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PREVALENCE OF BOVINE SCHISTOSOMIASIS AND ITS ASSOCIATED RISK FACTORS IN AND AROUND BAHIR DAR TOWN, NORTHWEST ETHIOPIA

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ABSTRACT

A cross-sectional study was conducted from November 2017 to March 2018 in Bahir Dar and its surrounding areas, north-western Ethiopia, to determine the prevalence of bovine schistosomiasis and to identify risk factors associated with *Schistosoma* infection. Simple random sampling method was used to select the study animals and coprological examination was applied to identify *Schistosoma* eggs. Total 300 cattle were examined and 21.6% (n=65) were found positive for *Schistosoma* eggs. Cattle of different age groups were studied and significantly ($p<0.05$) differ with the age, young (12.9%), adult (24.1%) and old (27.3%). The prevalence of bovine schistosomiasis across kebeles was found different, in Sebatamit (29.8%), Kebele seven (22.8%),Adisalem (19.3%) and Kebele fourteen (18.7%). But, there was no significant ($p<0.05$) difference based on origin and sex. Animals categorized under poor body condition score has significantly ($p<0.05$) higher prevalence (32, 6%), followed by medium (20%) and good body condition (11%). The prevalence of the disease was higher in local (25.6%) than cross breed cattle (13.9%). It was also significantly ($p<0.05$) higher in extensive management system (26.4%) than semi-intensive management system (16.6%) and intensive management system (0%). This study indicated that bovine schistosomiasis is becoming one of the major cattle health problems in and around Bahir Dar. Therefore, control measures against schistosomiasis must be designed to target either parasite or snail or both.

Keywords: Bahir Dar, Bovine, Coprology, Prevalence, Schistosoma

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1. INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. However, the contribution of livestock industry to the national economy is considerably less than its tremendous potential due to a number of factors including disease, malnutrition and management problems. Parasitic diseases are major constraint in animal health and production throughout tropical and sub-tropical countries of the world (Juyal and Singal, 2011). Among the parasitic diseases in the country, trematodes are one of the major problems of cattle and other ruminants which considerably lowering the productivity and may cause death (Vercruysse and Claerebout, 2001).

Schistosomiasis is a snail borne trematode infection of man and animals in different parts of tropical and subtropical countries (Zangana *et al*., 2012). In livestock sector, it is an economically important disease caused by several *Schistosoma* species, which inhabit the vascular system of final hosts (Lefevre *et al*., 2010). Domestic animals in various tropical areas may be infected with *Schistosoma bovis* (cattle and sheep), *Schistosoma indium* (horses, cattle, goats and Indian buffaloes), *Schistosoma matheei* (sheep, South Africa), *Schistosoma suis* (swine and goats in India), *Schistosoma japonicum* (humans, cats and mammals in Asia) and *Schistosoma margrebowei* (horses, ruminants and elephants in Africa) . Among these *Schistosoma bovis* is the common cause of infection in cattle rearing especially in or near to marshy land. Egg morphology, intermediate host spectra, and definitive host-parasite relationships are the major criteria for species identification of the genus *Schistosoma* (Dwight *et al*., 2003).

Schistosomes are different from most other members of the Digenea in which the sexes are separate. Schistosomes are thin, elongated fluke, up to 2 cm long primarily parasitize in blood vessels of alimentary and bladder (Urquhart *et al*., 2003).

The geographical distribution of bovine schistosomiasis has been determined primarily by the distribution of snail (intermediate host) particularly *Bulinus* species which are important for the occurrence of disease in bovine species. *Schistosoma bovis* is a species whose final hosts are bovine, ovine, caprine and whose reservoir hosts are small wild ruminants. They are distributed throughout Africa, South West Asia and Mediterranean, Europe (Urquhart *et al*., 2003). Animal and human schistosomiasis are dependent on environmental factors such as moisture, rainfall, temperature, water bodies (stagnant ponds, swamps, streams, rivers, irrigation canals, marshes and dams) and snail (Niaz*et al*., 2010; Li *et al*., 2012).

Diagnosis is based on clinical signs and seasonal occurrence in endemic areas. But, previous history of the area or identification of snail habitats, postmortem examinations and examination of faeces for fluke eggs are the best options. However, coprological analysis is commonly used (Thrusfied, 2005). Praziquantel is a highly effective drug for the treatment of bovine schistosomiasis. Treatment of schistosomiasis helps to reverse acute or early chronic disease, prevent complications associated with chronic

infection and prevent neuro-schistosomiasis. The most effective way to control cattle schistosomiasis in endemic areas is to prevent contact between the animals and the parasite (Richer, 2003).

Few and limited studies have been carried out with regard to bovine schistosomiasis in and around Bahir Dar. However, the disease has been encountered frequently in this area of investigation. Therefore, the present study has been designed with following objectives:

i. To estimate the prevalence of bovine schistosomiasis in and around Bahir Dar.
ii. To assess the major risk factors of schistosomiasis in the study area.

2. MATERIALS AND METHODS

2.1. Study area

The study was conducted from November 2017 to April 2018 in and around Bahirdar town, Northwest Ethiopia. This town is bordered with Lake Tana and having an altitude ranging from 1600-1800 meters above sea level and has a warm humid climate with an average annual rainfall of 700 mm. The annual temperature of the area ranges from 12.40 -27°C. The landscape is marked by the presence of Lake Tana, which drains a water shed of about 3,000 km^2 and areas adjacent to Lake Tana and Abay River have poor drainage and annual over flooding during the dry months. The total number of cattle population in Western Gojjam zone was 1,800,917 (CSA, 2008).

2.2. Study population

Samples were collected from local and cross breed cattle reared in different management practices of different age group, breed, sex and place of origin were recorded in the study area. Body condition score of cattle was categorized as poor (1), moderate (2) and good (3) as per method described by Ferguson *et al*., 1994 (Annex 1). The age of cattle was estimated by teeth method, horn method and tail brush method as expressed by Cole, 2008 (Annex 2).

2.3. Sample size

The desired sample size was calculated using the formula given by Thrusfied (2005) with 95% confidence level, 5% desired absolute precision and 26.6% expected prevalence (Assefa *et al*., 2013)and 300 cattle were selected using simple random sampling method to estimate the prevalence of the disease, $n=1.96^2 (p)(1-p)/ d^2$, where, n=required sample size, 1.96= value at 95% confidence interval, p=expected prevalence of schistosomiasis and d=desired absolute precision level at 95% confidence interval (0.05).

2.4. Sample collection

Fresh fecal samples were directly collected from the rectum of the cattle and were preserved in 10% formalin in air tight condition to prevent hatching of miracidia. The eggs were concentrated through sedimentation method and observed under low power microscope.

2.5. Data analysis

Collected data was analyzed using SPSS statistics software program version 20. The total prevalence was calculated by dividing number of positive animals by total number of animas tested. Chi-square was also used for data analysis particularly to determine whether risk factors.

3. RESULT ANALYSIS

Out of 300 faecal samples, 65 (21.6%) samples were found positive for *Schistosoma* eggs. The prevalence of *Schistosoma* infection in this study in relation to origin was higher in Sebatamite (29.8%) as compared to that of kebele seven (22.8%), adisalem (19.3%) and kebele fourteen (18.7%). However, the differences were observed statistically non-significant ($p>0.05$) as shown in Table 1.

Table 1. Overall prevalence of bovine Schistosomiasis on the study areas

Origin	No. of animals examined	No. of positive cases	Prevalence (%)	Chi-square	p-value
Kebele 14	80	15	18.7	2.619	0.454
Kebele 7	83	19	22.8		
Sebatamite	44	13	29.8		
Adisalem	93	18	19.3		
Total	300	65	21.6		

The prevalence of schistosomiasis was higher in old cattle (27.3%), followed adult cattle (24.1%) and lowest in young age groups (12.9%) which differs significantly ($p<0.05$) in all the categories (Table 2).

Table 2. The prevalence of schistosomiasis based on age risk factor

Age	No of animal examined	No of positive cases	Prevalence (%)	Chi-square	p-value	Odd ratio
Young	93	12	12.9	6.41	0.041	
Adult	108	26	24.1			0.395 (0.187-0.897)
Old	99	27	27.3			0.846 (0.453-1.579)
Total	300	65	21.6			

The prevalence of schistosomiasis was significantly ($p>0.05$) highest in female (24.4%) than male (18.7%) presented in Table 3.

Table 3. The prevalence of schistosomiasis based on sex risk factor

Sex	No. of animals examined	No. of positive	Prevalence (%)	Chi-square	p-value
Male	138	26	18.7	1.868	0.43
Female	160	39	24.4		
Total	300	65	21.6		

The prevalence of bovine Schistosoma infection was significantly (p>0.05) highest in local breed cattle (25.6%) as compare to cross breed cattle (13.9%) (Table 4).

Table 4: The prevalence of schistosomiasis based on Breed risk factor

Breed	No. of animals examined	No. of positive cases	prevalence	Chi-square	p-value	Odd ratio
Local	199	51	25.6	5.465	0.013	
Cross	101	14	13.9			2.141 (1.120-4.094)
Total	300	65	21.6			

The highest prevalence of schistosomiasis was significantly (p>0.05) highest in cattle with poor body conditioned (32.6%), followed by medium body conditioned (20%) and lowest in cattle with good body conditioned (11%) (Table 5).

Table 5. The prevalence of schistosomiasis based on body condition risk factor.

Bodycondition	No.of animals examined	No.of positive	prevalence	Chi-square	p-value	Odd Ratio
Poor	92	30	32.6	11.642	0.003	
Medium	135	27	20			3.931(1.674-9.235)
Good	73	8	11			2.031(0.871-4.737)
Total	300	65	21.6			

The prevalence of bovine schistosomiasis was found significantly (p>0.05) higher in extensive management of cattle (26.6%) than that of semi intensive management cattle (16.6%), while the prevalence of *S. bovis* in intensive management was 0% (Table 6).

Table 6. The prevalence of schistosomiasis based on management system risk factor

Management	No of animals examined	No of positive	Prevalence (%)	Chi-square	p-value	Odd ratio
Extensive	208	55	26.4	12.53	0.002	
Semi intensive	60	10	16.6			0.556(0.264-1.173)
Intensive	32	0	0			0.00(0.00-.)
Total	300	65	21.6			

4. DISCUSSION

The cross-sectional study was primarily conducted to assess the prevalence of bovine schistosomiasis and investigate potential risk factors related to its occurrence. The overall prevalence of *Schistosoma bovis* was found 21.6%. This prevalence rate is relatively lower as compared to previous studies which was 37.3% (Almaz and Solomon, 2011) and 34% (Hailu, 1999) in Bahir Dar. The lower prevalence rate of schistosomiasis recorded in this study was might be due to the variation in seasons, sample size, humidity, management practice and climate change. The prevalence rate in the present study was in accordance to the findings of Solomon (2008), Addis *et al*. (2017) and Miressa and Feyissa (2017). However, the prevalence rate was higher than previous study of Mersha *et al*. (2012), Adane and Mulat (2015) andYalelet (2004). The higher prevalence of schistosomiasis recorded in this study was might be due to the greater stagnant water bodies and irrigation practice in the study kebeles, which was favorable for the development and multiplication of snail.

The prevalence rate of schistosomiasis was significantly ($p<0.05$) higher in old cattle (27.3%) than the adult cattle (24.1%), while the lowest prevalence was observed in young cattle (12.9%). This is close agreement with Mengistu *et al*. (2012) and Merawe *et al*. (2014) who stated a significant effect of age on *S. bovis* infection in animals. The present result disagrees with Alemseged (2010), who reported the prevalence rate of 17.6% in cattle below 2 years of age; 30.10% in age between 2 and 5 years and 27.80% above 5 years of age in Dembia district.

The prevalence of schistosomiasis in relation to sex was higher in female (24.4%) than males (18.7%), did not differ significantly ($p>0.05$) Similarly, Solomon (2008) reported a prevalence rate of 29.61% in female and 19.54% in male in and around Bahir Dar and Belayneh and Tadesse (2014) reported 25.9% prevalence in female and 22.4% prevalence in male in Bahir Dar.

Significantly ($p>0.05$) higher prevalence of bovine Schistosoma infection was observed in local (25.6%) as compare to cross breed cattle (13.9%). This result are in agreement with the findings of Belayneh and Tadesse (2014) who reported higher prevalence (24.5%) in local breed cattle than that of cross breed cattle (18.6%) and disagreed with the observations of Mihret and Samuel (2015) who reported the higher prevalence rate in cross breed (8.3%) than that of local breed cattle (7.2%). This might be associated with the difference in exposure to natural infection. The cross breed cattle reared for milk purpose was kept in semi-intensive management system and hence exposure to infection less as compared to local cattle reared in extensive management system pickup more infection naturally. The statistical analysis of this study showed that body condition score of the animals had significant ($p<0.05$) influence on the prevalence of bovine schistosomiasis. The highest prevalence was observed in animals with poor body condition (32.6%), followed by medium body condition (20%) and lowest in cattle with good body condition (11%). This Result was similar to the result of Miressa and Feyissa (2017) who reported the prevalence rate of 32.46% in animals of poor body condition score, 21.42% in medium body condition score and 11.86% in good body condition score. Abebe *et al*. (2011) also reported that the prevalence of

schistosomiasis was 23.81% in animals of poor body condition score, 3.92% in medium body condition score and 0.00% in good body condition score in Jimma and Agaro area. The deviation might be due to variation in the accessibility of animals to the marshy area and management. However, non-significantly ($p<0.05$) highest *Schistosoma* infection was observed in sebatamit kebele (29.8%) as compared to those found in kebele seven (22.8%), adisalem (19.3%) and kebele seventeen (18.7%). This result agrees with the findings of Meriem and Tewodros (2015) in fogera wereda and disagrees with the result of Miressa and Feyissa (2017) in bakko town. The variation observed in the infection rate of the disease among the different kebeles might be attributed to the differences in the degree of swampiness (marshy-stagnant water), the number of rivers flowing in the area and the moisture content.

4. CONCLUSION AND RECOMMENDATION

The higher (21.6%) prevalence of *Schistosoma* infection can causes a significant economic loss to the local community. Schistosomiasis should be taken in to consideration as one of the major limiting factor of livestock production. The sub-clinical nature of the disease causes long term effect on animal growth and productivity and increase susceptibility to other parasitic or bacterial infections. The occurrence of schistosomiasis is closely linked with environmental factors suitable for the development, breeding and multiplication of intermediate host (snail) and the parasite itself. Risk factors such as age, breed, and body condition score and management had significant effect on prevalence rate of schistosomiasis in cattle, but sex and origin did not show any significant effect. Moreover, the study area is suitable for the survival of the snail, which further worsened the situation. In view of above conclusion the following recommendations can be adopted in the area of investigation to prevent *Schistosoma* infection in cattle.

- Farmers should avoid their cattle to graze freely in swampy area and supply dry feeds.
- Regular deworming before and after rainy season.
- Farmers should aware with the risk factors of *Schistosoma* infection.
- Strategic control measures against schistosomiasis must be designed to target either the parasite or the intermediate host snail.

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