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A Cross Sectional Study on the Prevalence and Possible Risk Factors of Bovine Schistosomiasis in and Around Jimma Town Southwest Ethiopia

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Abstract: A cross-sectional study was conducted from October 2015 to April 2016 in and around Jimma town, southwestern Ethiopia, to determine the prevalence of bovine Schistosomiasis and its associated risk factors. Simple random sampling methods were used to select the study animals and sedimentation technique was applied for recovery of Schistosoma eggs from fresh fecal samples. Out of 179 bovine fecal samples examined, 30 were positive and overall prevalence of Schistosomiasis was 16.8 % in the study area. The prevalence of bovine Schistosomiasis was higher prevalence in Koffe grazing site 11(22%) as compared to Gibe grazing site 9 (18%), Boye grazing site 7 (13.7%) and Bore grazing site 3(10.7%) However, there was no statistically significant difference on the prevalence of bovine Schistosomiasis based on grazing site. Similarly, not statistically significant difference observed between both sexes ($p>0.05$). However statistical significant differences were appreciated among the body condition categories ($p<0.05$). Cattle having good body condition should 0 (0%), medium body condition should 4 (6.06%) and poor body condition had 26 (26.8%) prevalence. The prevalence of Schistosomiasis was 14 (21.9%) in young age group and 16 (13.9%) in adult animal. The prevalence of Schistosomiasis in the animals positive for Fasciola eggs 23(19.4%) and negative for Fasciola eggs 7 (11.4%). There was no statistically difference observed between the two groups ($p>0.05$). Therefore, Schistosomiasis should be taken in to consideration as one of the major limiting factor to livestock productivity in and around Jimma town. Hence, control measures against Schistosomiasis must be designed to target either the parasite or the snail intermediate host or by regular deworming or drainage the area.

Key words: Bovine · Body Condition · Prevalence · Schistosomiasis

INTRODUCTION

Ethiopia has 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. The total cattle population of the country estimated to be about 56.71 million. Out of this total cattle population, the female cattle constitute about 55.45 percent and the remaining 44.55 percent are male cattle [1].

Thought Ethiopia is recognized for its vast wealth of livestock, the economic benefit derived from the livestock center does not commensurate with the potential [2]. Development of cattle population is constrained among other important factors, by wide spectrum of the disease like Schistosomiasis. In Ethiopia, Schistosomiasis appears to be spread in major transmitting sites are small streams all over the highlands of Ethiopia lakes Tana, Zeway as well as irrigation systems, such as sugar state Wonji [3].

Schistosomiasis is a common parasitic infection in Africa and Asia. Although this parasite occurs in many tropical and sub-tropical countries, the disease is important in livestock mainly in eastern Asia, Africa and India. Schistosomiasis is also one of the major diseases of man in tropical countries [4]. Domestic animals in various tropical areas may be infected with *Schistosoma bevies* (cattle and sheep), *Schistosoma indium* (Horses, cattle, goats and Indian buffalo), *Schistosoma matheei* (Sheep, South Africa), *Schistosoma suis* (Swine and goats in India), *Schistosoma japonicum* (Humans, cat and

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mammals in Asia) and *Schistosoma margrebowei* (Horses, ruminants and elephants in Africa). All these species of are found in mesenteric veins of the host and causes hepatic fibrosis [5].

The taxonomic classification of the organism that causes Schistosomiasis is present as platyhalminthes, class trematodes, sub class Digenea, super family schistomatidea, Genus *Schistosoma* and species S*chistosoma bovis, S. matheei, S. mansoni, S. hematobium, S. nasalis* and *S. spinalis* [6]. Schistosomiasis is a chronic debilitating infection affecting both humans and animals by different species of Schistosoma and hence the disease is public health importance.

Other names give to Schistosomiasis are blood fluke disease and Bilharziasis [7]. Therefore, the objective of this study was to estimate the prevalence of bovine Schistosomiasis and to identify host and ecology related risk factors for Schistosomiasis in and around Jimma town.

MATERIALS AND METHODS

Study Area: The study was conducted from October 2015 to April, to 2016 in and around Jimma town, southwestern Ethiopia. The town located in Jimma zone, Oromia regional administration at 352 km southwest of Addis Ababa. The town has a latitude of about 70 36' - 380 56'N and longitude of about 350 52' -370 37'E and an elevation ranging from 880-3360 m above sea level. The study area receives a mean annual rain fall of about 1530 mm, which comes from long and short rain season. The average minimum and maximum annual temperature ranges between 14.4 and 26.6co.

Study Population: The sampling units of study population were cattle systematically selected from four peasant associations (Bore, Gibe, Koffe and Boye). The study animals were local breeds cattle managed under extensive husbandry system and traditional feeding system, which depended mostly on grazing with supplement and minimum health intervention and care in and around Jimma town. Attempts were made to include all age study population. The age of each animal was estimated using the dentition pattern of the animals as described in people.

Study Design: A cross-sectional study was conducted from October 2015 to April 2016 to determine the prevalence of bovine Schistosomiasis and to assess the risk factors in and around Jimma town. A total of 179 cattle were selected by systematic random sampling methods from all the four Pas. Examination was conducted following appropriate sedimentation technique.

Sample Size Determination. The sample size will be determined by using the formula given by Thrusfield [6] with 95% confidence level, 5% desired absolute precision and 13 .46% expected prevalence [8]. According to Thrusfield [6] the number of samples, this particular study was calculated as follows:

$$n = \frac{(1.96)^2 \, p \ \exp \ (1 - p \ \exp)}{d^2}$$

where: n= required sample size
P exp= expected prevalence
d= desired absolute precision

Therefore, the number of cattle, examined in this study was 179. The animal was selected by Simple random sampling method. During sampling of the animals, their breeds, age groups, sex, body condition score and management system was recorded.

Sample Collection: Fecal sample was collected per rectum of individual animals using gloved hand and use 10% formalin was used as preservative. Each sample was labeled with age, sex, body condition, breed and place of the origin. The collected samples were subjected to qualitative coprological examination using sedimentation technique. For the trematodes egg identification, a drop of Methylene blue was added. Sedimentation technique was employed to assess the presence of *Schistosoma* eggs through repeating dilution of the fecal suspension and sedimentation of the eggs, which were heavier than most of the fecal particles [9].

Data Analysis: The collected data was entered and stored into Microsoft Excel spreadsheet 2007. The data were thoroughly screened for errors and properly coded before subjecting to statistical analysis. The data were imported from the Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. Descriptive statistics was used to determine the prevalence of Schistosomiasis and Chi-square (x^2) test was used to assess the association of the potential risk factors like age, sex, body condition, PA and being infected with Fasciola or not, for the occurrence of the Schistosomiasis. A 5% significance level was used to determine whether there are significant differences or not.

RESULTS

Among 179 cattle examined using coproscopical examination in the field survey 16.8 % (n=30) were found to be positive for bovine Schistosomiasis. The prevalence of bovine Schistosomiasis was higher prevalence in Koffe grazing site 11(22%) than Gibe grazing site 9 (18%) and Boye grazing site 7 (13.7%) and Bore grazing site 3(10.7%) However, there was no statistically significant difference on the prevalence of bovine Schistosomiasis based on grazing site. Similarly, there was not statistically significant difference observed between both sexes ($p>0.05$). There was statistically significant differences appreciated among the three body condition categories ($p<0.05$). Cattle having good body condition 0(0%), medium body condition4 (6.06%) and poor body condition had 26 (26.8%) prevalence.

Table 1: Prevalence of bovine Schistosomiasis based on risk factors

Risk factor	Number of examined	Number of positive (%)	χ^2(p-value)
Age			
Young	64	14 (21.88)	1.87(0.2)
Adult	115	16 (13.9)	
Total	179	30 (16.8)	
Body condition			
Poor	97	26 (26.8)	15.65(≤0.001)
Medium	66	4 (6.06)	
Good	16	0 (0)	
Total	179	30 (16.8)	
Sex			
Male	41	9 (21.9)	1.07(0.3)
Female	138	21 (15.2)	
Total	179	30 (16.8)	
Grazing site			
Bore	28	3(10.7)	2.1(0.56)
Boye	51	7 (13.7)	
Koffe	50	11 (22)	
Gibe	50	9 (18%)	
Total	179	30 (16.8)	

Table 2: Prevalence of Schistosomiasis based on Fasciolosis

	FER for Fasciola			
	Negative	Positive	Total	χ^2(p-value)
Negative	54	95	149	1.85(0.174)
FER for Schistosoma				
Positive	7	23	30	
Total	61	118	179	

NB: FER- Fecal examination result

The prevalence result in age category for young 14 (21.9%) and for adult 16 (13.9%). There were no statistically significant differences appreciated among the age categories.

The prevalence of the disease was higher with the animal positive for Fasciola eggs 23(19.4%) than that of animal with negative for Fasciola eggs 7(11.4%). However, there was statistically not significant difference observed between the two Fasciola eggs result ($p>0.05$).

DISCUSSION

The present study revealed an overall prevalence of 16.8% in the study peasant associations and agro-ecological zone of Jimma town; higher prevalence of bovine Schistosomiasis was obtained when it is compared with prevalence of the disease reported by Mihret and Samuel [10] and Mersha *et al*. [11] who reported 7.6 % and 13.7 % prevalence in Debra tabor and south Gondar respectively. This is probably due to the ecological, management and climatic difference between the two localities. Moreover, the management system in practice could also be the probable reason for the variation of the prevalence. This study has higher prevalence than that of prevalence study at Jimma municipality of abattoir in Jimma, 13.6% by Firomsa *et al*. [8]. This is probably due to the difference of origin of animal and grazing site of animals.

The result of this study unlike the result of similar earlier studies conducted in Bahirdar 37.3% by Almaz and Solomon [12] and in Kemisse 28% by Ameni *et al*. [13]. Has lower prevalence based on fecal examination. The variation in the prevalence of Schistosomiasis may be due to the lower humidity and less swampy nature of the study area, which is not suitable for the development and multiplication of the intermediate host snail.

Condition making unfavorable for snail breeding and development of larval stages within the snail, an intermediate host. During the study period, one of the most important factors that influence the occurrence of Schistosomiasis in the area was unavailability of a suitable snail host [14]. The result of the study showed that a relatively high prevalence of bovine Schistosomiasis in Koffe grazing site than the other three peasant associations. This difference was due to swampiest and moisture nature of Koffe than the other three .This can indicate that as the site is low land and with clay soil that absorb the water and retain it for long period which is favorable for intermediate host due to may be Koffe is more prevalent. Similarly, Ameni *et al*. [13]

has reported that water lodged and poorly drained areas with acidic soils are often endemic for schistosmiasis. In this study, the prevalence of the disease is dependent on body condition and it is for the reason that cattle with poor has highest prevalence this is may be the animal immunity suppressed due to malnutrition and other disease. The statistical analysis of this study showed that poor body condition had significant influence on the prevalence of bovine Schistosomiasis in the area, but age and sex had no influence on the prevalence of the disease. There was no statistically significant difference observed between the rates of infection in relation to both age and both sexes. The results indicated that both ages and both sexes were at about the same risk to acquire the infection. This is because of equal exposure to the risk factors, as there were no restriction on movement for grazing and contact with the parasite in terms of sex and age. The cattle were seen grazing in the area that necessitates more contact times with the larval stage of the parasite and the snail intermediate vector. This creates ideal condition for the multiplication of Schistosoma and increases the epidemiology of the disease. Kassaw [15] and Nagi *et al*. [16] reported that the increased contact time with Schistosoma infested habitat increases the rate and endemicity of Schistosomiasis.

CONCLUSION AND RECOMENDATIONS

The prevalence of bovine Schistosomiasis recorded in this study based on coprological examination revealed the presence of Schistosomiasis in the cattle population of the in and around Jimma town water bodies area. The disease detected in both sexes and age groups of the study animals. In addition, the occurrence of the diseases linked closely to the presence of biotypes suitable for the development and multiplication of intermediate hosts. Therefore, this study revealed that bovine Schistosomiasis was one of the major parasitic diseases contributing to loss in productivity and production of cattle in the study area. Depending on this, following conclusion and recommendations are forwarded.

- Schistosomiasis should be considered as one of the major limiting factor to livestock productivity in and around Jimma town.
- Implementation of appropriate control measures for the intermediate host should be encouraged.
- Strategic use of anti-helminthes should be practiced to reduce pasture contamination with fluke eggs.
- Detailed studies involving additional risk factors should be conducted on this similar study.

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