions often in conditions too harsh for the beneficial rearing of cattle. Small ruminants have also been reported to survive better under drought conditions than cattle due to their low body mass and

low metabolic requirements which in turn minimize their water requirements and maintenance needed in arid and semi-arid areas Wesongah *et al.*, 2003).

Ethiopia possesses the highest numbers of livestock resources in Africa. Despite the discrepancy in the numbers, it is widely expected that Ethiopia's resource of cattle, sheep and goats ranks first and second respectively in Africa. Sheep and goats are among the major economically important livestock which plays an important role in the livelihood of resource poor farmers and provide a vast range of product and services such as meat, milk, skin, manures (Alemayehu, *et al.*, 1995).

In the diverse agro-climatic zones of Ethiopia, small ruminants are important source of income for rural communities and are one of the nation's major

sources of foreign currency from exports. In the country there are about 45 millions of sheep and goats (CSA, 2008) providing more than 30% of domestic meat consumption and make an important contribution to the national economy (Alemayehu, *et al.*, 1995). They also play a major role in the food security and social well-being of rural populations living under conditions of extreme poverty which is particularly the case for eastern parts of Ethiopia (Duguma *et al.*, 2010).

Although small ruminants represent a great resource for the nation, the productivity per animal is low. However, the country is not using from her livestock as much expected due to many production constraints circulating in animal population (Zelege, 2009; Bonnet *et al.*, 2011). Prevalent small ruminant diseases, poor management, mal nutrition particularly pronounced during the long dry season and traditional management systems practiced in these environments mainly affect productivity of small ruminant (Admosum, 1992; WHO, 1995).

Helminthiasis adversely affects ruminants, causing hematological and biochemical disturbances, anorexia, weight loss, poor reproductive performance, and even death of lambs. The animals become susceptible to other health problems due to parasitic infestation which can lead to death (Raza *et al.*, 2010). It is one of the major threats for livestock, especially causing obstacles to the development of a profitable sheep and goat industry. The prevalence of helminthes of sheep and goat results in low productivity due to stunted growth, poor weight gain and poor feed utilization (Asif *et al.*, 2008).

Gastrointestinal parasites are recognized as a major constraint to livestock production throughout the tropics and elsewhere. They cause lowered productivity, mortality (Sykes, 1994), and high economic losses affecting the income of small holder farming communities (Pedreira *et al.*, 2006). These losses was estimated at 48.4 million Ethiopian Birr per year of which 46.5, 48.8 and 4.7% was due to mortality, lowered productivity (weight loss and reproductive problems) and organ condemnation due to ovine fasciolosis in the Ethiopian highlands, respectively (Ngategize *et al.*, 1993).

Even though, Ethiopia endowed with large number of sheep and population, little attempts has been made in the past to study the health aspect of these animals. Lack of well-established data on the magnitude, distribution and predisposing factors of sheep and goat GIT parasites in the study area initiated this study. Therefore, the main objectives of the present study was designed to identify the prevalence of major gastrointestinal parasites of small ruminant in the study area; to identify the major risk

factors associated and to forward possible control measures.

2. Materials and Methods

2.1. Study Area

The study was conducted in Nekemte town from November 2014 to March 2015. Nekemte town was located at 331 kms to the west of Addis Ababa, in Oromia regional state, in East Wollega Zone, Ethiopia, and lies at latitude of 9⁰5⁰ N and longitude of 36⁰33⁰ E with elevation of 1,960 to 2,170 meters above sea level. The climatic condition of the area was 'Woyna Dega', alternates with long summer rain fall (June to September), short rain season (March to April) and winter dry season (December to February). The maximum and minimum annual rain fall and daily temperature range are between 2,200 to 1,500 mm and 15°C to 27° C respectively. This area is characterized by mixed farming system and small ruminant are the third most abundant animal species next to poultry and cattle According to the Guto – Gida district agricultural office of 2015.

2.2. Study Population

From total of 40,250 (28,000 sheep and 12,250 goats) small ruminants present in Nekemte town. Out which, the study was conducted on 384 (244 sheep and 140 goat). The different variables such as, species, sex and age groups were involved in the study as risk factors. Age categorization was as described by Gatenby into Young (< 1 year) and Adult (> 1 year).

2.3. Sample Size and Sampling Method

A sample size of 384 was calculated to collect samples from slaughtered individual sheep and goat in different restaurants found in Nekemte town and faecal samples were also collected to detect some parasites those are not morphologically appreciated easily. Out of which, sheep and goat comprised of 260 and 124 respectively. The sample size was decided based on formula described by Thrusfield (2005) with 95% confidence interval at 5% desired absolute precision and by assuming the expected prevalence of 50%.

2.4. Study Design

A cross-sectional study was followed for prevalence determination of sheep and goat GIT parasites by Post mortem findings and coproscopic examination.

2.5. Study Methodology

Postmortem examinations were conducted to isolate and identify the adult parasites by collecting gastro-intestinal contents from slaughtered sheep and goats in different restaurants found in Nekemte town and faecal samples were also collected to detect some parasites those are not morphologically appreciated easily.

2.5.1. Parasitological Protocols

GIT parasites from the abomasum, small and large intestine were isolated after slaughtering of animals. Abomasum, Small and Large intestine were ligated at omasal-abomasal, abomasal-duodenal and ileo-caecal junction to prevent worm spilling from one location to another. The abomasum was cut opened longitudinally; the content of abomasum was poured in 10L bucket.

Abomasal wall was washed thoroughly under stream of water from a tap and mucous membrane rubbed with thumb finger to remove any adhering worms to it. The content of bucket were sieved through tea strainer and washed with stream water. The tea strainer having food material and worms was inserted into another bucket and wash with stream of water. More water was added to make up total volume of 4L which was then agitated vigorously and sample was taken by wide mouthed pipette. The sample was transferred to measuring cylinder until a total volume of 40ml. Small quantity of this 40ml were placed in Petridish and examined under stereo microscope for worms count. The Small and Large intestine were processed the same as abomasum. Worm from abomasum, Large and Small Intestine were collected and counted (Charles and Baker 1988).

The collected nematodes were washed in physiological saline (0.89gm/100ml distilled water). And were fixed in 70% alcohol for 24 Hrs. The worms were placed on microscopic slide and examined under 10X magnification of compound microscope and identified using standard key and morphological characteristic described by (Soulsby 1982; Hansen *et al.*, 1994; Urquhart *et al.*, 1996).

2.5.2. Coprological examination

From each of the gastrointestinal tract fecal samples were taken directly from the Abomasum, Small and Large intestine and the collected faecal samples were processed and examined by direct faecal smear (Annex 1) (Zajac and Conboy, 2006), floatation (Annex 2) (Hansen and Perry, 1994) and sedimentation techniques (Annex 3) (Hansen and Perry, 1994), for qualitative investigation of gastrointestinal helminthic eggs and oocyst following the standard procedures. Eggs of the different parasites were identified on the basis of their morphological appearance and size (Foreit, 1999). In this study, the floatation solution used was saturated solution of sodium chloride (Annex 6) (Urquhart *et al.*, 1996).

2.6 Data Analysis

All the data entry and management was made using Microsoft Excel sheets. Data analysis was made

using Statistical Package for Social Science (SPSS) version 20. Descriptive statistics was 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 age, sex and species of animals. In all the analyses, confidence level was held at 95% and $P < 0.05$ was set for significance.

3. Results

From a total of 384 animals (244 sheep and 140 goats) examined, overall of 261 (67.9%) individual animals were harboring one or more GIT parasites. The study comprised species, sex and age of animals as a major risk factors those play a role for the existence of GIT parasites in the study area (Table 1).

3.1. Prevalence of GIT Parasites Based on Species, Sex and Age of Animals

Prevalence rates of GIT parasites according to the species of animals found to harboring one or more species of parasites were 172 (70.4%) and 89 (63.5%) sheep and goats, respectively. There was statistically significant difference in prevalence of GIT parasites between of animals ($P < 0.05$, OR=2.50). This result shows *Ovine* species were more likely to be affected by GIT parasites more than two times as compared to that of *Caprine* species. Sex-wise prevalence of GIT parasite was higher in female (81.4%) as compared to the male (60.4%) with statistically significant difference ($P < 0.05$, OR=2.87) between sexes groups. The prevalence in young was 92.7% and 59.7% in adults and prevalence in female is 81.4% and 60.6% in males (Table 1).

Six genera of gastrointestinal nematode parasites were recovered during study period. Among these *Haemonchus* was the highest 71(27.2%) prevalent followed by *Trichostrongylus* 31(11.9%), *Trichuris* 16(6.1%), *Chabertia* 16(6.1%), *Strongyloides* 14(5.3), and *Ostertagia* 10 (3.8%). *Fasciola*, *Paramphistomum*, *Emeria*, *Chabertia* species prevalence were higher significantly in sheep whereas the reverse is true for *Trichostrongylus*, *Trichuris*, *Strongyloides* and *Ostertagia* species in goats. The prevalence of some gastrointestinal parasites (*Haemonchus*, *Emeria*, and *Trichostrongylus* species) were higher in young than adult, whereas *Paramphistomum* were higher in younger than adult sheep and goats. (Table 2). The prevalence of *Paramphistomum*, *Fasciola* and *Haemonchus* was significantly higher in female sheep and goats than males whereas *Trichostrongylus* were higher in Male animals. (Table 1).

Table 1: Prevalence of Gastrointestinal parasite in Small Ruminants Based on Species, Sex and Age

Risk factors		No of examined	No of positives	Prevalence (%)	P-value	OR	95% CI	
							Lower	Upper
Species	Ovine	244	172	70.4	0.034	2.50	1.074	5.825
	Caprine	140	89	63.5				
	Total	384	261					
Sex	Male	249	151	60.6	0.000	2.87	1.726	4.723
	Female	135	110	81.4				
	Total	384	261					
Age	Young	96	89	92.7	0.000	0.12	0.052	0.261
	Adult	288	172	59.7				
	Total	384	261					
Total		384	261	67.9				

3.2. Prevalence of gastrointestinal parasites identified

Out of the total 384 sheep and goats examined during this study, 261 (68.0%) were found infected with different species of gastro-intestinal parasites. Out of a total parasites identified, 71 (27.2%), 31 (11.9%), 25 (9.5%), 21 (8 %), 16 (6.1 %), 14 (5.3%)

and 10 (3.8%) were infected with *Haemonchus*, *Trichostrongylus* and *Paramphistomum*, *Emeria* and *Fasciola*, *monezia*, *Trichuris* and *Ostertagia*, *Strongloides* and *Ostertagia* species according to their descending order of prevalence, respectively (Table 3). An individual animal was harbored with more than one species of parasites.

Table 2: Prevalence of GIT parasite based on different species of parasites and animals

Species of parasite	Species of animals	N ^o of examined	N ^o of positives (%)	P-value	OR	95% CI	
						Lower	Upper
Haemonchus	Ovine	244	58	0.230	0.337	0.684	4.870
	Caprine	140	13				
Trichostrongylus	Ovine	244	14	0.042	2.148	1.118	3.962
	Caprine	140	17				
Strongyles	Ovine	244	8	0.365	0.545	0.147	2.026
	Caprine	140	6				
Trichuris	Ovine	244	4	0.004	1.825	3.035	5.538
	Caprine	140	12				
Ostertagia	Ovine	244	5	0.231	0.409	0.095	1.765
	Caprine	140	5				
Chabertia	Ovine	244	11	0.875	0.900	0.243	3.339
	Caprine	140	5				
Fasciola	Ovine	244	21	0.257	0.136	0.573	8.047
	Caprine	140	4				
Emeria	Ovine	244	17	0.810	0.869	0.277	2.728
	Caprine	140	8				
Monezia	Ovine	244	22	0.306	0.545	0.171	1.742
	Caprine	140	9				
Paraphistomum	Ovine	244	22				
	Caprine	140	9				
Total		384	261 (67.9%)				

Table 3: Prevalence of Gastrointestinal parasite based on different species of parasites and animals

Variables	No of animals examined	No of overall Positives (%)	Species of Parasites (%)										
			Haemonchus	Trichostrongylus	Strongyloides	Trichuris	Ostertagia	Chabertia	Fasciola	Emeria	Monezia	Paraphistomum	
Animal Species													
Ovine	244	172(70.5)	58(23.8)	14 (5.7)	8 (3.3)	4 (1.6)	5 (2)	11(4.5)	21(8.6)	17 (7)	12 (5)	22 (9)	
Caprine	140	89(63.6)	13(9.3)	17(12.1)	6 (4.3)	12 (8.6)	5 (3.6)	5 (3.6)	4 (2.8)	8 (5.7)	9 (6.4)	9 (6.4)	
Age													
Adult	288	172(59.7)	53(18.4)	19 (6.7)	9 (3.1)	12 (4.2)	4 (1.4)	12 (4.7)	14 (4.9)	13 (4.5)	12 (4.7)	24 (8.4)	
Young	96	89(92.7)	18(18.7)	12(12.5)	5 (5.2)	4 (4.2)	6 (6.25)	4 (4.2)	11(11.4)	12(12.5)	9 (9.4)	7 (7.3)	
Sex													
Male	249	151(60.6)	40(16.1)	21(8.4)	8(3.2)	13(5.2)	3(1.2)	11(4.4)	11(4.4)	14(5.6)	10(4)	19(7.6)	
Female	135	110(81.4)	31(23)	10 (7.4)	6 (4.5)	3 (2.3)	7 (5.2)	5(3.7)	14(10.4)	11 (8.1)	11(8.1)	12(8.9)	
Total	384	261(68.0)	71(27.2)	31(11.9)	14 (5.3)	16 (6.1)	10 (3.8)	16 (6.1)	25 (9.5)	25(9.5)	21(8.0)	31(11.9)	

4. Discussion

The present study on the prevalence of GIT helminthes was conducted in Nekemte town and the result revealed the existence of GI helminth parasites with an overall prevalence of 67.9% (n=384) in both sheep and goats. The current prevalence of gastrointestinal agrees with reports of previous studies conducted in different parts of Ethiopia by Tesfaye (1998), Tigist (2008), Temesgen (2008) and Ragassa *et al.* (2006) who reported prevalence of 56.6%, 66.6% and 70.2%, respectively.

Comparatively the result of this study was slightly lower than the report of various findings conducted in different parts of Ethiopia by Bikila *et al.*, (2013), Melkamu (1991) in and around Kombolcha, Bayou (1992) from Gonder, Yoseph (1993) from Mendayo district of Bale, Genene (1994) from four Awrajas of Eastern Showa, Getachew (1998) from Buno province, Tefera *et al.*, (2011) in and around Bedelle who reported 84.3%, 91.4%, 90.9%, 92.2%, 93.2%, 90.2%, 93.29%, respectively. Abebe and Eseyas (2001) reported prevalence of 97.03% which is higher than the current finding. This difference in prevalence rate in different parts of the country might be attributed to the difference in agro ecology and variation in managerial practice of animals in consideration.

Post mortem examination was made and the result revealed that sheep and goats were affected by different species of parasites like *Haemonchus*, *Trichostrongylus*, *Chabertia*, *Ostertagia*, *Trichuris* and *Strongyloides* (nematodes), *Moniezia* (Cestodes), *Fasciola* and *Paramphistomum* (Trematodes) and *Emeria* (protozoa). During this study, more than one species of genera of helminthes were identified from a single host. This finding is in harmonious with reports of previous studies conducted in Ethiopia by Fikru *et al.*, (2006), Hailelul (2002) and Tefera *et al.*, (2011).

In the present study, an attempt has also been made to compare prevalence of GIT helminthes infection between sex groups. The higher rate of infection was observed in female animals (81.4%) as

compared to males (60.6%). The present study shows statistically significant differences ($p < 0.05$, $OR = 2.87$) in the prevalence of GIT parasites between sex groups. This finding agrees with the work of Dagnachew *et al.*, (2011) Yoseph (2009), Bashir *et al.*, (2012), Mihreteab and Aman (2011), Desta (2013) who reported higher prevalence of GIT helminthes in females than in males. This is due to female animals are exposed to stress than male animals in different time such as during pregnancy and lactation which favors the egg output of helminthes. This finding disagrees with report by Regassa *et al.*, (2006), Assefa and Sissay (1998), Fikru *et al.*, (2006), Getachew (1998) and Ghanem *et al.*, (2009) which showed that sex of the animals did not show significant association with the prevalence of GIT helminthes. The author's stated that this is due to equal exposure of both sexes, and they are from similar agro-ecology.

The study was also under taken to observe the rate of GIT helminthes in age groups and the result showed that young animals were highly attacked 89 (92.7%) as compared to that of adult animals 172 (59.7%). The presence of significant association ($p < 0.05$, $OR = 0.12$) between age and infestation of GIT parasites was observed in current investigation. The present finding agrees with the finding of Fikru *et al.*, (2006), Gamble and Zajak (1992), Watson *et al.* (1994), Colditz *et al.* (1996), Kanyari (1991) and Kanyari *et al.*, (2009) that young animals are more susceptible to parasite infection than older one.

Additionally, other researchers also justified the result that it could be because adult animals may acquire immunity to the parasite through frequent challenge and expel the ingested parasite before they establish infection. Young animals are susceptible due to immunological immaturity and immunological unresponsiveness. This finding not in agreement with reports from Gechi distinct of south west Ethiopia, Semi-arid part of Kenya and Gambia as GIT helminthes affect both ages equally described by Bikila *et al.*, (2013), Waruiru *et al.*, (2005) and Fritsch *et al.*, (1993), respectively.

An effort has been made to identify different species of GIT parasites in sheep and goats at postmortem examination and the result revealed these species of parasites with their prevalence rate of *Haemonchus* (27.2%), *Trichostrongylus* and *Paramphistomum* (11.9%), *Emeria* and *Fasciola* (9.5%), *monezia* (8%), *Trichuris* and *Chabertia* (6.1%), *Strongloides* (5.3%) and *Ostertagia* (3.8%) species. As the result indicated, comparatively higher prevalence rate was found in the *Haemonchus* followed by *Trichostrongylus* and *Paramphistomum* species. The lowest prevalent parasite identified in this study area was *Ostertagia* (3.8%) species.

The prevalence of *Strongloides* species in the present study was 5.3 % which in accordance with the report from Debre Zeit by Tigist (2008) and Bedelle by Tefera *et al.*, (2011) who reported the prevalence of *Strongloides* species as 8.2% and 13.04%, respectively. This finding was lower as compared to 45.22% from Eastern part of Ethiopia by Abebe and Eseyas (2001). Similarly, The prevalence of *Trichuris* species was 6.5% and this finding was agree with work of Bersissa *et al.*, (2011), Tigist (2008), Temesgen (2008) and Ragassa *et al.*, (2006) with prevalence of 7.9%, 5%, 3.3%, and 4.5%, respectively. The present finding however was lower as compared to 30.25% from Eastern part of Ethiopia Abebe and Eseyas (2001). This variation in prevalence might be attributed to difference in agro ecology and management practice of the study area.

The prevalence of coccidian parasites was 9.5 % which is in line with in and around Jimma town by Nuraddis *et al.*, (2014) with prevalence of 11.7%. The present study was lower than report from Kenya by Kanyari *et al.*, (2009) with prevalence of 35%. This variation in prevalence might be due to management practice and agro ecological variation.

The only *cestode* observed was *Moniezia* species, with prevalence of 8.1%, which is in close accordance with report from in and around Jimma town by Nuraddis *et al.*, (2014) with prevalence of 13.1%. The present finding is lower than report from eastern part of Ethiopia by Sissay *et al.*, (2008) with prevalence of 61%. The difference of the prevalence may be due to that the area was previously occupied by pastoralist and animals were very congested, which increase the transmission of the parasite.

The present finding of *Fasciola* and *Paramphistomum* species was 9 % and 11.9%, respectively. This finding was lower than report by Nuraddis *et al.*, (2014), and Kanyari *et al.*, (2009) describing the prevalence of *Paramphistomum* and *Fasciola* species as 22.4% and 19.6% and 37%, 30% respectively. The result of above finding may be correlated with availability of ample intermediate hosts for perpetuation of the parasite life cycle.

Among the different parasites identified from the faeces of sheep and goat, the prevalence of Nematodes species accounted for 41.2 % followed by *Paramphistomum* species (8.1%), *Fasciola* and *Emeria* species (6.5%), and *Monezia* species (5.5%). This finding is in accordance with a number of findings obtained by different researchers in which species of Nematodes were dominant. Fikru, *et al.*, (2006), Bikila *et al.*, (2012), Abebe and Esayas (1999) and Anene (1994) reported a high prevalence rate in Nematodes infection in Western Oromia, Gechi district of south West Ethiopia, Eastern part of Ethiopia and South Eastern Nigeria, respectively.

5. Conclusion

The present study showed that the overall prevalence of gastrointestinal parasite 67.9% (261/384) in both sheep and goats conducted in Nekemte town. Thses shows that different gastrointestinal parasites were the most prevalent parasite which affecting the wellbeing of the animals in the study area. Most predominant gastrointestinal parasites identified in the study area were *Nematodes*, *Trematodes* and *Cestodes* species. Species, age and sex of animals were considered as potential risk factors for the prevalence of the gastrointestinal parasites. The present study conducted indicated that sheep and goats of the study area harbor different gastrointestinal parasites that could be implicated in the health and production status of the animals. The prevalence of parasitosis was 70.4% and 63.5% in sheep and goats, respectively and this finding suggests that the study area and its surrounding were conducive for the successive helminthes parasite of small ruminants perpetuation and favorable for subsequent transmission to susceptible hosts. Majority of sheep and goat in the study area were largely kept under traditional extensive management system which might increase chance of exposure to gastrointestinal parasites. Therefore, Strategic deworming of small ruminants using broad spectrum antihelminthics should be practiced and further studies on economic losses and epidemiology of gastrointestinal parasite of small ruminant should be conducted on the study area.

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