PREVALENCE OF GASTROINTESTINAL PARASITISM OF BOVINES ATTENDING VETERINARY TEACHING HOSPITAL, MEKELLE

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Abstract; Gastrointestinal tract parasites are a world-wide problem in cattle and responsible for major economic losses. The impact is greater in Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and types of helminthes. This study was conducted to determine the prevalence of gastrointestinal parasites and to asses associated risk factors of cattle attending veterinary teaching hospital at Mekelle University. A cross sectional study was conducted from August to November 2017. A total of 384 samples were collected and examined using floatation and sedimentation techniques to identified parasite eggs present in the feces, and McMaster technique to investigate the parasite burden. Out of 384 cattle examined, 181 (47.14%) were found to be positive for different GIT p arasites. Major parasite genera identified in this study were *Fasciola* (13.26 %), *Paramphistomu m* (10.50 %), *Trichostrongylus* (19.34 %), *Ostertagia* (12.71%), *Toxacara vitulorum* (5.52 %), *Heamonchus* (1.66 %). Mixed infection was also recorded: *Fasciola* with *Pramphistomum* (14.3 6 %), *Trichostrongylus* with *Ostertagia* (16.57%) and *Haemonchus* with *Fasciola* (6.08 %). *Trichostrongylus* was the dominant parasite found, while *Haemonchus* was the least single parasite infection obtained in this study. Age, body condition and deworming history of cattle examined were shown to have statistically significant association ($p<0.05$) with the prevalence of the GIT parasites, whereas sex of the animals were not shown statistically significant association ($p>0.05$). Body condition of the animals also shown to have statistically significant association ($p<0.05$) with the parasite burden, in which heavy infection was lower in good body condition cattle (4.11%) compared to medium (14.29%) and poor body condition (8.75%) anim als, whereas deworming history were not shown significant association ($p>0.05$) with the parasite burden. Gastrointestinal parasites identified in this study can cause negative impacts in the production and productivity of the cattle in the study area, therefore periodic deworming of cattle against helminthes parasites should be practiced strategically with the help of education and awareness on the effect of drug resistance and misuse of drugs by farmers is important.

Index Terms — Bovine, gastrointestinal parasites , Mekelle , prevalence , fecal examination;, Risk factors, Severity of parasitic infection

1 INTRODUCTION

Ethiopia has the largest livestock production in Africa, estimated at 57.83 million cattle, 29.33 million sheep, and 29.11 million goats, respectively [4]. Cattle constitute the major proportion of the Ethiopian livestock resources. They provide more than 30% of local meat consumption and generate a cash income from export of meat and live animals. They also contribute to the self-sufficiency of resources for poor farmers by providing milk, meat, manure and direct cash income. Cattle production in Ethiopia, however, is constrained by a number of factors including malnutrition, diseases, improper health care and other management problems. Among the serious constrains to livestock production in Ethiopia is the high prevalence of various disease, mainly of viral, bacterial and parasitic origin. In Ethiopia, where farm animals are kept on pasture throughout the year and clinical conditions are favorable for the development and survival of infective stages, parasites are recognized as major cause of economic loss. Although vaccines are available for most viral and bacterial disease, enabling the under taking of preventive measures, the controls of parasitic disease have made little progress [7].

Gastrointestinal tract (GIT) parasites are a world-wide problem in livestock as well as in agricultural sector and responsible for major economic losses. The economic impact of these parasites on animals industry is great. The impact is greater in Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and types of helminthes [8]

Gastrointestinal parasite infection is one of the major causes of wastage and decreased productivity exerting their effect through mortality, morbidity, decreased growth rate, weight loss in young growing calves and late maturity of slaughter stock, reduced milk and meat production and working capacity of the animal mainly in developing coun-

tries [14] These effects largely relates to specific damage caused by the parasites including villous atrophy at the site of gastrointestinal nematode attachment and liver trauma resulting from the presence of migratory liver fluke [14] Indirect effects have also been described, including altered feed intake, digest flow rate, nutrient absorption and liver metabolic activity, endocrine status and immunological response [10]. A number of helminths species are known to infect cattle worldwide. The most important ones include nematodes like *Strongyle* species (*Haemonchus, Ostartagia, Trichostrongylus, Cooperia*) and trematodes of economic importance such as *Fasciola* species (*Fasciola hepatica* and *Fasciola gigantica*) and *Paramphistomum* species (*Paramphistomum cervei*), while cestodes like *Monezia* species (*Monezia benideni* and *Monezia expanza*) could also be important constraints in animal production [15] There are many associated risk factors influencing the prevalence and severity of GI helminths. These include age, sex, and weather condition and husbandry or management practices [11]).

The proplem statement of this study was that, in some parts of Ethiopia, surveys have been carried out on prevalence of helminthes parasites of which most of the information obtained from abattoir survey and animals managed in stations [8] On the other side, GIT parasites remain an important problem of cattle in the study area and many parasitic related problems were presented to the veterinary teaching hospital in Mekelle University. Therefore, the current study was focusing on gastrointestinal parasites in bovine presenting veterinary teaching hospital for different purpose from different surrounding areas

2. METERIALS AND METHODS

STUDY AREA

This study was carried out from August 2017 to November 2017 at Mekelle University veterinary teaching hospital in Mekelle. Mekelle is the capital city of Tigray Regional State located 785km north of Addis Ababa, the capital city of Ethiopia. Its geographic location is 13° 32' N and 39° 33' E. It has an average altitude of 2200 m.a.s.l with a mean minimum and means maximum monthly temperatures of 8.7 and 26.8^{O}C, respectively. Mekelle receives an average 600 mmHg of rainfall annually and more than 70% of it falls between July and August, followed by long dry season (October to May).

STUDY ANIMALS

Study animals were cattle of all ages and both sexes presenting to veterinary teaching hospital for different purpose

STUDY DESIGN

A cross sectional epidemiological study was carried out on cattle attending veterinary teaching hospital for different purpose to determine the prevalence of GIT parasites in the study area.

SAMPLING METHOD AND SAMPLE SIZE CALCULATION

Animals were selected randomly (simple random sampling) for determination of the prevalence of GIT parasites. The sample size required in the study was determined using the formula given by Thrusfield (2005) for random sampling.

$$n= (1.96)^2 P_{exp} (1-P_{exp})/ d^2$$

Where, n = required sample size P_{exp} = expected prevalence d^2 = desired absolute precision Expected prevalence of 50 % was used since there were no prior works done in the study areas. 0.05 desired absolute precision and 95% level of confidence was used for the study. Therefore, a total of 384 cattle needed for the study. Veterinary teaching hospital works only 5 days in a week, so that 6 to 7 animals were randomly selected per day for every study period.

FECAL SAMPLE COLLECTION

Fecal samples were directly collected from rectum with unused gloves for each animal. Each sample was placed in plastic containers with lids and labeled with animal identification record including the age (based on their teeth eruption and by asking the owner), sex, body condition (poor, moderate and good) based on the description of Nicholson and [2] and date of any previous anthelminthic treatment (if any) were recorded. Age of the cattle were categorized into adults (over 2 years old) and young (2 or less than2 years old) De-Lahunta and Habel (1986). Poor body condition cattle having prominent dorsal spines pointed to the touch and individual visible transverse processes. Cattle having usually visible ribs with little fat cover and barely visible dorsal spines was considered as medium body condition score. A good body condition score was given for cattle when fat cover easily seen in critical areas and the transverse processes were not felt. Then, the samples were processed immediately after collection into veterinary parasitology laboratory of Mekelle University, college of veterinary medicine.

COPROLOGICAL EXAMINATION

The collected fecal samples were processed and examined using qualitative techniques (floatation and sedimentation) as described by Urquhart et al. (1996) and Quantitative parasitological techniques by using McMaster egg counting methods according to the standard procedures given by Soulsby (1982) and MAFF (1997). Levels of parasite infection were extrapolated from infection severity index defined by Smith (2009), where cattle were considered to have

low, moderate, and heavy infections if their fecal egg counts are 100-250, >250-500 and more than 500 respectively. Sodium chloride and zinc sulphate were used as flotation fluid for this study.

FECAL CULTURES AND LARVAE IDENTIFICATION

Fecal sample from each animals of whenever positive for nematode eggs will be cultured for harvesting second or third stage larvae and identification of the most important genera of non- distinguishable nematode eggs in cattle according to Hansen and Perry (1994). Finally larvae will be recovered using the Baermann technique. From each culture, the larvae (L) will be morphologically differentiated and identified according to keys provided by Van Wyk et al. (2004).

DATA ANALYSIS

Data was entered into Microsoft Excel spread sheet 2007 and descriptive statistics were used to determine the prevalence, while Chi-square analysis were employed to test the presence of variation between age, sex, body condition and deworming history of the animals. Confidence level was hold at 95% and $P < 0.05$ was set for significance. All statistical analysis was performed using STATA software package version 12.

3. RESULTS

DEMOGRAPHIC CHARACTERISTICS OF THE STUDY ANIMALS

Demographic characteristic of the study animals such as sex, age, body condition and deworming history were collected. Out of 384 cattle examined, 58.07% were female where the rest 41.93% were males. Similarly, 31.51% of the cattle were young while 68.49% were adults. On the other hand, 32.55%, 16.155% and 51.30% of the cattle examined were having poor, medium and good body condition respectively, where 72.66% of the cattle examined were dewormed while 27.34% were not dewormed as shown in Table 1.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF STUDY ANIMALS

Variables	Frequency	Percentage (%)
Sex		
Female	223	58.07
Male	161	41.93
Age		
Young	121	31.51
Adult	263	68.49
Body condition		
Poor	125	32.55
Medium	62	16.15
Good	197	51.30
Deworming history		
Dewormed	279	72.66
Un-dewormed	105	27.34

PREVALENCE OF GASTROINTESTINAL PARASITES AND DEGREE OF INFECTION

Out of 384 cattle examined under this study, 181 were found to harbor one or more parasite species. The overall prevalence of gastrointestinal parasites of cattle attending veterinary teaching hospital was 47.14 % (181 /384). Out of 181 cattle infected, 114 (62.98 %) had light infection whereas 53 (29.28 %) and 14 (7.73 %) were infected at moderate and heavy infection respectively as shown in Table 2

TABLE 2: OVERALL PREVALENCE AND DEGREE OF INFECTION

Variable	Frequency	Percentage (%)
Fecal examination		
Positive	181	**47.14**
Negative	203	52.86
Degree of infection		
Light	114	62.98
Moderate	53	29.28
Heavy	14	7.73

PREVALENCE OF SINGLE AND MIXED GASTROINTESTINAL PARASITES INFECTION

Both single and mixed infections of gastrointestinal parasites were identified in this study. Out of 181 infected cattle, 114 (62.99%) were infected with single parasites while the rest 67 (37.01%) were infected with mixed parasites. Out 114 cattle infected with single parasite had *Fasciola* (13.26 %), *Paramphistomum* (10.50 %), *Trichostrongylus* (19.34 %), *Ostertagia* (12.7 1%), *Toxacara vitulorum* (5.52 %) and *Heamonchus* (1.66 %). Among single parasite infections observed in this study, *Trichostrongylus* was the dominant parasite, while *Haemonchus* was the least single parasite infection obtained as shown in Table 3.

TABLE 3: PREVALENCE OF SINGLE GASTROINTESTINAL PARASITE INFECTION BY GENUS LEVEL

Parasite	Frequency	Percentage (%)
Fasciola	24	13.26
Paramphistomum	19	10.50
Trichostrongylus	35	19.34
Ostertagia	23	12.71
Toxacara vitulorum	10	5.52
Haemonchus	3	1.66
Total	114	62.99%

Out of 181 infected cattle, 67 (37.01%) were infected with mixed parasites. Mixed parasites observed were *Fasciola* with *Pramphistomum* (14.36 %), *Trichostrongylus* with *Ostertagia* (16.57%) and *Haemonchus* with *Fasciola* (6.08 %) as shown in Table 4.

TABLE 4: PREVALENCE OF MIXED GASTROINTESTINAL PARASITE INFECTION BY GENUS LEVEL

Parasite	Frequency	Percentage (%)
Fasciola with *Paramphistomum*	26	14.36
Trichostrongylus with *Ostertagia*	30	16.57
Haemonchus with *Fasciola*	11	6.08
Total	67	37.01%

PREVALENCE OF GASTROINTESTINAL PARASITES WITHIN IDENTIFIED RISK FACTORS

Prevalence of GIT parasites in relation to sex, high prevalence was recorded in females (45.74%) than in males (49.07%), but this difference was not statistically significance between the sex (P>0.05). High prevalence was recorded in adults (57.41%) compared to young animals (24.79 %) and this was statistically significance between age groups (p<0.05). Prevalence of GIT parasites in relation to body condition of the study animals, high prevalence was recorded in poor body condition (64%) compared to the medium (45.16%) and good (37.06%) body condition. There was statistically significance between body condition of the animals (p<0.05). Deworming history was also considered as a risk factor for the occurrence of parasite infection, 38.35% and 70.48% were recorded in dewormed and undewormed animals respectively and there was statistically significance between dewormed and undewormed animals (p<0.05) as shown in Table 5.

TABLE 5: ASSOCIATION OF THE RISK FACTORS WITH THE PREVALENCE OF THE PARASITE INFECTION

Variables		Feacal examination		X^2	P-value
		Positive (%)	Negative (%)		
Sex					
	Female	102 (45.74 %)	121 (54.26 %)	0.415	0.519
	Male	79 (49.07 %)	82 (50.93 %)		
Age					
	Young	30 (24.79 %)	91 (75.21 %)	35.391	0.000
	Adult	151(57.41 %)	112 (42.59 %)		
Body condition					
	Poor	80 (64.00 %)	45 (36.00 %)	22.396	0.000
	Medium	28 (45.16 %)	34 (54.86 %)		
	Good	73 (37.06 %)	124 (62.94 %)		
Deworming history					
	Dewormed	107 (38.35%)	172 (61.65 %)	31.596	0.000
	Non-dewormed	74 (70.48 %)	31 (29.52 %)		

ASSOCIATION OF RISK FACTORS WITH THE SEVERITY OF PARASITE INFECTION

Severity of parasitic infection in relation to body condition of the animals were considered in this study, where heavy infestation was lower in good body condition (4.11%) than in medium (14.29%) and poor (8.75%) body condition cattle, and there was statistically significance between body condition of the cattle (p<0.05). Deworming history of the infected animals in relation to the severity of parasitic infection was not statistically significance (p>0.05) as shown in Table 6

TABLE 6: ASSOCIATION OF THE RISK FACTORS WITH THE DEGREE OF INFECTION

Variable	Degree of infection			X^2	P-value
	Light (%)	Moderate (%)	Heavy (%)		
Body condition					
Poor	52 (65.00 %)	1 (26.25 %)	7 (8.75 %)	23.120	0.010
Medium	22 (78.57 %)	2 (7.14 %)	4 (14.29 %)		
Good	40 (54.79 %)	30 (41.10 %)	3 (4.11 %)		
Deworming history					
Dewormed	67 (62.62 %)	34 (31.78%)	6 (5.61 %)	2.092	0.351
Un-dewormed	47 (63.51 %)	19 (25.68 %)	8 (10.81 %)		

4. DISCUSSION

The current study revealed that different gastrointestinal parasites were infected in cattle attending veterinary teaching hospital in Mekelle University with overall prevalence of 47 %. This could be due to fact that cattle could have frequent exposure to the communal grazing land that causes contamination of the pasture. The findings of this study is very close to the report on endoparasites on dairy cattle by [6] and relatively lower than report on gastrointesti nal helminth in Zebu cattle by [17] in Bahir-dar and its surrounding with the prevalence of 50% and 59.5 %, respectively. High prevalence of 82.8% and 61% were also reported by [8] in Holleta and its surroundings and by [3] in East Showa Zone, Oromia region respectively. The lower prevalence of this study could be nowadays the animal owners deworm their animals with different anthelminths drugs during different seasons of the year. This variation might be due to optimum temperature and moisture content which favor the growth and development of larvae in to infective stage on pasture in difference of agro-ecology of study areas. Prevalence of 62.99% (114/181) was recorded to be infected with single parasite and 37.01% (67/181) were infected with mixed parasites. This result is closely related with the report of [1], who reported a prevalence of 57.98 % and 42.02% in single and mixed parasite infection respectively in West Arsi Zone, Oromia regional state. This could be parasites may compete with each other for the predilection sites and nutrition within the host which may lead higher prevalence of single parasite infection than mixed infections. It might be due to availability of suitable environment for growth, multiplication and completion of its life cycle of single parasite may be higher. In this study, the most prevalent parasite of cattle identified was *Trichostrongylus* (19.34%), similar findings was reported by [2] in Gonder, and this similarity could be similarity in management system and agro climate condition which favors the survival of parasite. The least prevalent parasite recorded in this study was *Haemonchus* (1.66 %), however high prevalence of 11.7 % was reported by [1] in West Arsi Zone, Oromia regional state. This variation could be that different parasite may require different agro climate for multiplication and survival of the infective stage of the parasite to infect animals and rate of exposure of the susceptible animals to that parasite. The present study revealed that sex of the studied animals did not show significance association with the prevalence of gastrointestinal parasitism. This absent of association between sexes agreed with the findings of [8] in western Oromia, [9] in Jimma, and [19] in Gonder. This could be due to an equal opportunity for infection when they are exposed to the parasites in communal grazing pasture

A significance variation was observed between different age groups for the occurrence of GIT parasites, where high prevalence was recorded in adults (57.41 %) compared to the young animals (24.79%). Similar finding was reported by [2] in West Arsi Zone, Oromia regional state. This could be due to that adult animals had frequent exposure to than young animals which are confirmed in house and whereas adult animals were managed in free grazing system Body condition of the cattle examined had significance association with the occurrence of the parasite infections in which poor body condition cattle (64.00 %) was observed a higher prevalence than medium (45.16 %) and good body condition (37.06 %). This result was in line with the previous report done by [19] in Gonder. This association could be explained not only by exacerbation of parasitic infection in poor body condition animals due to lowered immunity but also by the fact that loss of body condition in this group of animal could be due to parasite effect On the other hand, deworming of cattle had a significant association with the occurrence of GIT parasites in which undewormed cattle (70.48 %) had a higher prevalence of parasite infection than dewormed cattle (38.35%). Similar finding was reported by [1] in West Arsi Zone, Oromia regional state which showed significant association between de-wormed (41.3%) and not de-wormed animals (71.9%). These might be due to the obvious preventive effect of strategic anti-helminthes application. Regarding the degree of parasite infections, the present study showed that most infected cattle had light (62.98%) and moderate (29.28%) infections than heavy infection (7.73%). The reason for the majority of the animals showed low and moderate infection might be associated with the development of immunity causing lower worm fecundity in animals. The low infection intensity also indicated the low transmission and sub-clinical condition of parasite infection. The present study revealed that body condition of the cattle examined had significance association with the prevalence of the parasite burden where heavy infestation was higher in poor (8.75 %) and medium body condition (14.29 %) compared to the good body condition animals (4.11 %). This could be due to the effect of parasite burden which responsible loss of body condition also change in body condition could be the possible indicator for the severity of parasite infection. On the other hand, deworming history of the cattle did not show significance association with the prevalence of parasite burden. This may be due to misuse of drug or may be that the parasite burden may be related to the immunity of animal and fecundity of parasite.

5. CONCLUSION AND RECOMMENDATIONS

Gastrointestinal parasites were important health problems of cattle in the study area. Among the parasite genera identified, *Trichostrongylus* was found to be the most prevalent parasite

where *Haemonchus* was the least prevalent GIT parasite in the study area. Mixed parasite infection of different GIT parasites were also identified. All risk factors assessed in this study were found to be significantly associated with prevalence of GIT parasites with the exception of sex. Nevertheless, the effect of GIT parasite in the present study cannot be neglected which result loss of production, decreased growth rate, weight loss and decreased working capacity.

Therefore, based on above conclusive remark the following recommendations are forwarded:

- Periodic deworming of cattle against helminthes parasites should be practiced strategical ly.
- Pasture contamination should be minimized through management of grazing pasture.
- Education and awareness on the effect of drug resistance and misuse of drug for the farmers should be conducted, as farmer may use drugs without prescription by veterinarian.
- Further researches should be conducted in order to provide more information about GIT parasites in cattle in the study area and surrounding areas so as to situate appropriate control and preventive measures in place

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