Prevalence of Paramphistomosis in Ruminants in Ashenge, Tigray Ethiopia

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Abstract: Paramphistomosis is one of the trematode infections in domestic ruminants that have received little or no attention in Ethiopia because of misbelief that it does not cause disease in animals. However, this infection causes substantial economic losses to livestock industry and is widely spread and reported in ruminants of different parts of Ethiopia especially in areas having water logged and marshy grazing fields. A well-documented information on its occurrence in ruminants of Tigray region is lacking. A cross sectional study was, therefore, conducted to determine the prevalence of paramphistomosis in ruminants in Ashenge district of Tigray, North Ethiopia that has potential grazing but marshy fields. A total of 354 faecal samples from cattle and sheep of different age and sex were collected randomly from different village(s)/area(s) of the district of Ashenge during the period November 2013 to September 2014. The prevalence of paramphistomosis infection was found to be 23.7% in sheep and 65.3% in cattle with an overall prevalence of 49.44 %. There was a significant variation in paramphistomosis infection between cattle and sheep (p = 000). Statistically significant (p<0.05) difference in ovine paramphistomosis was observed between the age groups and among different districts but not between sexes. Significant variation, however, was not observed in bovine paramphistomosis between sex, age and district-wise. There is a need to develop integrated control strategies for the control of paramphistomosis.

Key words: Prevalence · Paramphistomosis · Cattle · Sheep · Ashenge · Ethiopia

INTRODUCTION

Paramphistomosis (Stomach fluke disease) is a parasitic infection caused by digenetic trematodes belonging to the family Paramphistomatidae. Adult paramphistomes are small flukes about 1 cm long, conical in shape and pink or a reddish color mainly parasitic in the fore stomachs (Rumen, reticulum) of ruminants [1]. They infect cattle, sheep, goats and other livestock as well as a number of wild ruminants. They are found worldwide, especially in humid regions, with varying prevalence depending on climatic and ecologic conditions. In endemic regions prevalence can be very high; up to 80% of the animals in a herd can be infected [2].

Paramphistomum have an indirect life cycle with freshwater snails as the intermediate hosts of the genus Bulinus, Planorbis, Stagnicola, etc. Adult flukes in the stomach lay eggs that are shed outside with the feces. About 2 weeks later miracidia hatch out of the eggs. They swim in the water until they find a suitable snail. They penetrate into the snail and continue development to sporocysts and rediae, which can multiply asexually and produce daughter rediae. Each redia produces several cercariae, the next developmental stage. Out of a single miracidium up to 30 cercariae can develop. Cercariae abandon the snail, swim around and attach to the vegetation where they encyst and become metacercariae, which are infective for final hosts that feed on infested vegetation. Once in the small intestine the young flukes develop by feeding on the tissues of the gut wall and later detach from the gut's wall and migrate to the rumen, where they complete development to adult flukes and start producing eggs. After ingestion by the final host it takes 2 to 4 months for metacercariae to complete development and start laying eggs (Pre-patent period) [2].

Infection with this adult flukes in the rumen at most may cause a localized loss of rumen papillae, causing indigestion only. The severity of the disease depends on how heavily contaminated the pastures are with...
metacercariae. In heavy infections of previously uninfected young animals, the immature helminths attach to the duodenal mucosa using their powerful ventral suckers and deeply embedded in the mucosa causing severe enteritis, duodenitis, hypoproteinemia, edema hemorrhage and possibly necrosis. The pathological lesions lead animals’ exhibit anorexia, polydipsia, unthriftiness and severe diarrhea [1]. Consequently, death due to immature paramphistomes is very high and may be as high as 80-90% in domesticated ruminants [3, 4].

In many countries stomach fluke infection is still underestimated. However, paramphistomes can limit livestock productivity and account for high economic losses in cattle and immature flukes cause disease [5].

In Ethiopia, paramphistomosis has been reported from different parts of the country with approximately 45.83% in western Gojam, 28.6% in Debrezeit and 6.7% in Hawassa [6-8] and there is scarcity of well documented information on the occurrence of paramphistomum in ruminants in grazing around Lake Ashenge. Therefore, the objective of this study was to determine the prevalence of paramphistomes in ruminants grazing around Lake Ashenge.

**MATERIALS AND METHODS**

**Study Area:** Lake Ashenge is located in Ofla district of the Southern Tigray, Northern Ethiopia at a distance of 120 km from the regional capital city Mekele. The altitude at the lake is 2,400 m while the mountains to the north rise to over 3,000 m. The average temperature ranges from 13-19°C and with mean annual rainfall of 979 mm [9].

**Study Animals:** A total of 354 animals (135 sheep and 219 cattle) from four districts (Adibomsa, Debri, Mewura, Detery) of all age group and both sexes were examined. Study animals were managed under traditional extensive system and depend mostly on grazing marshy area around Lake Ashenge and receive a minimum or no supplementary feed and health care.

**Study Design and Sample Size:** A total of 354 animals were selected for this study. Individual animals were selected using simple random sampling method and they were arranged according to their age, sex and districts.

The size of sample was determined considering expected prevalence of 28.6% for paramphistomosis in Debrezeit [7]. The formula given by Thrustfield [10] with 95% confidence interval and at 5% absolute precision was used for sample size calculation.

**Fecal Sampling and Examination:** Faecal samples (Approximately 10 gram) from bovine and ovine were collected directly from the rectum of the animal. The samples were then put in a plastic container with a detailed history about age group, sex and district of individual animal. Ten percent formalin was added and transported to College of Veterinary Medicine parasitology laboratory. The sedimentation technique is a qualitative method for detecting trematode eggs in the faeces. Most trematode eggs are relatively large and heavy compared to nematode eggs. This technique concentrates them in sediment. Three gram of faeces was weighed or measured using a sensitive balance and transferred into container 1. Then 42 ml of tap water poured into Container 1. It was mixed thoroughly with a stirring device. The faecal suspension filtered through a tea strainer into container 2. The filtered material poured into a test tube and centrifuged at 1500 rpm for 5 minutes. After centrifugation, the supernatant removed and a few drops of 5% methylene blue added. Then the sediment transferred to a microslide, covered with a coverslip and examined under 10x objective microscope [11].

**Statistical Analysis:** The data were fed in to computer using Microsoft excel spreadsheet and analyzed using STATA-11. Descriptive statistics was employed and expressed in terms of frequency and percentage. Chi-square ($\chi^2$) test statistics were used to test the association between variables.

**RESULTS**

Out of the total 354 fecal sample (Cattle and sheep) examined, an overall paramphistomosis prevalence of 49.44% was found in the study area (Table 1). Higher prevalence of paramphistomosis was found among bovine species (65.3%) compared to ovine species (23.7%) revealing a statistical significant. During microscopic examination of faecal samples of bovine and ovine, the egg of paramphistomum appeared as oval, operculated, colorless and with clear internal cells (Figure 1, 2).

There was a statistically significant difference in prevalence of ovine paramphistomosis infection between the two age groups and among different districts (P<0.05) while no significant (P>0.05) variation was seen between male and female sheep (Table 2).

The sex wise prevalence of bovine paramphistomosis was studied. The prevalence was higher in females (68.22%) than male (62.5%). But there was no statistically significant variation in prevalence of paramphistomosis between the two sexes (Table 3).
Fig. 1: Egg of paramphistomum isolated from faecal sample of bovine

Fig. 2: Egg of paramphistomum isolated from faecal sample of sheep

Table 1: Prevalence of rumen fluke infection based on animal species and grazing land and lack of intervention with anthelmintics. The higher prevalence of paramphistomosis in bovine as compared with that in sheep confirm earlier reports of Melaku and Addis [7] and Kanwal et al. [12]. The differences between the prevalence of rumen fluke infection might be attributed due to the sample size and management systems.

According to the current study sex related susceptibility to ovine paramphistomosis indicated both sexes have equal chance to be infected with the rumen fluke. This fact is also supported by previous author Godara et al. [13].

The prevalence of ovine paramphistomosis was proved be higher 34.72% in adult sheep than young sheep 11.11%. There was statistically significant difference in the prevalence of paramphistomosis with respect to the age of ovine. This result is in agreement with Melaku and Addis [7]. This may be due to the fact that adult sheep graze for longer period of time in the marshy area and young sheep are housed.

Higher proportion of ovine rumen fluke infection was found in Adibomsa and low in Debri. There was statistically significant difference (p<0.05) in the prevalence of ovine paramphistomosis among the different districts. This could be explained by the difference in the presence of intermediate hosts in the grazing area.

There was no significant difference (p>0.05) in the prevalence of bovine paramphistomosis in relation to sex. This is due to the same chance of both sexes to ingest the infective stage during grazing. This is in line with previous reports by Yeneneh et al. [6] and Tagesse et al. [8].

**DISCUSSION**

The results of the present study indicated that the overall prevalence of cattle and sheep rumen fluke infection grazing around Lake Ashenge was 49.44%. This result was higher than the 6.7% and 28.6% reported by Tagesse et al. [8] and Melaku and Addis [7] in ruminants in Hawassa and Jimma town, respectively. The high prevalence of paramphistomosis might be attributed to the intervention with anthelmintics. The higher prevalence of paramphistomosis in bovine as compared with that in sheep confirm earlier reports of Melaku and Addis [7] and Kanwal et al. [12]. The differences between the prevalence of rumen fluke infection might be attributed due to the sample size and management systems.

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The insignificance of age factor indicating that prevalence of bovine paramphistomosis in the study area is insignificant. This might be due to all age groups are grazing communally around Lake Ashenge which allows the animals for equal and continuous infective larvae exposure. This result is in support of the report made by Tagesse et al. [8]. However, this result contradicts with the report of Yeneneh et al. [6], who reported significant difference between age groups.

In this study, the prevalence of bovine paramphistomosis in different districts was assessed. The finding showed no significant variation among the different districts. This might be due to the grazing land surrounding the Lake was so large and all animals from the districts were equally exposed to the larvae of paramphistomum.

CONCLUSION

In this study the prevalence of Paramphistomosis among sheep and cattle were found to be high. Cattle were found to be more infected than sheep. The study on ovine showed that adult sheep are highly infected than the young sheep. There was no significant difference in rumen fluke infection between the ages, sex groups and among districts. The highest prevalence of paramphistomosis in this study indicates lack of deworming facility against this parasite. Thus paramphistomosis must be considered and integrated control approach should be implemented in Ashenge, North Ethiopia.

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REFERENCES