Prevalence of Gastrointestinal Nematodes of cattle and associated risk factors in and around Bambassi town, Benishangul Gumuz Region, Western Ethiopia

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Abstract

A cross sectional study was carried out from October 2016 to March 2017 to determine the prevalence and risk factors associated with gastrointestinal nematode parasitism in cattle in and around Bambassi town, Benishangul Gumuz region, western Ethiopia. A total of 384 fecal samples of cattle with different sexes and ages were collected and examined for gastrointestinal nematode eggs using floatation techniques. Three gastrointestinal nematode parasite egg-types were detected. The result of fecal examination revealed eggs of *Stronglye*-type, *Ascaris* and *Trichuris* species. Out of these, 93(24.2%) of animals were found positive for one or mixed gastrointestinal nematode infection. Cattle harboring one-parasite eggs were more common (95.7%) than those harboring two (4.3%). *Strongyle*-type eggs 43(40.9%), *Ascaris* 37(28.9%), *Trichuris* 9(29.2%), Strongyle + Ascaris 2(0.52%), Strongyle + Trichuris 1(0.26%) and Ascaris + Trichuris 1(0.26%). A significantly higher prevalence (P<0.05) of infection with gastrointestinal nematodes was recorded in calf 24 (38.6%) than in young 24(17.6%) and adult 45(25.1%) animals. Sex-wise prevalence of gastrointestinal nematodes was not significant (p>0.05).There was a statistically significant variation (P<0.05) among the different body conditions of study animals, where highest prevalence was recorded in poor 39(37.5%) followed by medium 36(21.7%) and good 18(15%) body condition. Hence, in this study the sex of the animal, body condition and age were found to be important risk factors associated with gastrointestinal nematodes in the study area. Prevalence of gastrointestinal nematodes was 48(23.30%) and 45(25.28%) in males and females, respectively. However, there was no statistically significant sex-related difference (P>0.05).

Keywords*: Bambasi, Cattle, Fecal, Floatation, Gastrointestinal, Nematode, Prevalence*.

INTRODUCTION

Gastrointestinal parasite infections are a global troubles for both small and massive scale farmers however their effect is more in sub Saharan Africa in general and Ethiopia particularly due to the availability of a huge variety of agro-ecological elements appropriate for varied hosts and parasite species (Fikru et al., 2006). They cause retarded growth, lower productivity and high economic losses. Thus have an effect on the income of small holder dairy farming communities (Muhammad et al., 2010).

Helminthiasis is considerable significance in the wide range of agro-climatic zones in sub Saharan Africa and constitutes one of the most important constraints to cattle production (ILCA, 1991*).* Even though Ethiopia has substantial resources and a home for many genetic assets, the livestock of the country are characterized by low productiveness ranges even underneath the average of Africa, leading to low per capital consumption of animal products. This is particularly due to the presence of high and extensive spread prevalence of animal illnesses (Gebru, 2003).

In Ethiopia there are 53,990,061 cattle population of which 558,551 are found in Benishangul Gumuz region. In and around Bambassi area it is estimated that 111,472 cattle populations present (Bambassi woreda Agriculture Development Office, 2016). Despite the immense progress made to control parasitosis, farmers in Ethiopia continue to incur significant losses due to insufficient availability of information in the epidemiology of the parasites. Furthermore, parasites appear to be a major factor for lowered productivity of Ethiopian livestock sector (Fikru *et al.,* 2006). To take the control measures assessment and epidemiological surveillance of nematode parasite by different diagnostic methods like fecal examination and identification of specific species

nematode is important (Ashutosh *et al.,* 2011). Emphasis must be placed on preventing the environment from becoming contaminated.

The low productivity is due to a number of factors among which are; quantitative and qualitative deficiencies in the feed resource base, diseases, poor animal performance level and insufficient knowledge on the dynamics of the different types of farming systems existing in the country (Plaizier, 1993). Prevalence of gastrointestinal helminthes has been reported ranging from 0.7 to 84.1% in domestic animals from various parts of the world. There are many associated risk factors influencing the prevalence of gastrointestinal helminthes including age, sex-and weather condition and husbandry or management practice (Muhammad *et al*., 2010*).*

Most of the studies conducted on the prevalence and distribution of gastrointestinal nematodes in the country tended to be in the central and Northern highlands and semi-arid regions of Eastern Ethiopia and little is known about the prevalence and distribution of gastrointestinal nematodes infecting cattle in and around Bambassi town. Therefore, the objectives of the present study are to assess the prevalence of gastrointestinal nematode parasite of cattle and to investigate associated risk factors.

MATERIALS AND METHODS

The Study Area Description

The study was conducted from October 2016 to March 2017 in and around Bambassi town, which is 45 km far from capital city of Benishangul Gumuz regional state. The town is located at about 636 km from the capital city Addis Ababa. Bambassi woreda is found in the north west of the country at latitude 9 and 11°N and 34 and 35°E and altitude is 1401-1544 m above sea level. The average annual rain fall of the woreda is 1350-1400 mm and annual ambient temperature varies from 25-30°C (Bambassi woreda Agriculture Development Office, 2016).

Study Population

The study animals were 384 cattle of one breed (local breed), both sex (206 male and 178 female animals) and different age groups. Body condition scoring was made according to (Morgan *et al*, 2006) and recorded as poor, medium or good. Due to the absence of written records, the age of the animal was estimated based on owners' response and also by looking the dentition pattern of the animals. Based on this study animals were classified as calf (<1 year), young (1-3 years) and adult (>3 years) (Frandson, 1992).

Study Design

Cross-sectional study design was used to determine the prevalence of gastrointestinal nematode parasite in cattle during the study period and to investigate the main factors influencing the prevalence of infection in cattle.

Sampling and Sample Size Determination

Systematic random sampling method was used to select study animals. The district was selected purposively based on the distance from Bambassi town and access to transportation. To determine the sample size an expected prevalence of 50% was taken in to consideration since there was no previous study conducted in the study area.

The desired sample size for the study was calculated using the formula given by (Thrusfield, 2005) with 95% confidential interval and 5 % absolute precision. Therefore, based on the above description the following formula was used:

$$n = \frac{1.96^2 \times Pexp\ (1-P_{exp})}{d^2} = 384$$

Where:-N = number of animals to be sampled
P = the expected prevalence of the disease
d = precision level (0.05).

Sample collection and Examination

A total of 384 fecal samples were collected during the entire period of the study, directly from the rectum of selected animals using a gloved hand and placed in air and water tight sample vials. During sampling, data with regard to age, sex, body condition, date and place of sample collection were recorded for each sampled animal. Finally, samples were transported to Assosa Regional Veterinary Laboratory for laboratory analysis.

Coprological Examination

Fecal samples were collected in polyethylene plastic labeled bags and were examined during the same day of collection by floatation technique according to the procedure of (Urquhart *et al.* 1987). Fecal samples were qualitatively examined on the day of collection or stored in a refrigerator at 4°C for processing next day. Identification of the eggs was made on the basis of their morphology using keys given by *(*Souls by, 1982*).*

Floatation

Fecal samples were examined according to the procedure of Urquhart *et al.*, 1987 as follow. About three grams from each fecal sample were triturated in pistol and mortar, then saturated salt solution was added to each of the sample tube as a floatation fluid and centrifuged at 1500rpm for two minutes only. After centrifugation top layer from each sample was taken using fine pasture pipette. About 2 or 3 drops from each sample were loaded on a microscopic slide, cover slip is applied and examined under 10X objective lenses of a microscope and results were recorded. Care was taken to keep the centrifuge speed low for shortest time in order to avoid damage or rupture of the parasitic ova present in suspension *(*Urquhart *et al.*, 1987*).*

Microscopical Examination

The prepared samples on micro slides from floatation method are examined under a microscope at the magnifications of 10x10 for nematode eggs. Three types of eggs were observed under microscopic examination with different egg morphology. The *Strongly* type-egg, *Ascaris* and *Trichuris* eggs were revealed during microscopic examination with respective morphology of ellipsoidal or oval shaped eggs, sub globular with thick shell and lemon shaped eggs were differentiated during microscopic examination. Note in case of time delay between processing the sample and reading the count, egg numbers may decline dramatically as well as the eggs change their appearance becoming crenated "ghost like''. It was therefore, advisable to prepare only a few samples at a time.

Data Analysis

Data on individual animals and parasitological examination results was entered in to MS-excel spread sheet program to create a data base and screened for errors that might have occurred during the entry. The data was analyzed using stata-11 (SPSS statistics 20) versions and Pearson chi-square test. Descriptive statistical tools such as frequency tables and percentages, were used to determine the association of prevalence of gastrointestinal nematode parasites with body condition and host factors like sex and age of the animal. Result $P<0.05$ was considered as significant differences (Clark, 1992*).*

RESULTS

The Carpological examination conducted on 384 fecal samples revealed an overall prevalence of gastrointestinal nematode infection of 24.2%. Variation had been observed on the occurrence of different types of gastrointestinal nematode parasites. Three gastrointestinal nematode genera egg-types were detected. *Strongyle*-type egg 43(40.9%), *Ascaris*37(28.9%), *Trichuris* species 9(29.2%), *strongly+Ascaris* 2(0.52%), *Strongyle +Trichuris 1*(0.26%) and *Ascaris + Trichuris* 1(0.26%) (Table5).

The prevalence of gastrostrointestinal nematodes based on animal's sex was identified. Out of 178 female animals the overall prevalence was 48(23.30%), infected with *Strongyle* 22(46.6%), *Ascaris* 19(40%), *Trichuris* 5(8.9%), *Strongyle +Ascaris* 1(2.2%) and *Strongyle +Trichuris* 1(2.2%). Whereas, among 206 male animals the overall prevalence was 45(25.2%), which were infected

with 21(45.8%) *Strongyle*, 19(39.6%) *Ascaris*, 4(10.4%) *Trichuris*, *1(2.1%) Strongyle +Ascaris* and 1(2.1%) *Ascaris +Trichuris*. There was relatively higher occurrence of Strongyles and *Ascaris* in female animals than male animals. But sex had no significant effect on the prevalence of helminthes parasite. Prevalence of gastrointestinal nematodes was 25.2% and 23.30% in males and females, respectively. However, there was no statistically significant sex-related difference (P>0.05) (Table 1).

Table 1: Prevalence of gastrointestinal nematode parasite based on sex

Sex	Total examined Animals	No of Positive Animals	Prevalence%	Chi-Square test(x^2)	p-value
Female	178 (46.4%)	48	23.30		
Male	206 (53.6%)	45	25.2	0.321	0.000
Total	**384(100.0%)**	**93**	**24.22**		

There was a statistically significant variation (P>0.05) among the different body condition animals, where highest prevalence was recorded in poor 39(37.5%) followed by medium 36(21.7%) and good 18(15.8%) body condition animals (Table 2).

Table 2: Prevalence of gastrointestinal nematode parasite based on BCS

Body condition	No of examined Animals	No of positive Animals	prevalence %	chi- square test(x2)	p-value
Poor	104 (27.1%)	39	37.5		
Medium	166 (43.2%)	36	21.7	0.220	0.000
Good	114 29.7%)	18	15.8		
Total	**384 (100.0%)**	**93**	**24.22**		

A significantly higher prevalence (P < 0.05) of infection with gastrointestinal nematodes was recorded in calves 24(34.28%) than in young 24(23.07 %) and adults 45(20.16%) (Table 3).

Table 3: Prevalence of gastrointestinal nematode parasites based on age

Risk factors	No of examine Animals	No of positive Animals	Prevalence %	Chi-square test(x)	p-value
Calf	70	24	34.28		
Young	119	24	23.07	0.411	0.089
Adult	195	45	20.16		
Total	**384**	**93**	**24.22**		

The prevalence of gastrointestinal nematodes based on PAs was identified. Out of 384 animals, 155 animals examined in Bambasi 01 were infected with *Strongyle* 22(53.6%), *Ascaris* 13(31.7%), *Trichuris* 4(9.75%), *Strongyle+Ascaris* 1(2.4%) and *Ascaris+Trichuris* 1(2.5%). In Bambasi 02 infection with *Strongyle* 13(46.4%), *Ascaris* 11(39.3%), *Trichuris* 3(10.7%) and *Strongyle +Ascaris* 1(3.6%) and in Wemba *Strongyles 8*(33.3%), *Ascaris* 13(54.2%), *Trichuris* 2(8.3%) and S*trongyle +Trichuris* 1(4.2%) were recorded. There was relatively higher occurrence of *Strongyle* and *Ascaris* in Bambasi 01 and Wemba than Bambasi 02(table 4).

Table 4: Prevalence of parasites egg in relation to Pas

Risk factor	No of Negative	No of positive	Prevalence %	x^2	p-value
Bambasi 01	114	41	44.08		
Bambasi 02	74	28	30.10	0.201	0.000
Wemba	103	24	25.80		
Total	**291(100%)**	**93**	**24.22**		

Variation had been observed on the occurrence of different types of gastrointestinal nematode parasites. Three gastrointestinal nematode genera egg-types were detected. *Strongyle-type egg* 43(46.23%), *Ascaris* 37(39.78%), *Trichuris* species 9(9.67%), *strongly+Ascaris* 2(2.15%), *Strongyle +Trichuris* 1(1.07%) and *Ascaris + Trichuris* 1(1.07%) (Table5).

Table 5: Prevalence of gastrointestinal nematode based on parasites

Risk factor	No of Positive	Prevalence %
Strongyle	43	46.23
Ascaris	37	39.78
Trichuris	9	9.67
Strongyle + Ascaris	2	2.15
Strongyle +Trichuris	1	1.07
Ascaris +Trichuris	1	1.07
Total	**93**	**24.22**

DISCUSSION

The current study revealed that from all 384 examined animals an overall prevalence of 93(24.2%) of gastrointestinal nematode infection of cattle. This result is lower than reports of 41% in East Showa Zone *(*Cheru *et al.*, 2013) and 66.25% in and around Hollota (Etsehiwot, 2004*).* The prevalence difference in different study area could have resulted from difference in management system, topography, deworming practices, sample size taken, the study season variation and climatic condition that favor the survival of infective stage of the parasite.

In this study, the gastrointestinal nematode parasites identified were *Strongyle*, *Ascaris* and *Trichuris* with the prevalence of each of the parasites 43(40.9%), 37(28.9%) and 9(29.2%) respectively. The present study was lower than with previous reports in northern Gonder with prevalence of each of the parasites 57%, 56.07% and 16.82%, according to (Tigist *et al.*, 2012). This probably be due to the alteration in the study methodology, agro ecology, season of sampling, managing system and sample size involved. In the case of *Trichuris,* the prevalence disagrees with reports in western Oromia 1.6% (Fikru *et al.*, 2006*)* and that in and around Hollota 1.2% (Etsehiwot, 2004).

Prevalence of *Strongyles* species was consistent with the record of (Coelho *et al.* 2012), (Almalaik et *al.,* 2008), (Lima *et al.,* 2006) and (Waruiru *et al.,* 2005) who reported 20.79%, 24.4% in Turkey, 24.32% in Brazil and 29% in Kenya, respectively. (Khajuria *et al.,* 2012).

However, observation of this study varied from the report of (Rajapakse *et al.,* 2008), (Mulugeta *et al.,* 2008*),* (Kumsa *et al.,* 2004), (Woldemariam 2003) and (Umur *et al.,* 2003) who recorded 59%, 48.8%, 40.2%, 83-100% and 40%, respectively in corners of the world. Comparatively higher prevalence of *Strongyltes spp* of current investigation might be due to high susceptibility and survival nature of pre-parasitic phages (Soulsby, 1982) as well as poor husbandry practices (Alim *et al*., 2012).

The present study clearly demonstrated the effect of age on the occurrence of gastrointestinal nematodes with the prevalence being highest in animals aged less than one year 24(38.6%) followed by young 24(17.6%) and adult 45(25.1%) cattle. This finding is in agreement with the earlier reports in Kenya *(*Anene *et al.,* 1994) and (Waruiru *et al*., 2000) which showed that the susceptibility and pathogenicity of nematode infections were greater in young animals than in mature animals. This also could be due to the fact that younger animals are more susceptible than adult counter parts. The prevalence recorded in relation to calves in this study is lower than the 56.25% and 69.2% reports of Pakistan cow calves (Bilal *et al.,* 2009) and in calves in Kenya *(*Maichomo *et al.,* 2004), respectively. This could be due to differences in agro-ecology of the study areas, the management systems and sample size taken.

In this study, there were no sex-related differences in the prevalence of gastrointestinal nematodes in cattle (P>0.05). The absence of association between sexes in the prevalence of gastrointestinal nematodes in cattle is in agreement with that in and around Bahir Dar (Teka, 2008*)* and in western Oromia (Fikru *et al.,* 2006) and elsewhere outside Ethiopia (William and David, 1989), 62% of yearling and 64.6% of calves in western Canada. The observed differences in prevalence between the present and previous studies may be due to variations in geographical and climatic conditions.

The study further revealed that body condition of the animal did show significant association with the prevalence of the parasites. Poor body condition animals have higher prevalence than medium and good body condition animals 39(37.5%), 36(21.7%) and 18(15.8%) respectively. In this study prevalence in body condition agrees with that of *(*Keyyu *et al*., 2003). Therefore, the change in body condition could be the possible indicator that the animals were infected by gastrointestinal nematode infections. Animal with poor body condition have low immunity for parasitic and another infectious diseases.

Generally as described above the prevalence of gastrointestinal nematodes as observed higher in animals aged less than one year as opposed to adult cattle. Hence, adult cattle act as reservoirs of infection and constant sources of infection for the more susceptible young animals.

CONCLUSION AND RECOMMENDATIONS

The overall objectives the present study was to assess the prevalence of gastrointestinal nematode parasite of cattle and to investigate associated risk factors. From overall 384 examined animals the prevalence was 93(24.22%), from strongyle 45(48.4%), Ascaris 38(40.86%) and Trichuris 10(10.75%).The prevalence of the nematode in calf 24(34.28%), young 24(23.07%) and adult 45(20.16%),prevalence of nematode in poor 39(37.5%),medium 36(21.7%) and good 18(15%) these result shows that calf and poor animals are highly affected by gastrointestinal nematodes in and around Bambassi town indicates the significance of these parasites by hampering growth, productivity and reproductive potential of the cattle in the area. The predominant nematode parasites in cattle in the study area were *Strongyle* followed by *Ascaris* and *Trichuris*. The role of cattle in the contribution of the country's economy and individual cattle owners is said to be high. In order to benefit from cattle, attention should be given and more works are expected to emerge to be productive in this sector. Based on the above conclusion, the following recommendations are forwarded:

- ✓ Strategic antihelmentics deworming should be practice regularly in the study areas

- ✓ Awareness creation like management activities hygiene of the house should be adopted as former livelihood relies on rearing of cattle production.
- ✓ Further should be done considering the breeds of animals, management and feeding systems, seasonal helminthes dynamics, and identification of parasite to species level.
- ✓ The future detailed works should be undertaken to establish the seasonal epidemiology of these parasites.

Competing interests

All authors have declared that no competing interests exist.

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Author contributions

Contributed to designing the methodology and collecting materials: Zinabu Tesfaye, Correcting of the methodology and checking up for collected materials: Zinabu Tesfaye and Dereje Abera, Contributed to writing the manuscript: Dereje Abera: Reviewing the manuscript to be ready for publication and contributes on drafting of the manuscript.

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