European Journal of Biological Sciences 7 (4): 186-190, 2015
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2015.7.04.9625

Study on the Prevalence of Bovine Schistosomiasis in Fogera Woreda, North-West of Ethiopia

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Abstract: A cross sectional study was conducted from November 2014 up to April 2015 in three selected kebeles of Fogera Woreda, South Gondar Zone, Ethiopia. The present study was aimed to determine the prevalence of bovine schistosomiasis and toidentify risk factors associated with *Schistosoma* infection. Systemic sampling was used to select the study animals within each study peasant associations and coprological examination was applied to identify *Schistosoma* egg (s). Pearson's chi-square test and logistic regression were used to examine the association between potential predictor variables and the occurrence of *Schistosoma* infection. From a total of 185 cattle examined, 19 (10.3%) were found positive for *Schistosoma* egg (s) on coproscopic examination. Among the selected demographic factors, age (p=0.038) and animal body condition (p=0.013) recorded statistically significant association with the identification of *Schistosoma* egg (s) in the feces of study cattle. Moreover;young age (2-5 years) and poor body condition were identified as risk factors. The overall 10.3% bovine schistosomiasis prevalence recorded in the present study was still higher even though the proportion was found lower than other previous similar studies conducted in Fogera Woreda and other localities in Amhara Region. Therefore; all the efforts so far made to decrease the disease in the study area should be strengthened and continuous assessment of the disease ought to be encouraged.

Key words: Cattle · Fogera Woreda · Prevalence · Schistosomiasis

INTRODUCTION

Parasitic diseases are major constraint in animal health and production throughout the tropic and sub-tropical countries of the world [1]. Parasitic diseases caused by helminthes, protozoa and arthropods can cause more economic losses than disease caused by bacteria and viruses but their impact is not clear to animal owners [2].

Schistosomiasis is a chronic debilitating parasitic disease of both human and animals and is caused by different species of the genus *Schistosoma* [3]. Schistosomes are thin elongated fluke, sexually differentiated and primarily parasitize in blood vessels of alimentary tract and bladder [4]. Domestic animals in various tropical areas may be infectedwith *Schistosoma (S.) bovis, S. indicus, S.nasalis, S. suis, S. matheei* [5]. *Sjaponicum* was also reported in human, cats and other mammals in Africa [6]. In human,the disease is common in about 75 developing countries and mainly affects people living in rural agricultural and peri-urban areas [7]. The principal clinical signs in the infectedhost are mainly associated with passage of the spindle eggs through the tissue of the gut lumen. The young parasites cause some damage during migration, but most of the lesions are due to the irritation produced by the eggs of the parasites in the intestine and other organs [5, 8].

Various epidemiological studies were conducted on bovine schistosomiasis in different time periods and localities in Ethiopia. More recently prevalence rates of 28, 33.8, 13.7 and24.3 were reported in previous studies conducted in Kemmissie [9], Bahir Dar [10], South Gondar [11] and Bahir Dar and its surroundings [12] respectively. The findings so far reported were indicatives of the endemic nature of the disease in Amhara Regional State, where our study area found.

Fogera Woreda (the study area) is among the areas in Ethiopia, where huge livestock populations are found and

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the major land cover is used for grazing. It is one of the areas where the climate and the marshy pasture areas are conducive for the occurrence of schistosomiasis in cattle and other domestic animals and human. Furthermore, more recently small-scale traditional irrigation schemes are expanding in many parts of the Woreda and creating favorable habitat for intermediate snail vector there by influencing the occurrence of schistosomiasis. This study was, therefore, formulated to estimate the prevalence of schistosomiasis in cattle and identify some of the potential risk factors associated with its occurrence in Fogera Woreda.

MATERIALS AND METHODS

Study Area: Thestudy was conducted in Fogera Wereda, which is one of the 106 Woredas,of Amhara Regional State and found in South Gondar Zone, Ethiopia. Wereta is the capital of the Fogra Woreda and is found 625km from Addis Ababa and 55km from Bahir Dar. The woreda is situated at 11° 57′N to 12°30′N latitude and 37°35′E to 37°58′E longitude. The altitude ranges from 1774 to 2410 masl. The mean annual rainfall of the woreda is 1284.2 mm and most of this rainfall occurs during ′kiremt′ season between June and September. Temperature ranges from 10° to 27° with mean value 18°. Fogera is divided into 30 rural and 4 urban kebeles.The total land area of the Woreda is 117, 405ha. Flat land accounts for 76% of the total land coverage while mountainous hills and valleys account for 11% and 3%, respectively. The average land holding is 1.4ha with a minimum and maximum hectare of 0.5 and 3.0,respectively. The Woreda is one of eight woredas bordering Lake Tana and has estimated water bodies of 23,354 ha. The livestock population in the woreda was estimated as 239,812 cattle, 35,512 sheep, 28,942 goat, 132,454 poultry, 22,579 bee hives, 21,126 donkeys, 6 horses and 399 mules in theWoreda [13].

Study Population: The study population included cattle,which were kept by the farmers and composed of different age groups, body conditions and both sexes. All animals in selected areas wereowned by smallholder farmers and managed by traditional feeding system with no supplement and minimum health intervention and care. The age category was classified arbitrarilyas calf (<2 years), young (between 2 to 5 years) and adult (≥ 5 years). Study animals were also scored in to poor, medium and good body condition according to Nicholson and Butterworth [14].

Study Design, Sampling and Sample Size Determination: The study design was cross-sectional and was conducted from November 2014 to April 2015.Study kebeles in the plain area of the Woreda close to Lake Tana such as Nabega, Wagetera and Kokit were selected purposely because of their high marshy pasture area. While systemic samplingtechnique was applied to select the study animals in the selected kebeles. The desired sample size was calculated using the formula given by Thrusfield [15] with 95% confidence level, 5% desired absolute precision and 13.7% expected prevalence [11]. Accordingly, a total of 185 cattle were selected and sampled for the present study.

Data Collection: A total of 185 fresh fecal samples were collected directly from the rectum of study cattle. The collected samples were placed into sampling bottle containing 10% formalin, labeled with the necessary information and transported to Wereta Veterinary Clinic for coprological examination. Samples were processed and *Schistosoma* eggs identified based on the techniques indicated by Urquhart *et al.* [16].Individual animal information (like age, sex, body condition and animal origin) and date of sample collection were recorded simultaneously with fecal sampling.

Data Management and Analysis: Data generated from the study was analyzed using STATA Version 12.0 software. The prevalence was determined by dividing the number of animals with *Schistosoma* egg(s) in their feces by the total number of cattle examined during the study period. Chi-square test was used to determine the association between selected potential risk factors with *Schistosoma* infection. Odds ratios (OR), 95% confidence intervals (95% CI) and p-values were calculated for potential predictor variable. P-value of <0.05 was considered significant.

RESULTS

A total of 185 cattle fecal samples were examined for the presence of *Schistosoma* egg(s). Of which, 19 (10.3%) were found positive. Statistically significant associations were observed among thedifferent age groups and the occurrence of *Schistosoma* infection (p=0.038) and body condition and *Schistosoma* infection (p=0.013). Descriptive summary of bovine schistosomiasis based on selected demographic factors and their corresponding statistical analysis using Pearson's Chi-square test are presented in Table 1.

Table 1: Prevalence of bovine schistosomiasis based on different demographic characteristics of cattle examined for *Schistosoma* egg(s) in Fogera woreda:

Demographic Characteristics	Total Examined	Positive	Infection rate (%)	df	χ^2	P-value
Location						
Nabega	60	8	4.32	2	0.96	0.618
Kokit	50	4	2.16			
Wagetera	75	7	3.78			
Sex						
Female	92	10	5.4	1	0.07	0.789
Male	93	9	4.86			
Age						
Calf (<2 yrs)	42	11	0.54	2	6.54	0.038
Young (2-5 yrs)	79	13	7.03			
Adult (≥5 yrs)	64	5	2.7			
Body condition						
Poor	71	13	7.03	2	8.86	0.013
Medium	72	5	2.7			
Good	42	1	0.54			
Total	185	19	10.3			

Table 2: Logistic regression analysis of demographic factors associated with *Schistosoma*infection in cattle studied

Potential risk factors	N	n(%)	COR (95% CI)	AOR (95%CI)
Sex				
Female	93	10 (5.4)	1.0	1.0
Male	92	9(4.86)	0.9(0.34-2.27)	0.93(0.34-2.56)
Age				
calf	42	1(0.54)	1.0	1.0
Young	79	13(7.03)	8.08(1.02-64.06)	3.39(0.37-31.0)
Adult	64	5(2.7)	3.47(0.39-30.85)	8.61(1.05-70.72)
Location				
Nabega	60	8(4.32)	1.0	1.0
Kokit	50	4(2.16)	0.57(0.16-2.0)	0.44(0.12-1.69)
Wagetera	75	7(3.78)	0.67(0.23-1.96)	0.67(0.21-2.11)
Body condition				
poor	71	13(7.03)	1.0	1.0
medium	72	5(2.7)	0.33(0.11-0.99)	0.31(0.10-0.94)
Good	42	1(0.54)	0.11(0.01-0.86)	0.11(0.13-0.87)

N=number observed; n=number of positive; COR: Crude Odd Ratio; AOR=Adjusted Odd Ratio; CI=Confidence Interval

Table 2 showedbi-variate and multi-variate logistic regression analysis for selected potential risk factors such as location, age, sex and body condition. Age and body condition of the examined animals were identified as risk factors. Accordingly, identification of *Schistosoma* egg(s) in the examined cattle feces were less likely in cattle with good body condition (adjusted odds ratio = 0.11, 95% CI: 0.13-0.87) and medium (0.31: 0.10-0.94) compared to those recorded as poor. The risks of schistosomiasisin young and adult age categories were found 8 and 3 times, respectively, higher than the age group designated as calf.

DISCUSSION

In the present study, 19 (10.3%) cattle fecal samples were identified with *Schistosoma* egg(s) from 185 cattle examined for bovine schistosomiasis in Fogera Woreda, North-West Ethiopia. Although further species identification of *Schistosoma* eggs was required, it was not possible due to lack of facilities for species identification locally in Fogera Woreda Veterinary Clinic Laboratory.

Unlike other previous studies conducted in Fogera Woreda and other areas of Amhara Region, the present

study applied bi-variate and multi-variate logistic regression statistical model to identify risk factors associated with bovine schistosomiasis in Fogera Woreda. In connection to this, the different values of odds ratio calculated in the present study were unable to compare and contrast with other similar studies conducted previously in Ethiopia and Amhara Regional State. For this reason, all comparisons made between the findings in the present study and other previous similar studies were only made based on the values of simple prevalence rates and p-values obtained. Accordingly, the overall prevalence of 10.3% bovine schistosomiasis observedin this study was comparable with 10.93% and 12.5%prevalence reported by previous studies conducted in Bahir Dar [17] and FogeraWoreda [18]. However, much lower than 29%, 17.4% and 24.73% other previous studies conducted in Bahir Dar and its surroundings [10, 12, 19], 28% in Kemissie [9] and 27.13% in Dembia Woreda [20]. The low prevalence recorded in the present study might be attributed to lower stagnant (swampiness) water, marshy and higher drainage for rice cultivation and irrigation practice in the study kebeles, which wasnot more favorable for development and multiplication of snail intermediate hosts.

In the present study, statistically no significant variations wereobserved in the prevalence of *Schistosoma* infection among the three study kebeles. However, relatively highest*Schistosoma*infection rate was observed inNabega (4.32%) kebele compared to those observed at Wagetera (3.78%) and Kokit (2.16%) peasant associations. The variation observed in the infection rate of the disease among the different study kebeles might be attributed to the differences in the degree of swampiness (marshy-stagnant water), extent of boundary borderingto Lake Tana, the number of rivers flowing in the area and the moisture content of the areas. Logged water, poorly drained areas with acidic soil wereendemic to schistosomiasis [16].

The variations in the prevalence of 93 and 92 observed in male and female study cattle were not also statistically significant. However,the high proportion of *Schistosoma* infection observed in female compared to male in this study was in line with the findings of previous studies in Amhara Region [10, 11, 12, 20].

In this study,the difference in the prevalence of schistosomiasis among the three age groups was found statistically significant ($p<0.05$). Highest prevalence was recorded in age group of cattle between 2 to 5 years (7.03%) followed by age group with greater than 5 years of age (2.7%) and age group below 2 years (0.54%). This finding agreed with the findings of previous studies in Dembia and Bahir Dar by Alemseged *et al.* [20] and Lulie and Guadu [12], respectively. However, this finding disagreed with the earlier study of Chanie *et al.*[11]. The explanation was that the prevalence of the disease wasdependent on age and it wasfor this reason cattle found in between 2 and 5 years old had showed highest infection rate than other older age groups. The reason was younger animalshadrelatively less immunity to resist the new infection as compared to other older age groups [16, 21].

CONCLUSIONS

The overall 10.3% *Schistosoma* infection rate observed in the present study was found higher even though the proportion was significantly decreased as compared to previous similar study conducted in Fogera Woreda by Chanie *et al*. [11]. This finding strongly suggests that bovine schistosomosis is one of the endemic disease in the study area that deserve serious attention in the future even though there has been little recognition of its veterinary significance, cattle schistosomosis does cause significant loss throughout the world. This is due to the nature of the disease, which usually occurs at sub-clinical level with long term effect on animal growth and productivity and increase susceptibility to other parasitic or bacterial infections. It is, therefore, important to obtain more information on natural schistosomes infection in cattle in general and on the evaluation of the host–parasite relationship under condition of challenge in particular. Differences in age and animal body condition were identified as risk factors in this study. Therefore, all the efforts made to decrease the disease in the study area should be strengthened and continuous assessment of the disease in the study area ought to be encouraged. Further investigations are advisable to define *Schistosoma* species associated with bovine schistosomiasis in the study area. Identification ofadditional potential risk factors related to bovine schistosomiasis should also be desirable.

ACKNOWLEDGMENTS

Our Gratitude goes to Dr. Anwar Nuru, for his valuable guidance and data analysis. We would like to thank our families,Woreta Agricultural Office (especially to Ato Merkew), Wereta City residents and Veterinary Clinic Stuff members (especially to Ato Wondifraw Moges and Dr. Aderajew Ashenafi),and University of Gondar, Faculty of Veterinary Medicine members and the Librarians.

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