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Crossectional Study on Prevalence of Bovine Schistosomiosis and its Associated Risk Factors in Dangila District, Amhara National Regional State, Ethiopia

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ABSTRACT

A cross sectional study was conducted from November 2014 to April 2015 in Dangila District, Awi Zone, Amhara National Regional State, Ethiopia, to determine the prevalence of Bovine schistosomosis and to identify the possible associated risk factors. Simple random sampling method was used to select the animals and coprological examination using sedimentation technique was applied for the recovery of *Schistosoma* eggs from freshly collected fecal samples and preserved in 10% formalin. Of the total 384 cattle examined, 44(11.5%) were found to be positive for *Schistosoma bovis*. there was no statistically significant difference observed among four kebeles; even though Dengesgta (16.3%) revealed the highest prevalence, while the lowest in Gumdrie (7.3%). There was no significant difference between two breeds, sexes and three age groups, even though, the prevalence of bovine schistosomosis was recorded higher in local breed cattle(12%) than that of cross breed cattle(8.5%), in female cattle(12.6%) than that of male(9.9%), and it was higher in age group of cattle below 2 years(14.7%) than above 2 years and below 5 year of age(11.7%) and that of age group of above 5 years(10.2%). The prevalence in poor body condition (23.1%) was higher than that of medium body condition (9.7%) as well as good body condition (5.1%) and variation was statistically significant.

Keywords: Cattle, dangila, prevalence, schistosomiosis, schistosoma

In sub-Saharan African countries livestock plays a crucial role both for the national economy and the livelihood of rural communities. It provides draught power and raw material for industry (ILCA, 2007). Livestock in great horn of Africa is a vital resource in promoting development. They provide 20-30% of the gross domestic product (GDP) and at the farmer level as much as 70% of cash income is generated from livestock (Swell and Brocklebsy, 2005). In Ethiopia, livestock contribute about 30-35% of agricultural gross domestic product (GDP) and 12-16% of total GDP (AAPMDA, 1999). Though Ethiopia is recognized for its vast wealth of livestock, the economic benefit derived from the livestock center does not commensurate with the potential (FAO, 1993). Development of large animal is constrained among other important factors, by wide spectrum of the diseases like schistosomosis. In our country, schistosomosis appears to be spreading. The major transmitting sites are small streams all over the highlands of Ethiopia, lakes like Tana, Zeway as well as irrigation systems, such as sugar state Wonji do also play a similar role (Shibru, 1989).

Schistosomiosis (Bilharziasis or blood fluke) is a parasitic disease in animals. Important predilection sites for this parasiteare the mesenteric, portal vein and typically in other organs of the final host. It is distributed in the tropical and sub-tropical countries. It is common in Africa, Asia and southern Europe. In tropics and sub-tropical countries the disease has significance effect (endemic) on domestic livestock production (Bont, 1995). 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 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 (Dwight *et al.*, 2003). Generally the disease affects sheep, goat and cattle (Kassaw, 2007).

In Ethiopia, various epidemiological studies conducted on cattle schistosomiosis were indicative of the endemicity of the disease particularly in large stagnant water bodies and marshy free grazing areas. In dangila district, there is complete lack of knowledge on schistosomosis, moreover; detailed epidemiological data with regard to associated risk factors was scanty. Environmental conditions and sewage disposal are deplorable, indiscriminate defecation and urination is very common, the literacy level is low, and safe/portable water is greatly inadequate and animal management system is greatly extensive in which animals graze on swampy pasture land, with consequent effects on the animal health and their productivity. Despite these factors that could favor snail multiplication and suitable condition for the distribution of bovine schistosomiosis in the study area; studies on animal schistosomosis are scanty. In view of above this study was conducted to ascertain true picture of the disease. Hence present research project was undertaken with the aim to study the prevalence and associated risk factors with bovine schistosomosis in cattle.

MATERIALS AND METHODS

Study Area

The study was conducted from December, 2014 to April, 2015 in Dangila district which is situated in, Awi Zone of northwest Amhara national regional state, Ethiopia. It is located at 11.267ºN latitude and 36.833º E longitude. The capital city of the district is Dangila which is located at 485 km from Addiss Ababa and 78km from Bahir Dar. The altitude of the district ranges from 1809 to 2137 m.a.s.l. and the mean annual rain fall varies between 1500-2200 mm with the average annual temperature which ranges from 14^0c- 31^0c. The district is bounded by four districts (on the south Faggeta Lekoma, on the southwest Guangua, on the northwest Jawi, and on the northeast Mirab Gojjam Zone). The district consists of 27 peasant associations (PAs) (rural administrative kebeles) and ten urban administrative kebeles. The topography of this area is plane with some hills and swampy areas. The rainy season (keremt) lasts from May to October which is relatively long.

Study Population

The sample unit of study population was local cattle breed (indigenous cattle) and cross breed cattle from selected four kebeles of district which have a huge livestock population available and extensive free grazing animal husbandry practice is exhibited. The study animals were selected from four kebeles namely, Gengita, Ziguda,Gumdrie and Dengashta which were selected randomly among kebeles accessible to road. The animals were classified in to three age categories: less than and equal to 2 years, above two and below 5 years and above 5 years old and in to three body condition categories, poor, medium and good body condition scores .The age of the study animals was determined by dental eruption formula which involves counting a number of permanent incisors (De-lahunta and hable, 1986) and by anemnensis and body condition score (Mari heinonen 1989).

Study Design

A cross-sectional study was used to determine the prevalence of bovine schistosomiosis. Simple random sampling methods were used to select the study animal in the area. A total of 384 cattle were randomly selected from all the four peasant associations and coprological examination was conducted following appropriate sedimentation technique. All fecal samples were stored in clean universal bottle containing 10% formalin and labeled separately and transported to Dangila Veterinary clinic laboratory in an air tight condition. Then samples were processed using sedimentation techniques indicated by (Hansen and Perry, 1994; Urquhart *et al.*, 1996).

Sampling Method and Sample Size Determination

Simple random sampling method was used to select the study animals in four selected peasant associations (kebeles). The sample size of the study was calculated according to Thrusfield (2005) using 95% confidence interval and 0.05 absolute precision (P-value).

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

Where

N = required sample size

P exp = the expected prevalence

d = the desired absolute precision

Data Analysis

The data were first entered in to Microsoft Excel work sheet and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. The prevalence of Schistosomiosis was expressed as percentage with 95% confidence interval (CI) by dividing total number of positive animals to the total number of animas examined. Descriptive statistics was utilized to summarize the data. Pearson's Chi-square(x^2) was used to evaluate the association between the prevalence of bovine schistosomosis with various risk factors. P-value less than 0.05 at 5% level of significance were considered statistically significant in the analysis.

RESULTS

Of the total numbers of 384 cattle examined using coproscopical examination, 44(11.5%) were found to be positive for *s.bovis*. Higher prevalence of bovine Schistosomiasi was recorded in dengeshta chisto (16.3%), followed by Gengita (11.6%), Ziguda (11.5%) and Gumdrie (7.3%).The difference observed among four kebeles was not statistically significant (p>0.05) (Table 1).

Table 1. prevalence of Schistosomiosis based on selected Kebele

Kebele	No. of cattle examined	No. of positive cattle (Percentage)	X^2	P value
Gengita	95	11(11.6%)	4.031	0.258
Ziguda	87	10(11.5%)		
Gumdrie	110	8(7.3%)		
Dengeshta	92	15(16.3%)		
Total	384	44(46.7%)		

Accordingly, the prevalence of bovine schistosomosis was higher in local breed cattle (12%) than that of cross breed cattle (8.5%) and the difference was not statistically significant (p>0.05) (Table 2).

Table 2. prevalence of schistosomosis based on breed

Breed	No. of cattle Examined	No. of positive cattle (percentage)	X^2	P value
Cross	59	5(8.5%)	0.612	0.434
Local	325	39(12.0%)		
Total	38	44(20.5%)		

The prevalence of bovine schistosomosis in male and female were (9.9%) and (12.6%) respectively. There was not statistically significant difference observed in both sexes (p>0.05) (Table 3).

Table 3: prevalence of schistosomosis based on sex

Sex	No. of cattle examined	No. of positive cattle (percentage)	X^2	P value
Male	161	16(9.9%)	0.632	0.427
Female	223	28(12.6%)		
Total	384	44(22.5)		

There was no significant difference observed (p>0.05) amongst the three age categories of cattle; likewise, the prevalence was relatively highest in cattle that are were less than 2 years old (14.7%) and lowest in cattle greater than 5 years old (10.2%)(Table 4).

Table 4: The prevalence of schistosomosis based on age

Age	No. of cattle examined	No. of positive cattle (percentage)	X^2	P value
<2	68	10(14.7%)	1.016	0.602
2-5	120	14(11.7%)		
>5	196	20(10.2%)		
Total	384	44(36.6%)		

According to the body condition, the prevalence of *S. bovis* was recorded highest in poor body condition (23.1%), followed by medium body condition (9.7%) and

good body condition (5.1%) and variation was statistically significant (P<0.05) (Table 5).

Table 5: The prevalence of schistosomosis based on body condition

Body condition	No. of cattle examined	No. of positive cattle (percentage)	X^2	P value
Poor	91	21(23.1%)		
Medium	175	17(9.7%)	17.357	0.00
Good	118	6(5.1%)		
Total	384	44(37.9%)		

DISCUSSION

The present study revealed an overall prevalence of 11.5% bovine schistosomosis in the study area, Dangila district. Higher prevalence of bovine schistosomosis was obtained when it is compared with prevalence of the disease reported by Lo and Lemma (1983) who reported 1.5% and 5.5% prevalence in Gewanie and Awassa respectively However, the prevalence of *S.bovis* infection 11.5% in the study area was found lower than other previous studies conducted in Bahir Dar 33.8% (Solomon, 1985), 17.4% (Yalelet, 2004), 29% (Hailu, 1999), 24.73% (Solomon, 2008) and in Kemissie 28% (Amen *et al.*, 2001), and 27.13% in Dembia distinct (Alemseged, 2010) based on fecal examination. The variation in the prevalence of schistosomiosis may be due to the lower humidity and less swampy nature of the studied area. The presence of schistosomiosis and difference in their prevalence was influenced by the local climatic conditions, presence or absence of water reservoirs, lakes, rivers and availability of suitable hosts (Maqbool *et al.*, 2003; Cameron *et al.*, 2004; Narcis *et al.*, 2004; Jesus *et al.*, 2004 and Langeler *et al.*, 2004). Availability of the snail intermediate hosts and the grazing habits of the definitive hosts to a large extent determine the epidemiology and seasonal pattern of infection with trematodes (Chiejina, 1994).

The result of this finding is also lower when compared with Abattoir surveys conducted in different periods in Bahir Dar which revealed prevalence at a rate of 48% (Hailu, 1999); 30.3% (Yalelet, 2004) and 28.14% (Almaz, 2007). This may be due to the fact that trematodes are intermittent egg layers so that the chance of detecting eggs by fecal examination may be minimal (Bushara *et al.*, 1982). In addition to these not all *schistosoma* eggs are excreted in the faces, many of them may be trapped in tissue. Moreover, the number of adult parasite established in the mesenteric veins and the stage of infection may determine fecal egg output (Jones *et al.*, 1997).

The result of this study is almost comparable with the prevalence studies in Bahir Dar 12.3% (Aemro, 1993), 10.93% (Almaze, 2007) and in Fogera 12.5% (Zelalem, 2010).

In present study prevalence of bovine schistosomiosis was higher in local breed cattle (12%) than that of cross breed cattle (8.5%). Moreover, there was no statistically significant difference (P>0.05) between the two breeds. This finding is not in line with other reports in which the prevalence of bovine schistosomiosis was higher in cross breed cattle than that of local cattle breed (Hailu, 1999); (Solomon, 2008), 25.83% in the cross breed and 16.66% in local breeds, but it was agreed with finding of Alemseged (2010) in Dembia distinct, 29.68% in local breed and 17.14% in cross breeds. This may be due to the cross breeds are managed in a better way by supplementing good feed and clean water so that they cannot get easy access to the cercariea, the infective stage of schistosoma. Beside this, there is difference in natural or innate immunity between indigenous and cross breed of cattle (Fekadu, *et. al.*, 1989). The imbalanced sampling ratio; small sample size of cross breed (n = 59) and relatively large sample size of local breed (n = 325) may also have its contribution. The study recorded little prevalence variation of *S. bovis* between two sexes of cattle; (9.9% in male and 12.6% in females), with statistically insignificant difference (P>0.05). The result of this study is in line with previous study (Solomon, 2008); 29.61% in female and 19.54% in male in and around Bahir Dar (Alemseged, 2010), 30.70% in female and 23.30% in male cattle was reported in Dembia distinct. The result indicated that both sexes were at about the same risk of acquiring the infection. This is because equal exposure to the risk factors as there were no restriction on movement for grazing and contact with the parasite. . Kassaw (2007) and Nagi *et al.* (1999) also reported that the increased contact time with schistosoma infested habitat increases the rate and endemicity of schistosomiosis.

The prevalence of bovine schistosomosis in this study was

recorded higher in age group of animals below 2 years (14.7%). However there was no statistically significant difference in prevalence rate among the three age groups. This finding is similar with other reports (Hailu, 1999), but it disagree with (Alemseged, 2010), 17.60% was found bellow 2 years of age, 30.10% ages between 2 and 5 years and 27.80% were found above 5 years reported in Dembia distinct. The reason that cattle less than 2 years old has highest prevalence since no immunity to resist the new-infection than others that can graze at marshy area throughout the day (Taylor *et al.,* 2007) and decreased prevalence of schistosomosis with advancement of age may also be due to the condition that Chronically infected cattle develop inununity against infection and egg production is greatly suppressed (Dargie, 1980; Aradaib *et al.,* 1993). Immunity did not act primarily by absolute prevention of maturation of challenge infection, but mainly by suppression of worm fecundity, by which faecal egg count decreases in contrast to worm burdens of schistosomes, which increases with the age of the animal in naturally infected animal (De Bont and Vercruysse, 1998). In addition, increasing duration of exposure to continuous challenge of chistosomiosiss, cattle also become less susceptible to reinfection (De Bont *et al.,* 1995). The statistical analysis of this study showed that body condition had significant influence on the prevalence of bovine schistosomosis in the study area. In this study, the prevalence of the disease was dependent on body condition with highest prevalence in poor body condition (23.1%). Higher prevalence in poor body condition may be due to the nature of the disease that, Schistosomiosis is a chronic, debilitating infection (Parija, 2004) and Dargie (1980) reported that schistosomiosis is characterized by its chronic nature and affects the productivity and reproduction performances and predisposes animals to other diseases. According to these finding animals with poor body condition play a major role in the environmental contamination with *S. bovis* egg. The potential importance of medium and good body condition in the spread of schistosomosis is as such important even if they contribute a little of part.

CONCLUSION

Cattle schistosomosis cause significant economic loses throughout the world. This is due to the nature of the disease. The prevalence of bovine schistosomosis recorded in this study based on coprological examination revealed the disease, schistosomosis in the cattle population of the study area that deserves serious attention. The disease was detected in all categories of breed, sex, age, body condition of the study animals examined. In addition, occurrence of the diseases is closely linked to the body condition Therefore; this study revealed that bovine schistosomosis was one of the major parasitic diseases contributing to loss in productivity and production of cattle in the study area; so it is important to obtain more information on natural *schistosoma* infection in cattle in general and on the evaluation of the host-parasite relationship under conditions of challenge.

REFERANCES

Aemro, T. 1993. Assessment of prevalence, economic significance and drug efficiency trial on bovine schistosomosis in Bahir Dar, Ethiopia. DVM Thesis, faculty of veterinary medicine, Addis Ababa University, Debre Zeit, Ethiopia.

Alemseged, G. 2010: Prevalence of *bovine schistosomosis* in Denbia District, North Western Ethiopia. DVM Thesis, Faculty of veterinary medicine, Gondar Ethiopia.

Almaz, H. 2007. Pathology of naturally occurring *Schistosoma* infection in cattle slaughtered at Bahir Dar Municipal Abattoir, Northwest Ethiopia. DVM Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia.

Ameni, G., Korok, B. and Bopal, T. 2001. Preliminary study on the major bovine trematod infection around kemissie, Nort eastern Ethiopia and treatment trial with praziquuantel, *Bull. Anim. Hlth. Prod. Africa*, **49**: 62-67.

Animal, animal products and by-products Market Development Authority (AAPMDA). 1999. Market Problems and Measures to Be Taken.

Aradaib, I., Abbas, B. and Bushara, H. 1993. Evaluation of *Schistosoma bovis* adult worm extract for vaccination of calves. *Prev. Vet. Med*, **16**: 77-84.

BOA. 2000. Livestock population of amhara region. A document of the animal health team, Bureau of agriculture, Amhara national regional state, Bahir Dar.

Bont, J. 1995. Cattle schistosomosis host-parasitic interactions. PhD. Thesis, University of Gent, Pp. 23.

Bushara, H., Hussein, M., Majid, A. and Taylor, M. 1982. Effective of praziquantel and metrifonate on *schistosoma bovis*. *Am. J. Trop. Med. Hygiene*. **29**: 442-451.

Cameron, B., Bernadette, P., Bina, S., Peter, M. and Maria, P. 2004. A national survey of the prevalence of Schistosomiasis

and soil transmitted helminthes Malawi. *BMC Infect. Dis.*, **4**: 49.

Chane, S. 2007. The roles and challenges of community participation in HIV/AIDS prevention,care and support activities in Dangila town (Unpublished M.A thesis). Addis Ababa University, Addis Ababa, Ethiopia.

Chiejina, S. 1994. Epidemiology of some helminth infections of domesticated animals in the tropics with emphasis on fasciolosis and parasitic gastroenteritis. In Chowdhury N, Tada I (eds) Helminthology Springer-Verlag, Narosa Publishing House, New Delhi: Pp.34–72.

Dargie, J. 1980. The pathogenesis of *Schistosoma bovis* infection in Sudanese cattle. *Trans. Royal Soc. Trop. Med. Hygien*, **74**: 560-562.

De Bont, J. and Vercruysse, J. 1998. Schistosomiasis in cattle. *Adv. Parasitol*, **41**: 285–364.

De Bont, J., Vercruysse, J., Sabbe, F. and Ysebaert, M. 1995. Observations on worm population dynamics in calves naturally infected with *Schistosoma mattheei*. *Parasitology*; **111**: 485–491.

De lahunta, A. and Hable, R. 1986. Applied veterinary anatomy. W. B. Saunders company.U.S.A. Debere-Zeit, Ethiopia.

Dwight, D., Bowman, G. and Georgis, M. 2003. Parasitological for veterinarians. Elsevier (USA). Pp. 129-133.

Food and agricultural organization (FAO). 1993. Agricultural statistical data. Statistics division, Rome, Italy.

Fekadu, D., Woldemichael, T. and Tadele, S. 1989. Pathogenesis and pathology of scistosomiasis, 5th edition. Addis Ababa University Printing Press, Addis Ababa. Pp. 34.

Hailu, M. 1999. Observations on the prevalence and intensity of *Schistosoma bovis* infection in Bahir Dar area. North central Ethiopia. DVM Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debre-Zeit, Ethiopia.

Hansen, J. and Perry, B. 1994. The Epidemiology, Diagnosis and Control of Helminth parasite of Ruminants: A hand book of animal production and health division, FAO, Rome, Italy. Pp.171.

International Livestock Center for Africa (ILCA). 2007. Annual Report. Addis Ababa, Ethiopia.

Jesus, S., Carneiro K., Carneiro, C. and Brillet, P. 2004. Evolution of the prevalence of Mansonia Schistosomiasis in the district of Sao Luis do Maranhao (Brazil) between 1978 and 2001. *Sante*, **3**: 149-152.

Jones, T., Hunt, R. and Kink, N. 1997. Veterinary pathology, 6th ed. U.S.A: Lippincott Williams and Wilkins, Pp. 664-667.

Kassaw, A. 2007. Major Animal Health problems of marketing oriented livestock Development in Fogera woreda. DVM Thesis, Addis Ababa University, Faculty of Veterinary Medicine.

Langeler, C., Makwala, J., Ngimbi, D. and Utzinger, J. 2004. Simple school questionnaires can map both *Schistosoma mansoni* and *Schistosoma haematobium* in the Democratic Republic of Congo. *Clin. Diagn. Lab. Immunol*, **6**: 1008-1115.

Lo, C. and Lemma, A. (1983). A study on *schistosoma boivs. Annals of Trop. Med. and parasitol*, **69(3)**: 375-387.

Maqbool, A., Hayat, C., Tanveer, A. and Ahmad, I. 2003. Prevalence of ecology of Lymnaea snails in Punjab. *Iranian Vet. Res. Univ. Shiraz.* **2**: 132.

Mari Heinon,G.1989. Body condition scoring, as of cattle in Ethiopia.MOA.

Nagi, M., Kumar, A., Mubara, J. and Mashmoos, S. 1999. Epidemiology, Clinical and Haematological profile of Schistosomiasis. *Am-Eur. J. of Scie. Res.*, **4(1)**: 14-19.

Narcis, B., Simon, B., Edridah, M., Francis, K. and Ambrose, W. 2004. Epidemiology and geography of *Schsitosoma mansoni* in Uganda: implication for planning control. *Trop. Med.and Int. Hlth.*, **3**:.372.

Parija, C. 2004. Text book of parasitology, protozology and helminthology. 2nd ed. Chennai: AIPD. Pp. 141-256.

Shibru, T., Getachew, T. and Hailu, B. 1989. Parasitology.Ins. Schistosomosis in Ethiopia. Addis Ababa: Addis Ababa printing press, Pp. 18-26.

Solomon, A. 2008. Prevalence of Bovine schistosomosis in and around Bahir Dar. DVM thesis FVM. Mekelle University, Mekelle Ethiopia.

Swell, M. and Brocklebsy, D. 2005. Disease caused by helminthes: Hand book on Animal Diseases in Tropics. 4th ed. Londen: Bailliere Tindal. Pp: 41-67.

Taylor, M.., Coop, R. and Wall, R. 2007. Veterinary parasitology, third edition, Pp.1716-1717.

Thrusfield, M. 2005. Veterinary Epidemiology. 3rd ed. UK: Black Well Sci., Pp: 182-189.

Urquhart, G., Armour, J., Duncan, J. and Jenning, F. 1996. Veterinary Helminthology, New York: Churchill Livinsotne Inc, Pp. 114-116.

Yalelet, W. 2004. Survey on Bovine Schistosomiasis in and around Bahir Dar, North west Ethiopia. DVM Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debre-Zeit, Ethiopia.

Zelaem, A. 2010. Prevalence of bovine schistosomiasis in Fogera Woreda Bussiness paper Submitted to Faculty of Veterinary Medicine, University of Gondar.