Acta Scientific Veterinary Sciences (ISSN: 2582-3183)

Volume 4 Issue 8 August 2022

Research Article

Prevalence of Paramphistomosis in Ruminants in Gursum District

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Received: June 27, 2022

Published: July 13, 2022

Abstract

Trematode (*Paramphistomosis*) is a parasitic infection caused by digenetic trematodes belonging to the family *Paramphistomatidae*. It is the major health problems limiting the productivity in animals. A cross sectional study was conducted from March 2021 to September 2021 to determine the prevalence of paramphistomosis in ruminants in Gursum district, Eastern Hararghe zone, Oromia regional state, Eastern Ethiopia. At the study area faecal samples collected randomly, with sample size 384 ruminants and fecal examinations was carried out according to the standard sedimentation techniques. Based on our data, the current prevalence of Paramphistomosis was 22.4% (86/384). The identification results in this study showed that the prevalence of Paramphistomosis was higher in ovines (25%) followed by bovines and caprines with prevalence of 21.9% and 21.4%, respectively. According to our results, there is statistical difference between age and body condition scoring (BCS) at the level of confidence interval 95% ($p < 0.05$). These findings suggest the importance of parasitic problems in the current study area require serious attention by concerned bodies to minimize and control the effects of those parasites on the general health status, productivity and reproductive potential of the animals. Diagnosis of paramphistomosis is based on clinical sign, grazing history, seasonal occurrence, examination of faces by laboratory tests and post-mortem examination. It is an important limiting factor for ruminant production. It causes several economic losses. The losses may be direct or indirect. The disease can be controlled by reduction in the number of intermediate snail host by chemical or biological, Immunological and strategic application of anthelmintic and a combination of control measure includes environmental sanitation and manipulation and managements system should be used to control and prevent the disease.

Keywords: Prevalence Trematodes; Paramphistomosis, Ruminants

Introduction

Paramphistomosis (Trematode disease) is a helminthic disease that caused by Trematode group which categorized under the family of Paramphistomatidae. The morphological size of adult *this parasite reaches* 1 cm long, with characterized by conical and pink/reddish color is the typical characteristic of these parasites (Rumen, reticulum) of ruminants [30]. Primary the predilection site of this parasite was the small intestine and abomasa and during disease development stages the eggs of this parasite can cross to rumen and finally it develops to adult trematode [26]. This parasite can inhibit all ruminants including livestock (cattle), shoat and wild ruminants [30]. This parasitic pathogen is one the neglected tropical infectious and mostly they occur at both tropical and subtropical regions, especially Africa, Asia, Europe and Australia [14]. With wide geographical distribution, specifically in a region of Australia [25], Thailand [28], Ethiopia [18] and Nigeria [7].

The distribution of this parasite can be estimated by different factors like -host-environment interactions. Most animal can gate this parasite during grazing the pastures. Other most common factors for the development of the egg for this parasite is climatic change, which was used for producing and larval development of this parasite, as well as for survival of the larvae in grasses [23]. The most common typical clinical symptoms of this parasite is occurred at the intestine of the affected animal species. After then these parasites can passes to the lower GIT like duodenal mucosa

and it causes inflammation on these organ and additional signs like enteritis, edema, hemorrhage and ulceration are the most common signs of this disease [7]. In areas where season out rain (have high amount of rain) region this parasite is most prevalent and it causes enteritis and anemia, decreases in the production and finally causes economic problems [6]. Immature flukes produce typical clinical signs as if watery diarrhea with some bad smelling and the risk factors associated with this parasite was high mortality, which reaches up to 80-90% In shoat and large ruminants [5].

Additionally, in heavy amount of infection this parasite can causes intestinal inflammation, decreased in the protein contents in the body of the host cell, bleeding, anemia and necrosis are the typical symptoms of this infection. Regarding to the risk factors this parasite can cause as high as 80% to 90% mortality rate in in food animals [12].

The disease progression of this parasite is started from lake/rivers that contaminated by snails, which is the intermediate hosts (vehicle) of the Trematodes. Primary the Adult trematodes in the stomach of host cell can lay the eggs. After two or three weeks, the miracidia hatch out of the eggs. After then when they enter in to host cell, they start to penetrate into the snail and progresses to the development of sporocysts and rediae [30].

When the intermediate host (snail that was affected by Cercariae larval stage of the parasite) can attaches to the pasture. The animal can gate it during grazing the pasture and after ingestion of the metacercia, the parasite can reaches to the small intestine. After then the young flukes migrate to the rumen of the host cell and they complete their development stages and start producing eggs (Prepatent period) [30]. At the most prevalent areas this parasite can causes vital economic loss because of animal those affected by this parasite can decrease in milk and meat production, loss of weight, the cost treatment of this parasite. Although this parasite can leads high death rate in young animals [4].

Mostly the outbreak of this parasite can occur during the dry season when most animal can grazes the pasture. The snail is the most common vehicles for this parasite to transmit it to the both domestic and wild animals [9]. Generally, this parasite can affects the economic developments of different countries and most common in developing countries like Ethiopia and it causes crucial losses production in different parts of the country [27].

The prevalence of this parasites, In Ethiopia, were investigated by different researcher at many parts of our countries, with 45.83% in western Gojam, 28.6% in Debrezeit, 6.7% in Hawassa and 49.44% in Ashenge [30]. Although there was no investigation of this parasite disease in Eastern Ethiopia, particularly in this study area. Based on the above suggestion, the objective of this study was determining the prevalence and associated risk factors of the Trematodes disease (*paramphistomum*) in cattle and shoats at Gursum district.

Materials and Methods

Description of the study area

The study was conducted in Gursum destrict, Eastern Hararghe zone, Oromiya regional state, Eastern Ethiopia. The district is located 616 km Northeast of Addis Ababa, 90 km from Chiro town. The soil type of the district is clay 43%, sand 55% and 2% others. The most common production of these districts is crop cultivated in this area is sorghum, maize, barley, teff and wheat. The estimated number of livestock in the study area is 14, 5615 bovine 37, 577 caprine 13, 177 lamb 23,456 poultry and equine7000 [3].

Study animals

A total of 384samples were collected from bovine and shoats. The sample was labelled accordingly, and the way of sample collection is randomly selected and processed qualitative fecal examination by standard sedimentation technique in order estimate the prevalence rate of Nematodes of Paraphistomum in the study area. In order to assess the risk factor of this parasite different factor was investigated including, age, sex and body condition of the animal. The animal was managed extensively with a free communal grazing system. The BCS is a parameter used to analyze the body condition of an animal unit. In this study, it was carried out through observation and palpation on the body fat deposits under the skin around the base of the tail, spine, and hip. The body score can be classified in two, good and poor, that is based on the physical observation of the animals. The Samples were collected from three randomly selected PAs associations, from the study district such as Awbare, Qore and Awdal. Fecal examination for the identification of paramphistomes eggs were undertaken in jigjiga regional veterinary laboratory.

Study design

A cross sectional study was conducted from January 2021 to June 2022 to determine the prevalence of paramphistomosis in ruminants using coproscopic examination.

Study methodology

Coproscopy was used to determine positivity of the animals for *paramphistomum*. The fresh fecal samples were used for examination of the *paraphistomum* in the animals. The Fecal samples were preserved by using 10% formalin in order to protect the eggs from damaging from environmental factors. During examination sedimentation techniques was performed to detect the presence of *paramphistomum* eggs. Methylene blue solution was the reagents that we used for to the sediment to differentiate it from eggs [10].

Sample size

For detection of *paramphistomum*, the expected sample size was 50% with 95% Confidence Interval level and the desired precision was 5% and based on this observation our sample size was 384 from bovine and small ruminants [29].

$$N = \frac{z^2 Pexp\ (1- Pexp)}{d^2}$$

Where

n = sample size

Pexp = expected prevalence

d^2 = desired precision

Z = constant from normal distribution table at a given confidence level.

Data analysis

All collected data was coded and entered in MS Excel database system. Using SPSS version 20-computer program. The data was analyzed by using Chi-square (χ 2) test to determine the risk factors of the infection, sex, age and body condition score. Statistical significance was set at $P < 0.05$ to determine whether there are significant differences between the parameters measured between the groups.

Results

The study was conducted from January 2022 to June 2022 with collecting 384-sample size from both cattle and small ruminants. Out of the collected sample 86 animals were affected by this parasite with an overall prevalence of *Paramphistomum* 22.4% (86/384).

Based on our current results, the prevalence of Paramphistomosis the highest prevalence was encountered in ovine (25%) followed by bovines and goat with encountered 21.9% and 21.4%, respectively. However, no significant difference ($P > 0.05$) was observed between species (Table 1). The occurrence of this parasite was higher in adult 28% (58/207) than young 15.8% (28/177). The statistically significant difference was occurred ($p < 0.05$) in the prevalence of *Paramphistomum* infections between ages (Table 1). The prevalence of paraphistomum was higher in male 24.3% (46/189) than female 20.5% (40/195). The $x^2_{correlation}$ analysis on sex related risk factors showed that there was no variation on occurrence of paramphistomosis between sexes. In that there was no statistically significant variation ($p > 0.05$) in prevalence of paramphistomosis within sex (Table 1).

The highest prevalence was also recorded on poor body condition, with results 38.2% (81/212) and in good body conditioned the prevalence was 2.9% (5/172). There was statistically significant difference ($p < 0.05$) on the prevalence of *Paramphistomum* between body conditioned groups of investigated ruminants (Table 1). Based on the Pas the prevalence of the paraphistomum were 26% (50/1992) from Awbare, followed by Qore 21.9% (21/96) and Awdal 15.6% (15/96). However, there was no statisticallysignificant variation ($p > 0.05$) in prevalence of paramphistomosis within districts.

Parameter Species	Total No. Affected Examined	Positive Number (%)	χ2	P Value
Bovine	192 42	42(21.9%)	0.402	0.81
Caprine	112 24	24(21.4%)		
Ovine	80 20	20(25%)		
Total	384 86	86(22.4%)		
Age Young	177 28	28(15.8%)	8.171	0.005
Adult	207 58	58(28%)		
Total	384 86	86(22.4%)		
Sex Female	195 40	40(20.5%)	0.808	0.393
Male	189 46	46(24.3%)		
Total	384 86	86(22.4%)		
BCS Good	172 5	5(2.9%)	68.084	0.00
Poor	212 81	81(38.2%)		
Total	384 86	86922.4%)		
Origin Awbare	96 15	15(15.6%)	4.016	0.122
Qore	96 21	21(21.9%)		
Awdal	192 50	50(26%)		
Total	384 86	86(22.4%)		

Table 1: Prevalence of Ruminant paramphistomosis and its association risk factors in Gursum district.

BCS: Body Condition Score

Different superscript in the same column showed a significant difference between age and body condition ($P < 0.05$).

Discussion

Based on our results the prevalence of Paramphistomosis in ruminants was 22.4% (86/384). The result of current research finding in lined with [24], who report that the prevalence of paraphistomosis in Pakistan (22%) and the other finding similar with this study reported by [15] from Kisumu Municipality abattoir in Kenya (30%). although, the current result is higher than reported by [2] from Kozakiewiez, Poland (3.06%). Similarly, the prevalence of Paramphistomosis was higher in ovine (25%) then bovines and caprine with prevalence of 21.9% and 21.4%, respectively. In that there was no Statistically significant difference (P > 0.05) in prevalence of *Paramphistomum* within species this may be due to grazing from similar farmlands. The prevalence of *Paramphistomum* in sheep was found to be 25%. This result was Similar with [19], who report that the prevalence of *Paramphistomum* in sheep at eastern Ethiopia (mainly in Haramaya, Harar, Dire Dawa and Jijiga) was 25%. Additionally, it was similar with results that reported by [22], who recorded 26.2% prevalence in Nigeria and [24] with prevalence of 28.57% in Pakistan. However, the current finding was lower than reported by [17], who recorded 55.9% in India. However, our result was higher than reported by [20], who recorded 7.06% in Egypt.

Actually, our results were similar with the prevalence of *Paramphistomum* in bovine with the present research was recorded by [11] who recorded 20% in Egypt [12] who recorded 23.8% in India [22] with prevalence of 26.2% in Nigeria. The current finding was disagreed with reported by [21] who recorded 5.43% at eastern Ethiopia in Hirna [11] who recorded 7.3% in Egypt [23] from Turkey (8.95%). On the other hand, the recent study is lower than reported by [30], who recorded 65.3% prevalence in Tigray region, by [1] in Debre Zeit, Ethiopia (40.1%) [20], who recorded 38.92% prevalence in Egypt. The result was similar with that of [19] Who recorded 21% prevalence of *Paramphistomum* in goats with the present research at eastern Ethiopia (mainly in Haramaya, Harar, Dire Dawa and Jijiga) [24], who recorded 23.80% prevalence in Tehsil Jatoi, District Muzaffar Garh, Pakistan. This prevalence was higher than reported by [17] with prevalence of 7.0 7% in India. This different prevalence of *Paramphistomum* in these reports could be due to the different parasitological techniques used in these studies, differences in the origin of the samples or by geographical differences. Other factor that predisposes for such a difference could be due to suitable ecological factors for the snail intermediate host of *Paramphistomum* in these areas.

It was observed that there was significant variation (P < 0.05); in prevalence of paramphistomosis between young and adult; with more prevalence 28% (58/207) in adult and relatively 15.8% (28/177) in young. The lower rate of infection in young animals may be attributed to the little chance of exposure to contaminated pasture and do not travel long distance to get their food where contaminated pasture present. Furthermore, adult animals were significantly more frequently affected than young regarding paramphistomosis because the young may not move to the grazing land (they stay around the house). In this studied, the prevelance was higher in male 24.3% (46/189) than female 20.5% (40/195). This positive association of sex as risk factor was males are known for its tolerance to parasitic diseases. There was statistically significant difference (p < 0.05) on the prevalence of *Paramphistomum* between body conditioned groups of investigated ruminants. The highest prevalence 38.2% (81/212) of *Paramphistomum* infection was recorded in poor body conditioned animals compared with good body conditioned once 2.9% (5/172). The positive association of body condition as risk factor could be explained by the fact that the fluke causes high protein loses in ruminant and the emaciated animal has lower resistance to fluke than cattle with a good body condition.

Conclusion and Recommendations

In general, paramphistomosis is the most common and important gastrointestinal and has a cosmopolitan distribution. The epidemiology of paramphistomosis is dependent on the ecology of the snail intermediate hosts. paramphistomosis continue to constrain, in a variety of different ways, livestock productivity and poverty alleviation in many regions of Ethiopia. The most important and read measurable direct effects of disease are often losses in productivity. These include the effects due to death, illness leading to condemnation, poor weight gain and poor feed conversion. Paramphistomosis is now recognized as an emerging human disease. Mostly in developing countries including Ethiopia, livestock management systems are extensively rearing which make the animal to be easily exposed to the disease. There is a risk of development of drug resistance in paramphistomosis through frequent use of single anthelmintics and Vaccine of paramphistomosis is under development. According to our current investigations, there was significant difference in the distribution of the *Paramphistomum* among the different species, ages, sex and body condition scores of the cattle and shoats the parasites were more prevalent in ruminants with poor body condition than good, conditioned animals.

Taking into accounts the above conclusion, the following recommendations are forwarded

- Drainage of swampy area is also important in the reduction of the intermediate host
- Zero grazingis important in the control of the disease
- Anthelmintics treatment should be combined with improved pasture management
- Regular deworming of animals before and after the rainy season is important
- Cook water-grown vegetables thoroughly before eating
- Farmers may be trained about the zoonotic
- Molluscide drugs are important in the control of the intermediate
- Drainage of swampy area is also important in the reduction of the intermediate host
- Control should be on preventive rather than treatment
- Further studies may needed for paramphistomosis vaccine.

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