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Prevalence of *Paramphistomum* and its associated factors in Cattle slaughtered at Boko slaughter house, Fedis District, Eastern Hararghe Zone, Ethiopia

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Abstract

BACKGROUND: Bovine paramphistomosis is one of the most important parasitic diseases of cattle causing mortality and production losses in various parts of Ethiopia.

OBJECTIVES: A cross sectional study was carried out in Fedis district from April 2019 to October 2020 to determine the prevalence of *Paramphistomum* and its associated factors in cattle slaughtered at Boko slaughter house.

METHODS: A total of 384 slaughtered cattle were selected by systematic random sampling and post-mortem examination of rumen and reticulum was conducted to check the presence or absence of adult *Paramphistomum*. The parasite was examined macroscopically and microscopically to appreciate the morphology of adult flukes.

RESULTS: Of 384 examined cattle, the prevalence of *Paramphistomum* was recorded in 156(40.6%). Of the total 156 positive samples 52.34%, 33.06% and 14.6% were infected with *Paramphistomum clavula*, *paramphistomum cervi* and mixed infection respectively. In this study, highest rate of infection was recorded in wet season. Among assessed factors; body condition and origin of animals was significant variation ($P < 0.05$) with infection.

CONCLUSIONS: This finding indicated the highest infection of *paramphistomum* was recorded cattle. Therefore, the farmers should be practiced mass de-worming of animals using selected anthelmintic therapy for flukes.

Keywords: Abattoir, Boko, cattle, *Paramphistomum*, Risk Factors.

Introduction

Ethiopia is believed to have the largest livestock population in Africa, yet produces insufficient animal protein and other livestock products to meet the demand of human population. The livestock sector has been contributing a considerable portion to the economy of the country and still promising to rally around the economic development of the country. However, production and productivity are low in Ethiopia, due to poor nutrition, reproduction insufficiency, poor breed improvement, management constraints, and prevailing of diseases (Ayele *et al.*, 2003). Among diseases, parasitism is the major

problems that affect the productivity of livestock worldwide. Amphistomosis is globally distributed, but the highest prevalence has been reported from tropical and sub-tropical regions, particularly Africa, Asia, Australia, Eastern Europe and Russia. It is caused by digenetic flukes belong to the family Paramphistomidae. The life cycle of these Trematodes involves snail as an intermediate host (Huson *et al.,* 2017).

The epidemiology of *Paramphistomum* infection in cattle is determined by several factors governed by parasite-host-environment interactions (Martinez-Ibeas *et al.,* 2016). It is also influenced by the climatic requirement for egg hatching, development and survival of the larvae in pasture (Ozdal *et al.,* 2010). Adults Paramphistomum are found in the rumen and reticulum whilst immature parasites are found in the duodenum. Adult *Paramphistomum* flukes parasitize mainly in the fore stomachs of cattle causing irregular rumination, lower nutrition conversion, loss of body condition, decrease milk production, and reduction of fertility rate (Getenet *et al.*, 2016). Severe infections with massive number of immature parasites migrating through the intestinal tract cause acute parasitic gastroenteritis with high morbidity and mortality rates, particularly in young animals (Maitra *et al*., 2014; Huson *et al*., 2017).

In spite of the aforementioned prevailing situation and the presence of a number of problems due to gastrointestinal parasites there is scarcity of well-documented information on the occurrence of Paramphistomum in ruminants in Ethiopia and also there is no any conducted research in Fedis district. knowledge of the prevalence and risk factors would help in implementing of strategies and policies for control and prevention of bovine Paramphistomosis in the study area. Therefore, the objectives of this

study was to determine the prevalence and associated factors of Paramphistomum in cattle slaughtered in the study area.

Materials and Methods

Study Area

The study was carried out in Fedis district Boko slaughter house. The district is found in Eastern Hararghe, Oromia Regional State, Ethiopia, at a geographical coordinate of 8° 49′ 43.3″N latitude and 42° 0′ 45.57″E longitude and an elevation of 1285m above sea level. It is divided into three major agro-climatic zones, namely highland, mid-highland and lowland. The district consists of two seasons, mainly wet season from April to September, and the dry season from October to March. The main occupation of the population in these rular Kebeles are mixed farming system. Livestock species include: cattle, sheep, goat, donkey and Poultry. The livelihood of the population is 93.8% agro-pastoralist while the rest, 6.2% are urban dwellers (FDOA, 2020).

Study Animals

The study animals were cattle (local breeds) of different sexes, ages groups and body conditions brought from highland, mid highland and lowland areas to the slaughter house. The body condition of animals was carried out through observation and palpation on the body fat deposits under the skin around the base of the tail, spine, and hip. Accordingly it was categorized in three namely good, medium and poor. Ageing of the cattle was based on rostral dentition as described by Lasisi *et al.* (2002). Cattle aged (< 3 years old) were classified as young while (> 3 years old) were considered as adults. Sexual differentiation was based on the appearance of external genitals as described by Yunusa *et al.* (2013).

Study Design and Sample Size Determination

A cross sectional study was conducted in Fedis District from April 2019 to October 2020 to determine the prevalence and associated factors of *Paramphistomum* in cattle slaughtered at Boko slaughter house using post-mortem examination. The number of cattle required for the study was calculated based on the formula given by (Thrusfield and Christley, 2018). The sample size was determined based on expected prevalence of 50%, confidence interval of 95% and desired level of precision of 5%.

$$n= 1.96^2[Pexp (1-Pexp)]/d^2$$

Where, n = required sample size, Pexp = expected prevalence, d = desired absolute precision. Therefore, based on the above formula 384 cattle slaughtered at Boko slaughter house were selected for this study.

Sampling Methods

The samples were collected from the slaughter house at the time of slaughtering process was conducted. Systematic random sampling technique was used to select the study animals i.e. the first animal was taken randomly and the next animals were selected on an interval of three.

Study Methodology

During ante mortem inspection, my own identification was carried out using marker on the head for each of study animals. General physical examinations of animals were conducted and details about sex, age, origin and body condition of the animals was recorded. During post-mortem examination, *rumen* and *reticulum* of the selected animals

was systematically inspected to check the presence of adult *Paramphistomum*. If the evidence of *paramphistomum* were found they are recorded separately as positive. Then secondary examination was conducted by further incisions of the rumen and reticulum. The parasite was examined macroscopically and microscopically to appreciate the morphology of adult flukes. Final identification of *Paramphistomum* was done based on morphology of flukes; shape, posterior sucker (acetabulum), anterior sucker, terminal genitalium and tegumental papillae following the standard guidelines (Urquhart *et al.*, 1996).

Data Management and Analysis

All of the data collected from each of slaughtered animals were entered into Microsoft Excels spread sheet and analyzed with SPSS Version 20. Chi- square test (X^2) was used to show the variation between different risk factors such as sex, age, body condition and origin of animals. ($P < 0.05$) was considered to be statistically significant.

Results

Out of the total of 384 examined animals, an overall prevalence of *Paramphistomum* was 156 (40.6%). This finding indicated that statistically siginificant variation ($P< 0.05$) between with the prevalence of 52.6% and 32.7% of *Paramphistomum clavula* and *Paramphistomum cervi* respectively (Table 2). The current finding showed that the infection was almost similar in both species of animals. However it shows slightly higher in old than adult animals, but there was no statistical significant difference ($P > 0.05$) in relation to sexes and age groups of animals (Table 3). This finding showed that, satistically significant variation ($P < 0.05$) with respect to origin the animals with highest

prevalence of *Paramphistomum* was recorded in cattle brought from highland than mid highland and lowland areas (Table 4). This finding showed that, satistically significant variation ($P < 0.05$) with respect to body condition of the animals with highest infection was recorded in poor body conditioned animals followed by medium and good body conditions (Table 5).

Discussion

Out of 384 selected animals, the overall prevalence of *Paramphistomum* was 40.6% that was in line with the findings of Melaku and Addis (2012) and Gudeta and Biyansa (2019) in Ethiopia and Modgy *et al.* (2009) in Egypt they reported 41.5%, 40.1% and 38.92% respectively. However, the current study found a higher rate of infection than studies conducted in Turkey, Ethiopia and Germany by Ozdal *et al.* (2010), Tagesse *et al.* (2014) and Forstmaier *et al.*(2021) who reported 8.95% and 6.7% respectively. This finding was slightly lower than 65.7% reported by Tsegabirhan *et al.* (2015) in Ethiopia and 91.16% reported by Chowdhury *et al.* (2019) in Bangladesh. This difference might be due to difference in sample size, season of the study, management system and environmental conditions.

In this study finding, two most common species of *paramphistomum* were identified the with the prevalence of 52.34% and 33.06% were *Paramphistomum clavula* and *Paramphistomum cervi* respectively, whereas 14.6% of animals were positive for mixed infection of *paramphistomum* species. This finding was agrees with the findings of Ayalew *et al.* (2016) who reported the highest infection rate of *paramphistomum clavula* than other species. The highest infection rate of cattle with *Paramphistomum* spp. was

observed in August and gradually decreased in October. This finding was agrees with the previous finding by Nayab *et al.* (2017) who reported that prevalence of *Paramphistomum* spp. was highest in cattle in March and the lowest in November. It has been described that the bionomic requirements for breeding of *Planorbis* snails and development of intramolluscan stages of flukes often reach the optimum threshold during the wet months (Radostits *et al.*, 2000).

Sex and age groups was not significant variation (P >0.05) in relation to infection rate. This finding is in agreement with other findings in Iran and in Ethiopia (Javad *et al.*, 2015; Gudeta and Biyansa, 2019) they reported insignificant difference between sexes and age groups cattle and also similar to the finding from Bangladesh by Sabbir Ahmad *et al.*(2020) and Azoro (2021) who reported the prevalence of gastrointestinal parasites was not significant difference in relation to sexes of animals. This is due to the fact that all ages and both sexes have the same chance to ingest the infective stage larvae during grazing and equally susceptible to infection.

This finding reported that the highest infection rate was recorded in poor body conditioned animals than medium and good. There is significant difference (P <0.05) in relation to body conditions was observed. In agreement with this finding, Tagesse *et al.* (2014) and Tsegabirhan *et al.* (2015) in Ethiopia reported significant variation (P< 0.05) between prevalence of *Paramphistomum* and body conditions. The difference of result may be due to the difference in immunity of the host and the fact that cattle with good body condition expected to be de-wormed and are more able to resist infection from others. It was similarly observed among the few cases which we encountered with heavy

fluke infestation that the animals appeared markedly emaciated with poor body conditions.

The current study finding showed that, the highest prevalence of *Paramphistomosis* was recorded in cattle brought from highland than mid highland and lowland areas of origin. There was statistically significant variation (P <0.05) between origin of animals. This finding is agrees with Tsegabirhan *et al.* (2015) from Ethiopia who reported significant difference in relation to origin of animals. But it is disagreed with Getenet *et al.* (2016) in Ethiopia who reported insignificant variation between origin of animals. These differences might be due to the differences in sample size, diagnostic technique, climate, ecology, and livestock management system (Javad *et al.*, 2015). In General, this study revealed that the highest prevalence of *paramphistomum* infection was recorded in cattle in study area and based on only slaughtered animals may have some limitation on results.

Conclusion

In this study, *Paramphistomum* was found to be prevalent in cattle. This will be a hindrance to the livestock production by causing remarkable direct or indirect losses of livestock productions and productivity in the study area. In the present study an overall prevalence of 40.6% were infected by adult *paramphistomum*. Age, sex, body condition scores and origin of animals were assessed as risk factors for occurrence of *bovine paramphistomum*. Among the risk factors, body conditions and origin of animals was statistically significant variation (P <0.05) with infection rate of *paramphistomum*, but

sexes and age groups was not significant difference. Therefore, based on the above conclusions the following recommendations were forwarded.

- Awareness creation for owners to improve feeds provision in order to obtain good body condition to provide sufficient level of resistance against infections.
- Integrated strategies should be implemented for control and prevention of infection using mass de-worming animals by selected anthelmintic.
- Further detail epidemiological and seasonal study should be carried out, so as to design appropriate control strategies on the area.
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- **Conflicts of Interest**

- The Author have not declared any conflict of interest.

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- Table 1. Overall prevalence of *bovine paramphistomum*

No of Cattle Examined	No of Positive	Prevalence (%)	95% CI
384	156	40.6%	[35.6 – 45.6]

Table 2: Prevalence of *bovine Paramphistomum* based on species distribution

Species	No of Positive	Prevalence (%)	X^2 (P-value)
Paramphistomum clavula	82	52.6%	
Paramphistomum cervi	51	32.7%	
Mixed Infection	23	14.7%	

Table 3: Prevalence of bovine *paramphistomum* based on sex and age groups

Risk Factors	Variables	No of Examined	No of Positive (%)	X^2 (P-Value)

Sexes	Male	291	117(40.2%)	0.06(0.146
	Female	93	39(42.1%)	
Age Groups	Adult	284	109(38.4%)	2.014(>0.05)
	Old	100	47(47.2%)	
	Total	384	156(40.6%)	

Table 4: Prevalence of *bovine paramphistomum* based on body conditions of animals

Body conditions	**No of Examined**	**No of Positive (%)**	**X^2(P-value)**
Good	90	30(33.3%)	11.923(0.01)
Medium	200	74(37.2%)	
Poor	94	52(55.3%)	
Total	384	156(40.6%)	

Table 5: Prevalence of *bovine paramphistomosis* based on origin of animals.

Origin of Animals	No of Examined	No of Positive (%)	X^2(P-value)
Highland	140	71(50.7%)	12.853(0.005)
Midhighland	140	56(40%)	
Lowland	104	29(28%)	
Total	384	156(40.6%)	