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Prevalence of Bovine Schistosomiasis and its Associated Risk Factor in and Around Debre Tabor Town, North West of Ethiopia

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Abstract: A cross-sectional study was conducted from October, 2014 to April, 2015 in and around Debre Tabor town, South Gondar Zone of Amhara region, Northwestern Ethiopia, to determine the prevalence of bovine schistosomiasis and its associated risk factors. Simple random sampling method was used to select the study animals and sedimentation technique was applied for recovery of *Schistosoma* eggs from fresh fecal samples. Out of 384 fecal samples examined, 29 were found positive and overall prevalence of schistosomiasis was 7.6% in the study area. The prevalence of bovine schistosomiasis was higher prevalence in T/eyesus (9.2%) than Selamko (7.4%) and Gribi (6.1%). But there was no statistically significant difference on the prevalence of bovine schistosomiasis based on origin. Similarly, there was not statistically significant difference observed between both sexes ($p>0.05$). There was statistically significant differences appreciated among the three age categories ($p<0.05$). Cattle having = 2 years, 2-5years and =5 years old had 3.1%, 11.5% and 8.1% prevalence, respectively. The prevalence result in body condition category was reported relatively higher in poor body condition cattle (11.9%) and lower in good body condition animals (3.4%). There were statistically significant differences appreciated among the three body condition categories ($p<0.05$). The prevalence of the disease was higher in cross breed cattle (8.3%) than that of local breed cattle (7.2%). But there was statistically not significant difference observed between the two breeds ($p>0.05$). Therefore, schistosomiasis should be taken in to consideration as one of the major limiting factor to livestock productivity in and around Debre Tabor town. Hence, control measures against schistosomiasis must be designed to target either the parasite or the snail intermediate host.

Key words: Bovine · Coprology · Prevalence · Schistosomiasis · Sedimentation Test

INTRODUCTION

Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world. In Sub-Saharan Africa countries livestock plays a crucial role for the national economy and the livelihood of rural communities. It provides draught power and raw material for industry [1].

Ethiopia has the largest livestock population in Africa, but productivity is low as a result of parasite, bacterial, viral disease, malnutrition and other management problems. Parasitism is one of the major impacts on livestock development in the tropics. Among many parasitic problems of farm animals, schistsomiasis is one of the most prevalent trematode infections of ruminants in different parts of the world including Ethiopia [2].

Schistosomiasis is a snail borne trematode infection of man, animal and wild animals in different parts of tropical and subtropical countries [3,4, 5]. In livestock sector, it is an economically important disease caused by several *Schistosoma* species, which inhabit the vascular system of final hosts [6].

Domestic animals in various tropical areas may be infected with *Schistosoma bovis* (cattle and sheep), *Schistosoma indium* (horses, cattle, goats and Indian bufflo), *Schistosoma matheei* (sheep, South Africa), *Schistosoma suis* (Swine and goats in India), *Schistosoma*

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japonicum (humans, cat and mammals in Asia) and *Schistosoma margrebowei* (horses, ruminants and elephants in Africa). All these species of *Schistosoma* are found in mesenteric veins of the host and causes the disease hepatic fibrosis [7].

In Ethiopia, epidemiological studies conducted on bovine schistosomiasis are suggestive of the endemicity of the disease particularly in the area with large permanent water bodies and marsh pasture area. The prevalence of *Schistosoma bovis* has been reported in different parts of Ethiopia from fecal sample examination study conducted in Gewane, 1.5% and in Awassa, 5.5% [8], in Bahir Dar, 33.8% [9] and 22.06% [10] and 28% in Kemissei [11].

Pathogenesis of schistosomasis during larval migration may cause mechanical damage and lesions. Moreover *Schistosoma* eggs trapped in the tissue elicit granulomatous reaction that is mounted to destruct the eggs. These granulomas consist of several cell types, mainly eosinophils, macrophages and lymphocytes. In the chronic stages of the disease the pathology is associated with collagen deposition and fibrosis, resulting in organ damage and dysfunction [12].

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. Coprological analysis is commonly employed to diagnose schistosomiasis [13].

Several drugs such as trivalent antimonials, hycanthone, nitridazole, trichlorphan, haoxon, amoscanate and praziquantel have been used to treat visceral and nasal Schistosomiasis with variable efficacy and toxicity [14].The drug praziquantel is choice for all species of schistosomiasis [11].

Though our study area ended with wetland fields that favor the breeding and development of *Schistosoma* species biological vectors (snails), there is no any report regarding the prevalence of bovine schistosomiasis in and around Debre Tabor town, Northwest Ethiopia. Nevertheless, there is no any epidemiological data with regard to risk factors of the disease in and around Debe Tabor. Therefore, the present study has the following objectives:

- To estimate the prevalence of bovine schistosomiasis in and around Debre Tabor
- To assess the major risk factors of schistosomasis in the study area

MATERIALS AND METHODS

Study Area: The study was conducted from October, 2014 to April, to 2015 in and around Debre Tabor town, Northwest Ethiopia. It is located at 11.850°N 38.017°E latitude and 11°51'N 38°1'E longitude and at 666km from Addis Ababa, capital city of Ethiopia. The altitude of the district ranges from 2,706 m.a.s.l and the mean annual rain fall 1497 mm with the annual temperature ranges from 9.9°C to 21°C. The district has banks of streams, ponds, marshy stagnant water bodies, irrigation and swampy area. The livestock populations found in the district include cattle, sheep, goats, horses, mules, donkeys and poultry. Among these animals cattle are the dominant species raised in the area [15].

Study Population: The sampling units of study population were cattle randomly selected from three peasant associations (Selamko, Tsegur eyesus and Girbi). The study animals were local and cross 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 Debre Tabor town. Attempts were made to include all age (young=2 years, adult 2-5 years and old =5 years) and sex (male and female) groups of study population. The age of each animal was estimated using the dentition pattern of the animals as described in Pope [16].

Study Design: A cross-sectional study was conducted from October, 2014 to April, 2015 to determine the prevalence of bovine schistosomiasis and to assess the risk factors in and around Debre Tabor town. A total of 384 cattle were selected by simple random sampling methods from all the three PAs and coprological examination was conducted following appropriate sedimentation technique.

Sample Size Determination: Simple random sampling method was used to select the study animals in the three selected peasant associations. The sample size was calculated according to Thrusfield [13] using 95% confidence interval and 5% of desired absolute precision. Since, there were no previous studies done on bovine schistosomiasis in the study area, 50% expected prevalence was considered.

$$n = \frac{1.96^2 Pexp\ (1\text{-}Pexp)}{d^2}$$

Where
n = required sample size,
Pexp = expected prevalence,
d = desired absolute precision. Therefore, n=384 bovine were required for this study.

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 [17].

Data Analysis: The collected data was entered and stored into Microsoft Excel spread sheet 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 16.0. Descriptive statistics was used to determine the prevalence of schistosomiasis and Chi-square ($x2$) test was used to assess the association of the potential risk factors like age, sex, body condition, PA and breed for the occurrence of the schistosomiasis. A 5% significance level was used to determine whether there are significant differences or not.

RESULTS

Among a total of 384 cattle examined using coproscopical examination in the field survey 7.6% (n=29) were found to be positive for bovine schistosomiasis. The prevalence of bovine schistosomiasis was higher in T/eyesus (9.2%) than Selamko (7.4%) and Gribi (6.1%). But there was no statistically significant difference on the prevalence of bovine schistosomiasis based on three Pas (p>0.05) as indicated in Table 1.

Influence of breed on the prevalence of bovine schistosomiasis revealed that there was higher prevalence rate (8.3%) in cross than local breed (7.2%). But there was no statistically significant difference on the prevalence of bovine schistosomiasis based on breed (p>0.05) as shown in Table 1.

Table 1: Prevalence of bovine schistosomiasis based on risk factors

Risk factors	No. of examined	No. of positive	Prevalence (%)	x^2 (p-value)
Study Site				
Selamko	122	9	7.4	0.951(0.622)
T/eyesus	130	12	9.2	
Gribi	132	8	6.1	
Total	384	29	7.6	
Breed				
cross	133	11	8.3	0.15(0.698)
local	251	18	7.2	
Total	384	29	7.6	
Sex				
Male	164	8	4.9	2.932(0.087)
Female	220	21	9.5	
Total	384	29	7.6\	
Body condition				
Poor	134	16	11.9	6.777(0.034)
Medium	131	9	6.9	
Good	119	4	3.4	
Total	384	29	7.6	
Age (years)				
≤ 2	131	4	3.1	6.815(0.033)
2-5	130	15	11.5	
≥ 5	123	10	8.1	
Total	384	29	7.6	

The prevalence of bovine schistosomiasis in male and female was 4.9% and 9.5%, respectively. Although the prevalence was relatively higher in female as indicated in Table 1 the difference was not statistically significant (p>0.05).

Prevalence of bovine schistosomiasis on poor body condition animals was 11.9% and medium body condition (6.9%). However, animals with good body condition showed prevalence of 3.4%. As described in Table 1, significant difference (p< 0.05) was observed among body condition of the study animals for the occurrence of schistosomasis.

Prevalence of schistosomiasis varied based on their age. Low prevalence was observed in <2 years (3.1%), Meanwhile, Highest prevalence was observed within value 2-5 years (11.5%) and >5 years (8.1%). As indicated in Table 1 significant difference (P < 0.05) was observed among age in the study animals.

DISCUSSION

Schistosomiasis is known to be livestock and public health important disease and for establishment of a control strategy, detailed information on local epidemiology and significance of the disease must be known. The overall prevalence of bovine schistosomiasis infection found in this study was 7.6%. However, the prevalence from this study is lower than the other studies done previously in the study region around Lake Tana which was 13.7% in Fogera by Mersha *et al.* [18], 22.06% in and around Bahir Dar by Solomon [10] and 27.13% in Dembia by Alemseged [19].There was prevalence difference due to the variation in the ecology as most of the kebeles included in this study in Debre Tabor district were located not close to Lake Tana or any permanent stagnated water bodies, but has swampy, pastureland that creates a favorable environment for the existence of intermediate host (snail vectors). Other reasons may be the variation in the study seasons, sample size and humidity, management and climate change between localities. The slight schistosomiasis prevalence difference among study kebeles, relatively higher in T/Eyesus and Selamko could be due to swampiest and moisture nature of most of the grazing areas in these kebeles. Almaz [20] has reported that water lodged and poorly drained areas with acidic soils are often endemic for schistosomiasis.

According to the age group, the prevalence of schistosomiasis in this study was the highest in age group of cattle between 2-5 years (11.5%) followed by that to the age group with greater than 5 years of age (8.1%) and it was least in age group of below 2 years (3.1%). However, the difference in the prevalence among the three groups was not statistically significant ($P<0.05$). This finding agrees with the work of Alemseged [20], who reported 17.6% in that age groups below 2 years; 30.10% in age between 2 and 5 years and 27.80% above 5 years in Dembia district. The present study result disagree with Taylor and Wall [21] who reported that the prevalence of the disease is dependent on age and it is for that cattle less than 2 years old has highest prevalence. The variation in the prevalence between two sexes (4.9%) in male and (9.5%) in female revealed no statistically significant ($P>0.05$) difference observed between the rates of infection in relation to both sexes. This is in according with previous study of Solomon [10], 29.61% in female and 19.54% in male in and around Bahir Dar as well as Alemseged [19], 30.70% in female and 23.30% in male in Dembia district. The results indicated that both sexes are the same risk to acquire the infection. This is because of equal exposure to the risk factors as there were no restrictions on movement for grazing and contact with the parasite in terms of sex. This creates ideal condition for the multiplication of *Schistosoma* and increases the epidemiology of the disease; Kassaw [22] also reported that the increased contact time with *Schistosoma* infested habitat increases the rate and endemicity of schistosomiasis. But this finding was different from previous study report of Alemseged [19] in Dembia district and Solomon [10] in and around Bahr Dar. The difference in reports may be due to unproportion representation of male and female animals in previous studies.

Schistosoma infection rate in relation with body condition score in the present study was varied in cattle. Animals with poor body condition score were more affected than other groups of animals. Similarly Merawe *et al* [23] affirmed that the infection rate increase with animals which have poor body condition score. This could be due to that acquired immunity status of poor body condition and weak animals become more suppressed and susceptible which might be due to malnutrition and other parasite infection. So, infected animals may require long period of time to respond against *Schistosoma* infection. This gives suitable time for establishment and fecundity of the parasite in animals. This finding also coincides with the work of Belayneh and Taddese [24] that accounted the prevalence of *Schistosoma* more common in animals with poor body score animals than medium and good body condition.

Although the prevalence of bovine schistosomiasis in this study was higher in cross breed (8.3%) than that of local breed cattle (7.2%), the difference was not statistically significant ($P>0.05$). In support of this work, Solomon [10] reported higher prevalence (25.83%) in cross breed cattle than that of local breed cattle (16.66%). In contrast, Alemseged [19] recorded higher prevalence of bovine schistosomiasis in local breed than cross breed in Dembia district. This inagreement might be because of the local breeds were well adapted to the area hence they could be immuned due to continuous infection by the parasite.

CONCLUSION

The present study shows the occurrence of *Schistosoma* infection in cattle in and around Debre Tabor town. The occurrence of schistosomiasis is closely linked with environmental factors suitable for the development,

breeding and multiplication of snail intermediate hosts and the parasite itself. Therefore, it can be concluded that *Schistosoma* infection is one of the major parasite diseases contributing to loss in productivity and production of cattle population in the study area.

Recommendations: Depending on the above conclusion the following recommendations are forwarded;

- Agriculture department should initiate actions for control of snails through drainage of stagnant water in swampy areas.
- Further epidemiological investigations should be initiated to assess the worm burden in Ethiopia to study the associated risk factors and indirect economic losses.
- Veterinary service should be extended to the disease prevalent areas with provision of modern antihelemthtics for treatment of affected animals.
- Farmers should get awareness about the risk factors and schistosomiasis transmission
- Regular deworming of animals before and after the rainy season should be done.

REFERENCES

1. International Livestock Center for Africa, 2007. Annual Report. Addis Ababa, Ethiopia, pp: 34-38.
2. Ali, A., B. Erko, Woldemichael and H. Kloos, 2006. schistosomiasis epidemiology and ecology health and disease in Ethiopia, pp: 661-669.
3. Singh, A. and S. Chaudhri, 2004. Visceral schistosomiasis of domestic animals in India. Humoral immune status of infected cattle, sheep and goats against major polypeptide antigens of Schistosoma indicum and Schistosoma spindale. parasite and Immunology, 26: 167-175.
4. Islam, M., N. Begum and M. Alam, 2011. Epidemiology of intestinal schistosomiasis in ruminants: of Bangladesh. Journal of Banglanesh Agricultural University, 9(2): 221-228.
5. Zangana, I. and K. Aziz, 2012. Prevalance and pathological study of schistosomiasis in sheep in Akra/Dohuk province, Norther Iraq. Iraq Journal of veterinary science, 26: 125-130.
6. Lefevre, C., J. Blancou, R. Chermette and G. Uilenberg, 2010. Infectious disease of livestock. 1st ed. Paris. Lavoizer, 2: 1699-1703.
7. Dwight, D., I. Bowman and A. George., 2003. Parasitology for Veterinarians. 1st ed. USA: Elsevier, pp: 129-133.
8. Lemma, A., 1999. A study on Schistosoma bovis. Annals of Tropical Medicine and Parasitology, 69: 375-382.
9. Hailu, M., 1999. Observations on the prevalence intensity of Schistosoma bovis infection in Bahr Dar, North central Ethiopia. DVM Thesis, Fculity of Veterinary Medicine, Addis Ababa University.
10. Solomon, O., 2008. Observation on the prevalence of Schistosoma Bovis infection in Bahir Dar area. North central Ethiopia, Global Veterinaria, 3(1): 13-16.
11. Ameni, G., B. Korok and T. Bogale, 2001. Preliminary study on the major bovine trematode infection around Kemissie. Northeasten Ethiopia and treatment trial with praziquantel, American- Eurasian. Journal of Scientific Research, 2(1): 24-28.
12. Yalelet, W., 2004. Survey on Bovine schistosomasisin and around Bahir Dar, North western Ethiopia. Global Veterinaria, 3(2): 12-15.
13. Thrusfied, M., 2005. Survey in veterinary epidemiology 2nd ed. Cambridge: Blackwell science. Ltd, pp: 182-189.
14. Bedarkar, S.N., B.W. Narladkar and P. D. Despande, 2000. Seasonal prevalence of snail borne fluke infections in ruminants of Maratwada region. Journal of veterinary Parasitology, 14: 51-54.
15. CSA, 2008. Summary of statistic reports of 2007 population and housing census; Federal Democratic Republic of Ethiopiapopulation censuses commission. December 2008, Addis Ababa, Ethiopia.
16. Pope, G.M., 2008. Determining the age of cattle by their teeth. Farmers' Bulleitin1066 USA Departement of Agriculture, pp: 1-12.
17. Hansen, J. and B. Perry, 1994. The epidemiology, Diagnosis and control of Helminthes parasite of Ruminants A hand book of animal production and health division of FAO, Rome, Italy, pp: 171.
18. Mersha, C., D. Belay and F. Tewodros, 2012. Prevalence of Cattle schistosomiasis and Associated Risk Factors in Fogera Cattle, South Gondar Zone and Amhara National Regional State, Ethiopia. Journal of Advanced Veterinary Research, 2: 53-56.
19. Alemseged, G., 2010. Prevalence of bovine schistosomiasis in Dembia District North west Ethiopia. Dvm thesis, faculty of veterinary medicine. Gondar, Ethiopia.
20. Almaz, H., 2007. Pathology of naturally occurring Schistosoma infection in cattle slaughtered at Bahir Dar municipal abattoir North West Ethiopia. MSc thesis, Faculty of Veterinary medicine, Addis Ababa University, Debere Zeit, Ethiopia.

21. Taylor, M.A., R.L. Coop and R.L. Wall, 2007. Veterinary Parasitology 3rd edition, Blackwell Publishing, Oxford, pp: 201-208.
22. Kassaw, A., 2007. Major Animal Health Problems of Marketing Oriented livestock Development in Fogera.DVM Thesis.FVM, Addis Ababa Univeristy, Debreziet Ethiopia.
23. Merawe, M., K. Amsslu, Y. Hagos and B. Afera, 2014. Intestinal schistosomiasis of Bovine and Ovine in Fogera district, South Gondar Zone, Amhara National Regional State, Ethiopia. Acta Parasitolgical Globalis, 5(2): 87-90.
24. Belayneh, L. and G. Tadesse, 2012. Bovine schistosomiasis: A Threat in Public Health perspective in Bahir Dar Town, Northwest Ethiopia.Acta Parasitological Globalis, 5(1): 1-6.