Study on Prevalence and its Potential Risk Factors of Gastrointestinal Parasite in Small Ruminants in Bambasi, Homosha and Kurmuk Districts of Assosa Zone, Western Ethiopia.

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Abstract: A cross sectional study was conducted from February to June 2019 to determine the prevalence and risk factors associated with small ruminants' gastrointestinal helminthes parasite in Bambasi, Homesha and Kurmuk Districts, Assosa Zone, Western part of Ethiopia. Based on coprological examination a total of 432 small ruminants' fecal samples (86 sheep and 346 goats) were collected and examined using standard parasitological procedures of direct smear, sedimentation and flotation techniques. The present study revealed that the overall prevalence of the major gastrointestinal helminthes parasite was 244 (56.5%). Out of 244 positive samples the species of parasite were found with the prevalence of strongly (29.9%), Trichuris (1.22%), Ascaris (9.83%), Paramphistomum (2.05%), Emeria (42.6%), Oesophagostomum (0.82%), Monesia (0.82%) and as mixed infection (12.7%). The study indicate that 45.4% and 59.3% of sheep and goats respectively were infected with one or more helminthes and higher prevalence was recorded in goats than sheep but there was no statistically significant difference (P>0.05) between the specious animal. Similarly Prevalence of gastrointestinal helminthes infection among Female and Male animals and between body conditions was not statistically significant (P>0.05) of the study animals. There was also statistically significant variation (P<0.05) was observed in young animal than adult animal with the prevalence of 64.8% and 52.9% respectively. Hence, the study indicated that the prevailing of various types of gastrointestinal helminthes signaling the importance of devising strategic and appropriate control measures to mitigate the parasitic adverse impacts on livestock production and health in the studied areas.
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1. Introduction

The livestock sector is a massive transformational state to meet increased demand of animal origin foods for increasing human population (Karim *et a*l., 2008). Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter supply etc. provide the needed animal proteins that contribute to the improvement of the nutritional status of the people. Livestock also plays an important role in providing export commodities, such as live animals, hides, and skins to earn foreign exchanges to the country. Ethiopia has an estimated of 53.4 million Cattle, 25.5 million sheep, 22.78 million goats, 2 million horses, 6.2 million donkeys, 0.38 million mules, about 1.1 million camels and 49.3 million poultries (CSA, 2014).

Sheep and goats are widely adapted to different climates and are found in all production system. They also have lower feed requirement as compared to cattle because of their small body size. This allows easy integration of small ruminants in to different farming system (Alemu and Merkel, 2008).

Parasitic helminthes or worms are important cause of disease in all species of animal. Although in many case they produce little serious damage to the host, these parasites are never beneficial in some case they can produce sever and even fatal disease (Jones *et al*., 1996).

In Ethiopia, 5-7 million sheep and goats die each year due to diseases including helminthes infections. More significant, however, are losses resulting from inferior weight gains, condemnation of organs and carcasses and lower milk yields. The overall economic loss to the Ethiopian meat industry due to parasitic diseases is estimated at US$ 400 million annually (MOARD, 2017).

Small ruminants are harboring a variety of gastrointestinal tract parasites, many of which are shared by both species. Among these parasites, helminthes are the most important GIT parasites that affect the growth as well as production of the animals. Gastrointestinal nematodes of Trichostrongylidae family are perhaps the most important parasites of

small ruminants worldwide, causing significant morbidity and loss of production. Helmintic infections can be treated by anthelmintics chemotherapy, however, treatment is costly and drug resistance has evolved in all major parasite species (Ijaz *et al.*, 2009).

In the varied 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 Ethiopia about 8 millions of small ruminants are slaughtered annually and providing more than 30% of domestic meat consumption. The rich potential from the small ruminant sector is not efficiently exploited; however, due to several constraints, including malnutrition, inefficient management and diseases (Abebe and Esayas, 2001).

Small ruminants are providing cash income, meat and skin to the Assosa zone society and to different hotels in Assosa, Bambasi, Homosha and Kurmuk town. The animal mostly affected by different disease due to suitability of the area to different disease epidemiology including helmintic infection and their productivity is low. Therefore, the present study was designed to assess the prevalence of gastrointestinal parasite of small ruminants in the study areas; to identify the major risk factors associated and to forward possible control measures.

2. Materials and Methods

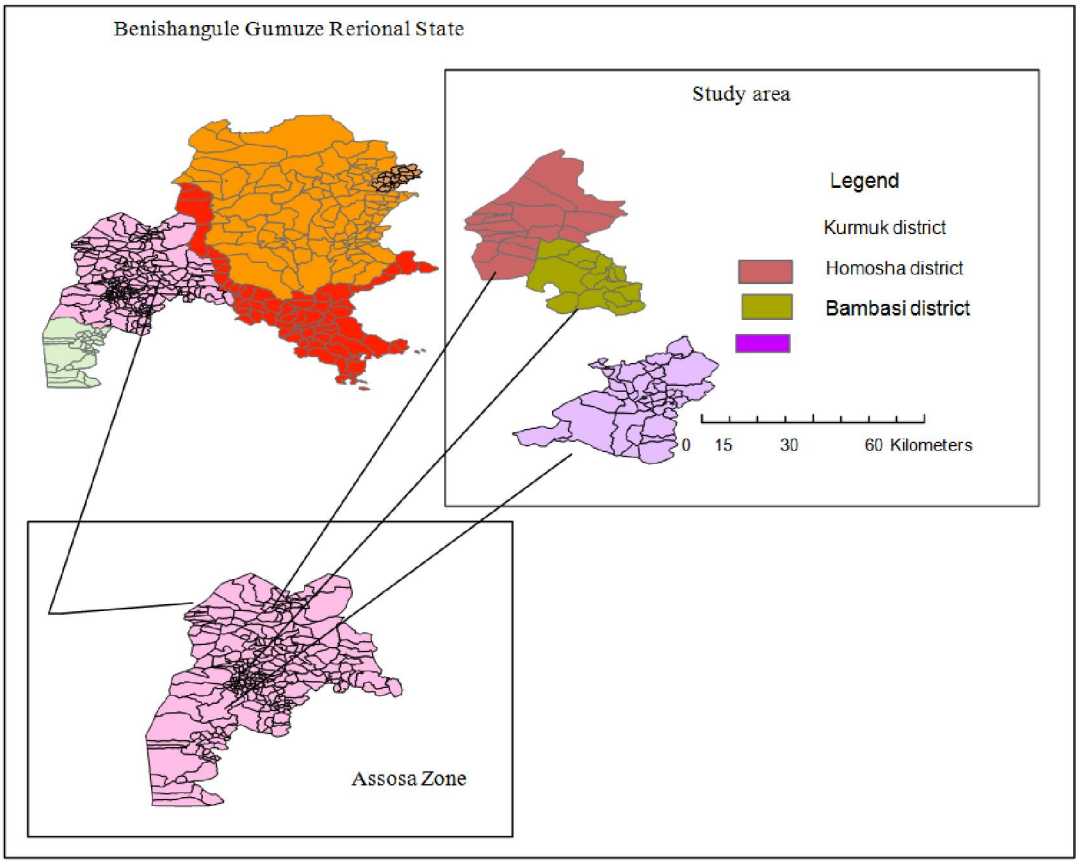

Figure 1: Map of the study area (Source: Tesfaye and Inger, 2007)

2.1 Study Area

The study was conducted from February to June 2019 to determine the prevalence of gastrointestinal parasites of small ruminants in three selected districts of Assosa zone (Bambassi, Homosha, and Kurmuk), Benishangul Gumuz Regional State, Western Ethiopia.

Bambassi district is found in Benishangul Gumuz Regional State, in Assosa zone. The district is 45 km far from the capital city of Benishangul Gumuz Regional State, Asossa town. It has common boundaries with Maokomo special district, in the south, Assosa in the south west, and Oromia region in the North West. The district is divided in to 42 peasant associations with total human Populations of 62,693(CSA, 2014). The district has minimum and maximum altitude of 1350m and 1400 m above sea level and the average annual rain fall is 1400mm with average temperature of 27^0c and the total land size of the area is about 2210 km^2. The total Livestock population of the district is estimated as 38964 Cattle,

3739 Sheep, 11990 Goat, 4467 Equines and 41438 Poultry (BGRBOA, 2018).

Homesha district is located in Assosa zone and its about 37km far from the capital city of Benishangul Gumuz Regional State, Asossa town which is found in North West part of the region at $10^0$19'04"N and $034^0$38'17.9''E with altitude of 1346m above sea level. The District is divided in to 15 peasant associations with total human populations of 21,744(CSA, 2014). The average annual rain fall is 700-1700 mm with average temperature of 29^0c and the total land size of the area is about 21045 km^2. The total livestock population of the district is estimated as Cattle 447, Sheep 548 Goat 11536 Equines 841 and Poultry 15651 (BGRBOA, 2018).

Kurmuk district is located in Asossa Zone and it is 96km far from the capital city of Assosa zone, Assosa town which is found in western part of the region at $10^0$34'19.8''N and $034^0$21'30.3''E with altitude of 708m above sea level. The district is divided in to 16 peasant associations with total human Populations of 16,734(CSA, 2014). The average annual rain fall is 700-1000 mm with average temperature of 32^0c and the total land size of the area is about 1434 km^2. The total Livestock population of the district is estimated as Cattle 127, Sheep 509, Goat 16,925, Equines 424 and, 18925 Poultry (BGRBOA, 2018).

2.2 Study Population

The study animals were small ruminants in Assosa zone at three selected districts which are managed under extensive management system. All the sheep and goats that the sample collected was indigenous breeds and the animal was classified as young (≤1 year) and adult (>1 year) according to (Fikru *et al*., 2006) and age was estimated based own owners knowledge and pattern of incisor eruption (MOARD, 2017). The body condition can be classified as poor, medium and good according to (Asmare *et al*., 2012) and body condition Scoring is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region (Thompson and Meyer, 1994).

2.3 Sample Size and Sampling Method

The sample size required for this study was determined based on sample determination in random sampling with expected prevalence of major gastro intestinal helminthes parasite of small ruminant in the study area is 50% which no previous know prevalence and at 5% desire absolute precision and 95% confidence level according to (Thrusfield, 2005). Therefore, the sample size of 384 collected from the study district. This number was inflated to 431 samples for the effect of randomness and representativeness. The sample size was obtained by using formula for sample size determination as given below as follow.

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

Where:

n = require sample size

p_{exp}= expected prevalence

d = desire absolute precision

1.96^2 = z-value for the 95% confidence level

When this number substituted in the above formula the required sample size was 384.

2.4 Study Design

The study design was cross-sectional which carried out to determine the prevalence of major gastrointestinal helminthes parasites of small ruminants and to assess their prevalence based on coprological examination.

2.5 Sample Collection

The sample was collected from 432 small ruminants (86 sheep and 346 goats) directly from the rectum which is placed on Ice box by using glove. During sample collection, date, sex, species of animal, age, and body condition of the animal were properly recoded.

2.6. Coprological Examination

After collecting the sample was examined by direct smear, flotation and sedimentation technique at each district Veterinary clinic with a standard parasitological procedure described by (Hansen and Perry, 1994). Eggs of the different helminthes were identified on the basis of morphological appearance and size with the help of keys (Urquhart *et al*., 1996).

2.6.1. Direct Fecal Smear

A small amount of faces was emulsified on slide with a few drop of saline water and Heavy debris was put aside on one side of the slide. The emulsified material was spreaded thinly over the slide and Covered with cover slip and examined under low objectives of microscope.

2.6.2. Floatation

Fecal samples were examined according to the procedure of (Urquhart *et al*. 1996) as follow. About three grams of fecal samples were taken from each fecal sample and triturated in pistol mortar; floatation fluid of saturated salt solution was added, and placed to each of the sample tube and centrifuged at 1500 rpm for two minutes. After centrifugation the samples were removed, top layer from each sample was taken using fine pasture pipette. 2 – 3 drops from each sample were put on microscope slide and covered with slid cover and examined under ten times objective lenses of the microscope and results were recorded. Care was taken to keep the centrifuge speed low for shortest time in order to avoid damage or ruptured of the parasitic ova present in suspension (Urquhart *et al*., 1996).

2.6.3. Sedimentation Technique

About 3 gm of faces was measured and transferred into container and 50 ml of tap water was poured in to the container. Faces and flotation fluid was mixed thoroughly with a string device resulting fecal suspension was filtered through a tea strainer to another container. The filtered material was poured into a test tube and allowed to stand for 5 minutes. The supernatant was discarded very carefully, the Sediment was re suspended in 5 ml of water and allowed to stand for 5 minutes. The Supernatant was discarded very carefully and the Sediment was stained by adding one drop of methylene blue and transferred to a micro slide and covered with a cover slip for microscopic examination (Urquhart *et al*., 1996).

2.7. Data Analysis

Data entry and management was made using Microsoft Excel Spread Sheets. Data analysis was done using STATA 12 statistical tool. Descriptive statistics was used to determine the prevalence of the parasites and Chi-square test was used to assess the association of the potential risk factors with the prevalence of the parasites. For statistical analysis a confidence level of 95% and P-values less than 5% ($p<0.05$) was considered as significant.

3. Results

Out of the total 432 (86 sheep and 346 goats) small ruminants examined over the study period, 244 (56.5%) were found to harbor one or more parasite species. Out of the total 86 (45.4%) of the sheep and 346 (59.3%) of the goat studied were found to harbor one or more parasite species. There was no significant difference between the two species (Table 3). The Infection rate of GIT helminthes parasite in relation to sex, 56.8% in female and 54.9% in male were observed. Even if higher prevalence was recorded in female (56.8%) than in male (54.9%) there was no statistically significant difference (Table 3).

Table 1. Prevalence of Major Gastrointestinal Helminthes Parasite in the Three District of Assosa zone

s.n	Study area	Number examined	Number of positive (%)	Number of Negative (%)	χ^2	(p-value)
1	Bambasi	209	134(64.11%)	75(35.89%)		
2	Homesha	90	48(53.4%)	42(46.6%)	0.0006	0.7035
3	Kurmuk	133	62(46.6%)	71(53.4%)		
Total		432	244(56.5%)	188(43.5%)		

The Infection rate prevalence of gastrointestinal helminthes parasite in different age groups were 64.8% in young and 52.9% in adult sheep and goat and there was statically significant between age (Table 3). High Prevalence was observed in poor body condition (67%) as compared to medium (53.8%) and good (38.4%) body condition but there was no statically significant difference between body conditions (Table 3). The prevalence of gastrointestinal helminthes parasite between study district were assessed and 64.1% of the higher in Bambassi and 47.4% the low prevalence in Kurmuk district was recorded but there was no significant difference between the study area (Table 1).

The infection rate of gastrointestinal helminthes parasite between study kebeles were 79.7% of the higher in Shobera and 35% the low infection rate in Bambasi town 01 & 02 kebele and there was no significant difference between the study areas (Table 2). The present study indicate the prevalence of gastrointestinal parasites of the of small ruminant in the study area based on genus level was 29.9% Strongyl, 9.83% Ascaris, 1.22% Trichuris, 2.05% Paramphistomum, 42.6% Emeria, 0.82% Oesophagostomum, 0.82% Monesia and 12.7% mixed infection (Table 4).

Table 2. Infection Rate of Major Gastrointestinal Helminthes Parasite in Small Ruminants at Different Selected Village of Study Area.

s.n	**Site (PA)**	**Number of animal examined**	**Number of Positive in (%)**	χ^2	**(p-value)**
1	Bambasi 01/02	60	21(35%)		
2	Shobera	79	63(79.7%)		
3	Jematsa	70	50(71.4%)		
4	Tumet	35	20(57.14%)		
5	Dunga harumela	33	16(48.48%)	0.0058	0.2354
6	Gumu	22	12(54.55%)		
7	Abadi	53	21(39.6%)		
8	Famatsere	60	27(45%)		
9	Dulshitalo	20	14(70%)		
	Total	432	244(56.5%)		

Table 3: Prevalence of Major Gastrointestinal Helminthes Parasite in Small Ruminants Based on Species, Sex, Age and Body condition.

Risk factor		No examined	No positive	Prevalence (%)	X^2	P value
Species	Sheep	86	39	45.4	0.0008	0.6675
	Goat	346	205	59.3		
		432	**244**	**56.5**		
Sex	Male	82	45	54.9	0.0000	0.94000
	Female	350	199	56.8		
		432	**244**	**56.5**		
Age	Young	128	83	64.8	0.0172	0.0406
	Adult	304	161	52.9		
		432	**244**	**56.5**		
Body condition	Poor	188	126	67	0.0011	0.6026
	Medium	145	78	53.8		
	Good	99	38	38.4		
	Total	**432**	**244**	**56.5**		

Table 4: Prevalence of the Gastrointestinal Parasite of Small Ruminants Based on Genus Level

Species	No examined	No of positive	Strongyl %	Trichuris %	Paramphistomum %	Oesophagostomum%	Monesia %	Ascaris %	Emeria %	Mixed %
Sheep	86	39	**10 (25.6)**	**0(0)**	**0(0)**	**0(0)**	**0(0)**	**3 (7.7)**	**24 (61.5)**	**2 (5.12)**
Goat	346	205	**63 (30.73)**	**3 (1.46)**	**5 (2.44)**	**2 (0.98)**	**2 (0.98)**	**21 (10.2)**	**80 (39)**	**29 (14.1)**
Total	432	244	**73 (29.9)**	**3 (1.22)**	**5 (2.05)**	**2 (0.82)**	**2 (0.82)**	**24 (9.8)**	**104 (42.6)**	**31 (12.7)**

4. Discussions

The present study revealed that the overall prevalence of gastrointestinal helminthes parasites was 56.5% in the small ruminants examined. This finding is comparable with the previous findings of (Tigist, 2008) and (Regassa *et al*., 2006) who reported an overall prevalence of 66.6%,70.2% and 70.2%, respectively in different parts of Ethiopia and lower than the results of other studies in sheep and goat carried out in different part of Ethiopia (Berisa *et al*., 2011) 70.2% in Central Oromia, (Nuraddis *et al*., 2014) 87.2% around Jima town, Western Ethiopia, (Bikila *et at*., 2013) 87.3% in Genchi District, Southwest Ethiopia and elsewhere in the world (Pant *et al*., 2009) 96.0% in Tarai region of Uttarakhand, and (Kuchai *et al*., 2011) 69.7% in Ladakh, India.

The prevalence of the current study is lower than most of the previous studies. This might be due to the existence of a direct relationship between prevalence and rainfall, humidity and temperature. That means the presence of sufficient rainfall and moisture during the study period was favored the survival of infective larvae in pasture and higher probability of uptake of the infective larvae leading to higher prevalence rate. In addition different parasite require different agro climate for multiplication and survival of the infective stage of the parasite and infect the animal and this area might be do not allow this things for the parasite. The present finding however, was higher when compared to 30.25% from Eastern part of Ethiopia (Abebe and Esayas, 2001). This variation in prevalence might be attributed to the difference in agro ecology and climatic condition and partly due to the difference in the management practice of the study areas.

The present study showed that 45.4% and 59.3 % of sheep and goats respectively are infected with one or more helminthes and higher prevalence was observed in goats than sheep which is disagreed with other studies that reported higher prevalence in sheep than goats 96.25% and 86% in Bokova, a rural area of Buea Sub Division, Cameroon, in sheep and goats respectively. The prevalence of helminthes parasites was higher in goats in the present study. This is due to the difference in agro ecology and climatic condition and partly due to the difference in the management practice of the study areas and more samples were collected from goats.

Female animals were found with higher prevalence of helminthes infection rate than male animals and there was statically not significant ($p>0.05$) between them in the present study. The prevalence of gastrointestinal helminthes parasite in this study in female and male animal was 56.8% and 54.9% respectively. This finding agreed with other studies which are reported higher prevalence in female than male (Shimelis *et al*., 2011) 48.80% and 42.42% in North Gonder zone, Northwest Ethiopia in female and male animal respectively. The higher prevalence

in female animals observed in the study due to male animals are slaughter early and more samples were collected from the female, and female animals immunity may be lowered than male animal during lactation and pregnancy.

The lower prevalence was observed in adult animal than young animal in this study and there was statically significant ($p<0.05$) between age group. The prevalence of gastrointestinal helminthes parasite in this study young and adult animal was 64.8% and 52.9% respectively. This finding is similar to other finding that reported higher prevalence in young animal than adult animal (Diriba and Birhanu, 2013) 79.6% and 62.4% in and around Asella, South Eastern Ethiopia. This might be due to young animals are susceptible to different diseases including parasitic infection due to low development of immune response to the infection, lack of adaptation and resistance before they exposure to infection where as adult animals are resistant and adapted to infection due rapid response of immunity to the infection due to previous exposure of infection which remove the parasite before it attach to its predilection site.

The study showed that higher prevalence of helmintic infection was observed in poor body condition animals as compared to medium and good body condition animals and there was not statically significant ($P>0.5$) between body condition. The prevalence of helminthes parasite in these studies in relation to body conditions 67%, 53.8% and 38.4% in poor, medium and good body condition respectively. This finding is similar to other studies (Welemehret *et al*., 2012) in and Around Mekelle Town, Northern Ethiopia, The higher prevalence in poor body conditions might be caused by due to malnutrition, other concurrent diseases or current parasitic infection that lead to lower the immune status of the animal to different diseases or infective stage of the parasites. The major helminthes parasite that has been observed in this study were Strongly, Paramphistomum, Trichuris, Oesophagostomum, monesia, Ascaris and Emeria species of helminthes parasites of small ruminant in this area.

The prevalence of the parasite was 29.9% strongly, 1.22% Trichuris, 9.83% Ascaris, 2.05% Paramphistomum, 42.6% Emeria,0.82% oesophagostomum, 0.82% monesia species of helminthes parasite in small ruminants. This finding disagreed with (Lone *et al*., 2012) in Gander BAL, Kashmir. The highest prevalence was seen in emeria type of parasite than other helminthes parasites this might be due to the area is suitable to the survival of the infective stage of the parasite which means there was optimal moisture and temperature that helps to the egg of parasite to hatch and develop to the infective stage outside the definitive host. The development of larvae in the environment depends upon warm temperature and adequate moisture. In most tropical and sub-tropical countries, temperatures are permanently favorable for larval development in the environment.

5. Conclusion

The study revealed an overall prevalence of 244 (56.5%) gastrointestinal parasite in small ruminant population of the study area. The predominantly gastrointestinal parasite identified were *Strongly, Ascaris, Trichuris, Paramphistomum, Emeria, Oesophagostomum, Monesia*. Due to the mixed nature of infection of host by these parasite their role in reducing the productivity and the general health status cannot be under estimated. These indicate that Bambassi, Homosha and Kurmuk district and their surrounding rural areas are favorable for the successive perpetuation of the mentioned parasites and for their subsequent transmission to susceptible host. Therefore, strategic antihelmentics deworming of the animals should be practiced by the local farmers; farmers have to be educated about the impact of parasitism on the health and productivity of the animal. Further epidemiological should be conducted in different agro-ecological site in the region.

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