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

Naol Haile, Dereje Abera and Feyisa Bekuma
College of Veterinary Medicine, Wollega University, P.O. Box 395, Nekemte, Ethiopia

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Corresponding Author:
Dereje Abera
College of Veterinary Medicine, Wollega University, P.O. Box 395, Nekemte, 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* spps 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.

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].

Gastrointestinal parasites not only affect the health but also affect the productive and reproductive performance of the cattle. Gastrointestinal worms are recognized as by for the most significant part of diseases in livestock sector[12, 13]. It has been established that parasitic infestation results inconsiderable losses in milk production in cattle[14].

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[15]. 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[16].

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[17]. There another associated risk factors influencing the prevalence and severity of GIT helminthes. These include age and sex of the animal[18].

Even though gastrointestinal helminth parasite is one of the most prevalent cattle disease 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 located115 km West of Addis Ababa and the area is found at a longitude of 370 32°-380 3°E and latitude of 80 47°-90 20°N and the altitude range is from 1900-2275 m 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 800-1000 mm and 20-29°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[19].

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 estimated based on the owner's response and by looking to the dentition pattern of the cattle[20]. They were grouped as young (1-3 years) and adults (>3 years) based on[21] classification methods. Body condition was classified into poor, medium and good according the Nicholson and Butter[22].

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:

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

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 h were stored in a refrigerator at 4°C. Fecal samples were processed and examined by flotation and sedimentation techniques as described by Hansen and Perry[23] and parasitic eggs were identified using ova identification keys provided by Soulsby[24]. The flotation solution used was a saturated solution of sodium chloride[25].

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 AND DISCUSSION

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).

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

Risk factors	No. examined	No. positive	χ^2	p-values
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%)		

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 >3 years old. In the present study, the prevalence Of GIT helminth parasite is greater in cattle <3 years old (60.9%) higher than those recorded in cattle >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 ($p<0.05$) (Table 1).

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 (Table 1).

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 (Table 1).

Comparison has also done on the prevalence of GIT helminth parasite between the local and exotic breed. The

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

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

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

Type of parasite	No. positive animal's	Percentage
Strongyle	44	24.2
Fasciola	34	18.7
Paraphistomum	28	15.4
Toxocara	23	12.6
Monezia	9	4.9
Schistosoma	10	5.5
Mixed infection	34	18.7
Total	182	100

study revealed that higher prevalence ($p<0.05$) was recorded in local (51.5%) than cross (31.6%) breed (Table 1).

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).

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 where as 34(18.7%) mixed infection (Table 3).

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 PAthan the prevalence recorded in Wadessa, Senkele and Kisose PA, except *Strongyle and Fasciola* which was found higher in wadessa PA (Table 4).

The overall prevalence GIT helminth parasite of cattle in current study is 47.4%. This finding of the study is comparablewith result of other researchers who have reported prevalence rate of49.0% in west Arsi[26], 50.8% in Western Hararghe[27] and 52.4% in Western Oromia[9], 51.3% in University of Maiduguri research farm, Nigeria[28], 54.2% in Ejere District, West Shoa[29], overall prevalence of 44.4 and 37.0% for large and small scale dairy cattle,respectively in Tanzania[30].

The finding of present study is lower than the report of Etsehiwot[31] in dairy cows in and around Holeta (82.8%), 77.6% in small dairy farms of Jimma town[32], 97.2% in Tanzania[33], 71% in Asella and its surrounding high lands[34] and 64.2% in Bedelle district[35]. 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[36, 37].

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 animalis might be due to alimited previous exposure and immaturity of theimmune system that resulted in higher development of the parasite[37]. This result is in line with previous reports in Gedebario Gutazer Wolane district, Ethiopiaby[38] and in Tulo District, West Hararghe zone by Tulu and Lelisa[27]. But the findings of this study are inconsistentwith reports in Ethiopia[29] and in Zimbabwe[39].

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 agreementwith high prevalence of the parasitic egg in female than male was previously reported by Ferede[40] from Ethiopia. The justification why the parasitic eggs prevalence were higher in female than male is related the biological activity of the animals. Female's 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 Wondimu[41] 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 GIThelminth 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[37]. 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[29]. However, this report disagrees with the finding in west Arsi Zone, Oromia Regional state[26] and with finding of Ferede[40].

According to the current study result which indicated the prevalent helminths egg with respect to their genera

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

	Types of parasite						
Selected PA	*Strongyle*	*Fasciola*	*Paraphistomum*	*Toxocara*	*Monezia*	*Schistosoma*	Mixed
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%)
Gosukora	15(8.2%)	8(4.4%)	12(6.6%)	11(6.0%)	5(2.7%)	3(1.6%)	13(7%)

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[31, 42], trematodes were found to be the dominantly prevalent than *Strongyle* species and agree with the finding in East Shoa zone, central Ethiopia[43]. 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* spps, 18.7% (n = 34) were *Fasciola* spps, 15.4% (n = 28) were *Paraphistomum* spps, 12.6% (n = 23) were *Toxocara* spps, 4.9% (n = 9) were *Monezia* spps and 5.5% (n = 10) were *Schistosoma* spps. The previous reported prevalence of *Fasciola* spps (17%) and *Monezia* (5.6%) in Ejere district[29] 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 Kisose 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

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* spps egg (24.2%) was found to be the most prevalent helminth parasite where as *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. Based on the aforementioned conclusion, the following recommendations are forwarded:

- Young cattle should receive great attention as they are most susceptible categories to helminthes infection
- Strategic treatment and awareness creation should be adopted
- Veterinary service should be expanded to the vicinity of the farmers
- Further investigations should be done in order to identify the parasite at species level and quantitative method of study should be conducted to determine the parasite burden

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