



Prevalence and Associated Risk Factors of Bovine Schistosomiasis in Northwestern Ethiopia

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ABSTRACT

Schistosomiasis is a parasitic disease caused by microorganisms from the genus *Schistosoma*. It has a huge negative impact on both economy and health worldwide. In this paper a cross-sectional study was conducted to evaluate the prevalence and associated risk factors of bovine schistosomiasis in north western Ethiopia with the objective of providing detailed information on bovine schistosomiasis prevalence in relation to animal and ecological related risk factors. The sampled animals were categorized under four associated risk factors which include: origin, sex, body condition score and age. Fecal samples were randomly collected from a total of 289 animals and *Schistosoma*'s eggs were identified by sedimentation technique. 69 (23.9%) fecal samples were revealed positive for *Schistosoma*. The highest (29.8%) prevalence rate was recorded at Keltafa district followed by Lalibella (25.9%), Korench (19.1%) and kurbiha (14.0%). Animals categorized under medium body condition score has a relative high prevalence (25.7%) followed by poor (24.3%) and good body condition (21.7%) animals. In conclusion, the prevalence recorded among different selected study districts, sex, body condition score and age groups shows some degree of variability and insignificant ($p > 0.05$), which resulted from the difference in abundance of marshy areas and rivers, animal's immunity and types of management system. Despite these variability factors, the disease has a great socio-economic impact that needs intervention.

Key words: Bovine, Prevalence, Schistosomiasis, Ethiopia

INTRODUCTION

Parasitism represents a major challenge to development. Trematode parasitism is one of the major problems constraining of both animal and human productivity around the world (Jejaw et al., 2015). These parasites are found in vast water lodged and marshy grazing field, a condition anticipated for being ideal for the propagation and maintenance of the intermediate host (snails) and hence high prevalence of trematode infection occurred (Fromsa et al., 2011). Schistosomiasis (also called Bilharzias after the German tropical disease specialist (Lo and Lemma, 1973) is a parasitic disease caused by microorganism from the genus *Schistosoma*. The major species that cause animal schistosomiasis include: *Schistosomabovis*, *S. indicum*, *S. japonicum*, *S. matthei*, *S. intercalatum*, *S. nasale* and *S. rodhoni* (Jejaw et al., 2015). *S. bovis*, *S. matthei* and *S. intercalatum* are the most important species that can cause schistosomiasis in ruminants. The adult worms inhabit the mesenteric vessels of the definitive host and the intermediate forms develop into snails from the genus *Biomphalaria*, *bulinus* and *monocephala* (Kassai, 1999).

Schistosomiasis is one of the 15 neglected diseases in tropics and it is the second parasitic disease next to malaria. It is endemic not only in sub-Saharan Africa, but also in the Middle East, Far East, South, Central America and the Caribbean (Taylor et al., 2007; Georg et al., 2003).

S. bovis has a localized distribution, which is commonly found in northern, eastern, south eastern and central part of Ethiopia. There are some reports which indicate the prevalence of schistosomiasis in different area of Ethiopia (Belayneh and Tadesse, 2014). However there are few documentation examples in north western Ethiopia. Therefore this study was conducted to fill this information gap with the objectives of estimating the prevalence and assessing the impact of host and ecological related risk factors for the occurrence of bovine schistosomiasis in north western part of Ethiopia.

MATERIAL AND METHODS

Study area

The study was conducted in four districts such as Ahuri-keltafa, Korench, Kurbiha and Lalibella which are 60km

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away from the city of Bahir Dar from November 2015 to April 2016. The areas cover a total of 217995 hectares of land. Geographically located at 11°37'N latitude and 37°25'E longitude with an altitude of 1500-2300 meter above sea level (m.a.s.), 1200-1600 mm rain fall and average temperature of 29.5°C recorded annually. Animal population in the areas include 204747 cattle, 763000 sheep, 35970 goats, 9980 horses, 5218 mules and 16570 donkey. About 70% of the land is featured by plain plateaus and covered by various bush formation low woods and some semi-humid and humid highland vegetation. The landscape is marked by the presence of Nile River, has a poor drainage system and annual over flooding during the rainy seasons which leave pockets of water bodies for long period of time during the dry season (CSA, 2008).

Study animals

The sampling units of the study were cattle of different body condition score, age, sex and origin that were found in the four districts. The age of each animal was estimated using the owner's response and dentition pattern as young or adult. The cattle had different body condition scores like, good, medium and poor depends on visualization and both sexes were involved in the study.

Study design, sampling and data collection

A cross-sectional study was conducted to estimate the prevalence of bovine schistosomiasis and its associated risk factors. This study was performed by coprological examination of samples, which were collected from systematically random selected animals. Samples of fresh faeces were collected directly from the rectum of the cattle. The collected samples were preserved by 10% formalin in a universal bottle with proper labeling of necessary information and then transported to the laboratory for further examination and analysis of *Schistosoma*'s eggs using sedimentation technique.

Data management and analysis

Data was stored in a Microsoft Excel spreadsheet and analyzed using SPSS version 16.0 statistical software. While descriptive statistics such as percentages were used to calculate prevalence rate, Chi-square test was used to evaluate the association between different parameters and P-value less than 0.05 considered as significant.

Ethical approval

This study is conducted according to the research ethics approved by the University of Gondar, Ethiopia and no animal was subjected to suffer.

RESULTS

From the total of 289 bovine species examined, 69 (23.9%) were infected by *Schistosoma*. The highest prevalence (29.8%) was observed in animals originated from Ahuri-keltafa district representing mid highland. As indicated by table 1 the prevalence of schistosomiasis at Ahuri-keltafa (29.8%) district was followed by lalibella (25.9%) and korench (19.1%) districts. As denoted by table 1 the prevalence based on sex was 24.3% in female whereas 23.5% was recorded in male bovines. Based on age as risk factor, the prevalence in adults were relatively higher (25.6%) than that of young bovines (21.6%). Moreover, highest prevalence was (25.7%) recorded in medium body condition score followed by poor (24.3%) and good (21.7%) body condition score animals. Despite all risk factors have some degree of visible effect on the prevalence of schistosomiasis, the difference between all risk factors was not statistically significant ($p > 0.05$).

Table 1. Prevalence and associated risk factors of bovine schistosomiasis around in north western Ethiopia from November 2015 to April 2016

Risk factors	Category	No. examined	Positive	Prevalence (%)	P- value
Sex	Male	153	36	23.5	0.88
	Female	136	33	24.3	
Age	Adult	164	42	25.6	0.43
	Young	125	27	21.6	
Body Condition	Good	106	23	21.7	0.79
	Medium	113	29	25.7	
	Poor	70	17	24.3	
Origin	Keltafa	84	25	29.8	0.16
	Korench	47	9	19.1	
	Kurbiha	50	7	14.0	
	Lalibella	108	28	25.9	

DISCUSSION

The overall prevalence of *Schistosoma bovis* found in this study area was at 23.9%. This prevalence rate is relatively lower as compared to previous studies, including 29% by Hailu (1999) in Bahir Dar area, north and central Ethiopia, 37.3% by Almaz and Solomon (2011) in Bahir Dar area, 27.13% and by Alemseged (2010) in Dembia district. But relatively higher than 17.4% by Yalelet (2004) in and around Bahir Dar, North western Ethiopia, 10.17% by Mersha et al. (2012), at South Gondar zone, Amhara national regional state, Ethiopia, Gewanie (1.5%) and Hawassa (5.5%) by Lo and Lemma (1973). Furthermore, as Abebe et al. (2011) reported the prevalence of schistosomiasis was 4.59% in Agaro and 10.11% Jimma area. The difference might be due to reasons such as irrigation practice, agro-ecology, animal management type, climatic variation and other geographical factors.

The present finding also disclosed higher prevalence (29.8%) in Keltafa district as compared to the other districts. The variation in the prevalence of the disease might be the presence of Nile, Kiltiand Biranti rivers which are the major water source to animals originated from Keltafa area and the presence of Gedelit, Gumara, Walkaye, Wulsi and Ahuri marshy range land from which animals graze in common. In support of this theory, Urquhart et al. (1996) has explained the importance of water bodies and marshy areas for the occurrence of schistosomiasis. Prevalence in Lalibella district was the second highly prevalent (25.9%). This result might be due to the presence of highly swampy communal range land called Flantimesk, Adissambamesk, Azenamesk and the presence of Zabziriver which passes across the Flantimesk communal range land. The remaining two districts such as Korench (19.1%) and Kurbiha (14.0%) have seasonal marshy areas and small rivers which would serve as the reservoir of the intermediate hosts (snail) and important for endemic nature of schistosomiasis.

In the present study the prevalence variation of schistosomiasis between the two sexes were at 23.5% in female and 24.3% in male. This data is in line with Tadesse et al. (2009) who reported the prevalence of bovine schistosomiasis 22.4% in male and 25.9% in female around Bahirdar city. This might be due to the fact that absence of difference in grazing behavior, animal management and grazing land for the two sexes.

Statistical analysis of this study indicated that body condition score had no influence on the prevalence of bovine schistosomiasis. The prevalence was relatively highest in medium body condition score animals (25.7%), comparing to poor (24.3%) and good (21.7%) condition score bovines. This result contradicted the result of Hailu (1999) and Belayneh and Tadesse (2014) who reported the prevalence of bovine schistosomiasis 22.4% in male and 25.9% in female at Bahirdar city. This Result contradict again with Abebe et al. (2011) who reports as the prevalence of schistosomiasis was 23.81% in poor body condition score animals, 3.92% in medium body condition score animals and 0.00% in good body condition score animals at Jimma and Agaro areas. The deviation might be due to variation in the accessibility of animals to the marshy area, animal management system and difference in the study districts.

The age of the study animals was classified as young (≤ 3 years) and adult (> 3 years) by dentition. The prevalence of schistosomiasis according to age as a risk factor were 21.6% and 25.6% in young and adult animals, respectively. This result agreed with the result of Belayneh and Tadesse (2014) and Abebe et al. (2011) who obtained the prevalence was 0.00% in young and 8.28% in adult animals at Jimma town municipal abattoir. However, this result disagrees with Taylor (2007) who reported that the prevalence of the disease is dependent on age.

CONCLUSION

The present study shows that different risk factors affect the prevalence of schistosomiasis. Although the different variability resulted from degree of a bundancy in marshy areas and rivers which act as reservoir for snail intermediate hosts, animal's immunity status, animal management system and other geographical and environmental factors, the disease has great socio-economic impact that needs an intervention.

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Competing interest

The authors have not declared any conflict of interest

Author's contributions

Addis Kassahun Gebremeskel designed and conducted analysis; Solomon Tayelgn Simeneh conducted the experiments, Shewangzaw Aaddisu Mekuria conducted edition.

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