Study on Prevalence and Its Potential Risk Factors of GIT Parasite in Small Ruminants in Metekel Zone, Dangur, Dibate and Mandura Districts

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Abstract: A cross sectional study was conducted to determine the prevalence and risk factors associated with small ruminants GIT helminthes parasites in Mandura, Dangur and Debate Woreda, Metekel Zone, Northwest of Ethiopia on October 2018 based on coprological examination. A total of 431 small ruminants' fecal samples (135 sheep and 296 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 GIT helminthes parasite was 292 (67.7%). Out of 292 positive samples the species of parasite were found strongly (49.1%), Trichuris (2.1%), Ascaris (2.5%), Paramphistomum (3.2%), Emeria (6.1%) and as mixed infection (4.6%). The study showed that 62.2 % and 70.3% of sheep and goats respectively were infected with one or more helminthes and higher prevalence was observed in goats than sheep and has no significant difference (P>0.05) between them. Female animals were found with higher prevalence of helminthes infection rate than male animals with a prevalence of 71.1% and 56.5% respectively and has no significant difference (P>0.05) between sex. Higher prevalence was observed in young animal than adult animal in this study and the prevalence was 76.6% and 64.8% respectively. There was statically significant difference (P<0.05) between age group. 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 their prevalence were 73.1%, 67.9% and 52.6% respectively. There was highly statically significant difference (P<0.05) between body condition of the animal. In conclusion the animal was affected by different helminthes parasite infections which cause loss of production, reducing growth rate and death of small ruminants. So the animal owner should be deworming their small ruminants by anthelmintics based on order of the Veterinarian to avoid drug resistance as recommendation.

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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, 2011).

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 (GIT) 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 Metekel zone society and to different hotels in Gilgel, Manbuke and Debate 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. So Lack of well-established data in the selected district to initiate this study about the prevalence of major GIT helminthes parasites of small ruminants

Therefore the objectives of this study in the study area were:

- To determine the prevalence of gastrointestinal parasite of small ruminants in the study area.
- To assess the major risk factors associated with GIT parasites of small ruminants.

2. Materials And Methods

2.1 Study Area

The study was conducted on October 2018 to estimate the prevalence of gastrointestinal parasites of small ruminants in at three selected districts in Metekel zone of Benishangul Gumuz Regional State, namely Dangur, Mandura and Debate. Dangur district is found in Benishangul Gumuz Regional State, in Metekel zone. It is about 369 km from the capital city of Benishangul Gumuz Regional State, Asossa town. It has common boundaries with pawe, in the North West, Madura in the south west, and Guba in the west and Amhara in the north east. The district is divided in to 29 peasant associations with total human Populations of 63,160. The district has minimum and maximum altitude of 910m and 3,300 m above sea level. The average annual rain fall is 1800mm with average temperature of 36^0c and the total land size of the area is about 838,700 hector. The total Livestock population of the district is estimated as Cattle 36,624, Sheep, 2,656, Goat, 33,892, Equines 5574 and 81,495 Poultry (DDOLFD, 2017).

Mandura district is located in Metekel zone. It is about 387km far from the capital city of Benishangul Gumuz Regional State, Asossa town which is found in North West part of the region at $11^0$03'24.4"N and $036^0$19'42.8''E with a minimum and maximum altitude of 1050m and 1400m above sea level. The District is divided in to 20 peasant associations with total human populations of 46, 198. The average annual rain fall is 1000-1600 mm with average temperature of 28^0c and the total land size of the area is about 1100 km2. The total livestock population of the district is estimated as Cattle 67,053, Sheep 14,100, Goat 36108, Equines 4,655 and Poultry 84,317 (MDOLFD, 2017).

Debate district is located at 54km far from the capital city of Metekel zone, Gelgel beles town which is found in south part of the town at $10^0$46'00.3''N and $036^0$15'36.5''E with altitude of 1505m above sea level. The average annual rain fall is 1000-1600 mm with average temperature of 28^0c and the total land size of the area is about 368,289hr. The total Livestock population of the district is estimated as Cattle 116,687, Sheep 15,555, Goat 42,183, Equines 8439 and, 58,801 Poultry (DDOLFD, 2017).

GIT parasites study areas in dangur, Madura and debate "districts" of B/G/R/State.

2.2 Study Population

The study animals were small ruminants in Metekel 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, 2009) and 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).

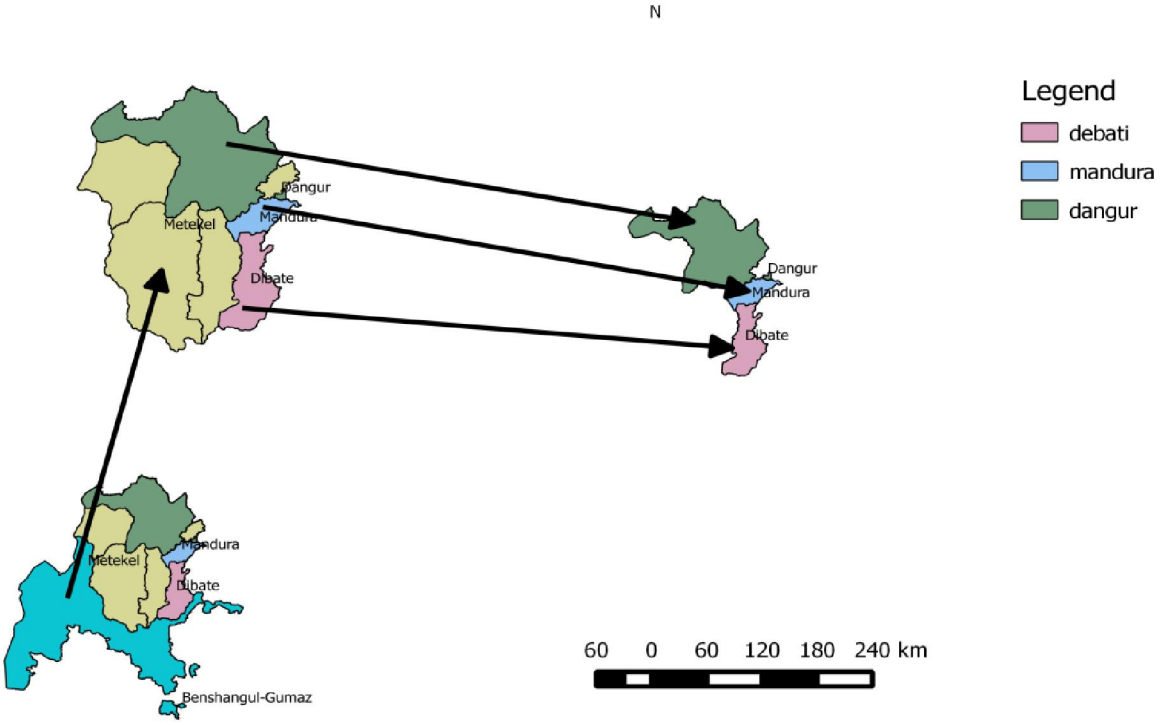

Figure 1: Map of the study area

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 (Thru field, 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 GIT helminthes parasites of small ruminants and to assess their prevalence based on coprological examination.

2.5 Sample collection and coprological examination

The sample was collected from 431 small ruminants (135 sheep and 296 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.

2.5.1. Coprological examination

After collecting the sample was examined by direct smear (Annex 1), flotation (Annex 2) and sedimentation technique (Annex 3) 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 Data entry and 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

3.1 The prevalence of GIT helminthes parasite between study district

Table 1. Prevalence of major GIT helminthes parasite in the three district of Metekel zone

s.n	Study area	Number examined	Number of positive (%)	Number of Negative (%)	χ^2	(p-value)
1	Mandura	178	128(71.9%)	50(28.08%)		
2	Dangur	143	88(61.5%)	55(38.5%)		
3	Debate	110	76(69.09%)	34(30.9%)	0.0081	0.061
Total		431	292(67.7%)	139(32.2%)		

Table 2. Infection rate of major GIT helminthes parasite in small ruminants at different selected kebele (PA) of study area

s.n	**Site (PA)**	**Number of animal examined**	**Number of Positive in (%)**	χ^2	**(p-value)**
1	Edida	43	35(81.4%)		
2	Mandura 01 kebele	42	23(54.7%)		
3	Duhanzabaguna	54	32(59.3%)		
4	Duhagubash	39	38(97.4%)		
5	Dangur 01 kebele	51	25(49%)		
6	Delsambi	55	38(69.09%)		
7	Azartkiteli	37	25(67.5%)		
8	Yamp	40	25(62.5%)	0.0027	0.283
9	Debate 01 kebele	39	28(71.7%)		
10	Parzite	31	23(74%)		
	Total	431	292(67.7%)		

Table 3: Infection rate of major GIT helminthes parasite in small ruminants based on Species, Sex, Age and Body condition

Risk factor		**No examined**	**No positive**	**Prevalence (%)**	$\mathbf{X^2}$	**P value**
Species	Sheep	135	84	62.2		
	Goat	296	208	70.3	0.0020	0.357
	431	**292**	**67.7**			
Sex	Male	99	56	56.5		
	Female	332	236	71.1	0.0073	0.076
	431	**292**	**67.7**			
Age	Young	107	82	76.6		
	Adult	324	210	64.8	0.0200	0.003
	431	**292**	**67.7**			
Body condition	Poor	180	138	76.6		
	Medium	196	126	64.2	0.0231	0.002
	Good	55	28	50.9		
	Total	**431**	**292**	**67.7**		

Table 4: Infection rate of the parasite of small ruminants based on genus level

Species	**No examined**	**No of positive**	**Strongly %**	**Trichuris %**	**Paramphistomum %**	**Ascaris %**	**Emeria %**	**Mixed %**
Sheep	135	84	59(43.7)	5(3.7)	9(6.6)	8(5.9)	2(1.5)	1(0.7)
Goat	296	208	153(51.6)	8(2.7)	2(0.7)	11(3.7)	12(4.0)	8(2.7)
Total	431	292	212(49.1)	13(3.0)	11(2.5)	19(4.4)	14(3.2)	9(2.0)

The prevalence of GIT helminthes parasite between study district were 71.9% of the higher in Mandura and 61.5% the low prevalence in Debate district and there was no significant difference between the study area (Table 1).

3.2 Infection rate of major GIT helminthes parasite in small ruminants at different selected kebele (PA) of study area

The infection rate of GIT helminthes parasite between study kebeles were 97.4% of the higher in Duhagubash and 49% the low infection rate in Dangur 01 kebele and there was no significant difference between the study areas (Table 2).

3.3 Infection rate of major GIT helminthes parasite in small ruminants based on Species, Sex, Age and Body condition

Out of the total 431 (135 sheep and 296 goats) small ruminants examined over the study period, 292 (67.7%) were found to harbor one or more parasite species. Out of the total of 135 (62.2%) of the sheep and 296 (70.3%) 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, 71.1% in female and 56.5% in male were observed. Higher prevalence was recorded in female (71.1%) than in male (56.5%) and there was no significant difference between sexes (Table 3).

The Infection rate prevalence of GIT helminthes parasite in different age groups were76.6% in young and 64.8% in adult sheep and goat and there was statically significant between age (Table 3). High Infection rate prevalence was observed in poor body condition (76.6%) as compared to medium (64.2%) and good (50.9%) body condition. There was also statically significant between body conditions (Table 3).

3.4 Infection rate of the parasite of small ruminants based on genus level

The present identified GIT parasites prevalence of the of small ruminant in the study area based on genus level was 49.18% Strangle, 2.08% Trichuris, 2.55% Ascaris, 3.24% Paramphistomum, 6.03% Emeria and 4.64% mixed infection (Table 4).

4. Discussions

The present study revealed that the overall prevalence of GIT helminthes parasites was 67.7% 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 Gechi 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 62.2% and 70.3 % 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 [26] 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 GIT helminthes parasite in this study in female and male animal was 71.1% and 56.5% 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 GIT helminthes parasite in this study young and adult animal was 76.6% and 64.8% respectively. This study is similar to other finding that reported higher prevalence in young animal than adult animal such as, (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 highly statically significant ($P<0.02$) between body condition. The prevalence of helminthes parasite in these studs in relation to body conditions 76.6%, 64.2% and 50.9% in poor, medium and good body condition. This finding is similar to other studies which is (Welemehret *et al*., 20-12) 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, Ascaris and Emeria species of helminthes parasites of small ruminant in this area.

The prevalence of the parasite was 49.18 % strongly, 2.08% Trichuris, 2.55% Ascaris, 3.24% Paramphistomum, 6.03% Emeria, species of helminthes parasite in small ruminants. This finding agreed with (Lone *et al*., 2012) in Gander BAL, Kashmir. The highest prevalence was seen in Strongly 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 And Recomendations

The study area has large number of small ruminant that are managed under extensive management system in mixed farming system that serve as source of food and cash income for rural society of the area. But the animal was affected by different helminthes parasites such as Strongly, Trichuris, Paramphistomum, Ascaris and Emeria specie of parasite and sometimes by mixed parasitic infection which causes loss of production, reducing growth rate and death of small ruminants due to lack of proper management like regular deworming, improper feeding, animals are keeping on communal grazing on the field and lack of adequate animal health and production extension workers that give to advise to the animal owner.

Based on the above conclusion the following recommendations are forwarded:

- The animal owner should be deworming their small ruminants by different anthelmintics based on order of the Veterinarian to avoid drug resistance.
- Once grazing starts, all small ruminants grazing the same pasture should be dewormed every three weeks for a minimum of three to four times beginning three weeks after the start of spring grazing.
- The government should be designing region wide control of GIT parasite infection in small ruminants.
- Further characterization of GIT parasites circulating in the area and appropriate control strategies (periodic and strategic deworming) should be under taken to combat small ruminants' GIT parasites in the study area.
- Education of the small holder communities regarding correct ways to improve animal management systems, the importance of parasites and major signs of worm infections in their animals.
- The government should be available different group of drugs for the treatment of GIT parasite. The most commonly used group of drugs for the treatment of gastro-intestinal parasitic infections are: Benzimidazoles, Imidazothiazoles and Macro cyclic Lactones.

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7. Annexes

Annex 1: Fecal Direct smear Procedure

1. A small amount of faces was emulsified on slide with a few drop of saline water.

2. Heavy debris was put aside on one side of the slide.
3. The emulsified material was spreaded thinly over the slide.
4. Covered with cover slip and examined under low objectives of microscope.

Annex 2: Procedure of Flotation technique

1. 3 gm faces was taken and crashed.
2. 50 ml floatation fluid was poured into container 1.
3. Faces and flotation fluid was mixed thoroughly with a stirring device.
4. Resulting fecal suspension was poured through a tea strainer to container 2.
5. Fecal suspension was transferred into a test tube from container 2.
6. The test tube was placed in a test tube rack.
7. Cover slip was carefully placed on top of the test tube.
8. The test tube was allowed to stand for 20 minutes.
9. The cover slip was carefully lift off from the tube, together with the drop of fluid adhering to it, and immediately placed on the microscope slide for demonstration under 10x objective lenses.

Annex 3: Sedimentation technique

1. 3 gm of faces was measured and transferred into container 1.
2. 50 ml of tap water was poured into container 1.
3. Faces and flotation fluid was mixed thoroughly with a string device.
4. Resulting fecal suspension was filtered through a tea strainer to container 2.
5. The filtered material was poured into a test tube.
6. The test tube was allowed to stand for 5 minutes.
7. The supernatant was discarded very carefully.
8. Sediment was re-suspended in 5 ml of water and allowed to stand for 5 minutes.
9. Supernatant was discarded very carefully.
10. Sediment was stained by adding one drop of methylene blue.
11. Sediment was transferred to a micro slide and covered with a cover slip for demonstration.

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