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Prevalence of Bovine Schistosomiasis and Associated Risk Factors in South Mecha District, North Gojjam, Ethiopia

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Abstract

Bovine schistosomiasis is a parasitic disease of cattle that is caused by trematode worms and transmitted through intermediate hosts, such as snails and results in mortality and reduces productivity.A cross-sectional study was conducted in South Mecha District, North Gojjam, Ethiopia from May 2025 to February 2026 with the objective of estimating the prevalence of schistosomiasis in cattle and associated risk factors. For this study fecal samples were randomly collected from a total of 300 bovine animals and schistosoma's eggs were identified by sedimentation technique. Out of the total, 68 (22.7%) fecal samples were found positive for bovine schistosoma. Geographically, thehighest prevalence rate was recorded atkebele Lehulum Selam (31.7%) followed by Lehulum Birhan (22.4%),while the least was recorded at Zemen Birhan (14.3%). Among risk factor consider for study, age and sex of animalshave no significant association with diseases even though apparently different with higher prevalence in female animals (25.8%) than males (19.1%) and highest prevalent were observed in animals <5 years (28.6%) and the least was in animals > 5 years of age (16.2%). But body condition of animal was food significant at ($p<0.05$) with the highest prevalence in poor body (33.0%) followed by medium (18.8%), while the least was fond in good body condition. Generally the study indicated that bovine schistosomiasis the most important disease in area and causes significant livestock production loss. So responsible bodies should take tangible and measurable action to prevent and control the diseases and farmer should avoid extensive grazing system and agricultural malpractice.

Keywords: Bovine, Prevalence, Schistosomiasis, Ethiopia, Risk Factors, South Mecha

1. Introduction

Ethiopia possesses diverse ecological zone with wide range of climatic condition that are conducive to accommodating a substantial agricultural and large livestock population (Zhongming *et al*., 2013). The country has the largest livestock herds in Africa with an estimated of 39 million cattle, 31.3 million sheep, 32.74 million goats, 11.32 million equines, and 1.42 million camels (Mengistu *et al*., 2021).Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world (ILCA, 2007). In Ethiopia the sector contributed up to 40% of agricultural Gross Domestic Product (GDP), nearly 20% of total GDP, and 20% of national foreign exchange earnings in the country (Mengistu *et al*., 2021).

Despite the importance of these animals, cattle production and productivity are far below the expected potential due to widespread animal diseases. Among the bottlenecks in cattle production is parasitism represents a major challenge to development particularly trematode parasite which hindered animal and human productivity around the world (Jejaw *et al*., 2015). Schistosomiasis is one of the trematode parasitism of the fifteen neglected tropical diseases (NTD) found in vast water lodged and marshy grazing field, which is ideal for the propagation and maintenance of the intermediate host (snails) (Fromsa *et al*., 2011).

In Africa, schistosomiasis in cattle is caused by *Schistosoma bovis, Schistosoma leiperican*, and *Schistosoma mattheei* (VanWykand Mayhew, 2013). The presence of water bodies such as stagnant ponds, swampy areas, rivers, streams and wetlands are among the environmental variables that affect the presence of schistosomiasis (Kifle *et al*., 2022). In Ethiopia, various epidemiological study conducted on bovine schistosomiasis are indicative of the epidemicity of the disease particularly in large stagnant water bodies and marshy free grazing areas (Getachew *et al*., 2014). The prevalence of S. Bovis has been reported various parts of the country (Tsega and Derso, 2015; Kerie and Seyoum, 2016; Kassahun *et al*., 2017; Molla *et al*., 2022). Although diverse research outcomes have been published from various areas of the country; there is dearth of information on epidemiological data with regard to the prevalence and risk factors of the disease in the present study area. Therefore, the main objective of this study was to estimate the prevalence of bovine Schistosomiasis and identify the possible risk factors for the occurrence of the disease in the study area.

2. Materials and Methods

2.1 Study area

The study was conducted in South Mecha District, North Gojjam Zone, Amhara Regional State, Ethiopia. The District is located approximately 565 km Northwest of Addis Ababa and about 72 km Southwest of Bahir Dar, the regional capital. South Mecha District covers a total land area of about 45,297.5 hectares. Geographically, the district lies between 11°6'30"N and 11°17'30"N latitude and 37°4'00"E and 37°15'00"E longitude. Administratively, South Mecha is one of the ten districts in North Gojjam Zone and was officially established in 2010 following its separation from North Mecha District. The district comprises 14 kebeles, two of which were formed through administrative restructuring after the separation. South Mecha District is bordered by North Mecha District to the north and west, Sekela District to the south, and North Mecha and Yilmana Densa districts to the east (South Mecha District Agriculture Office, 2025).

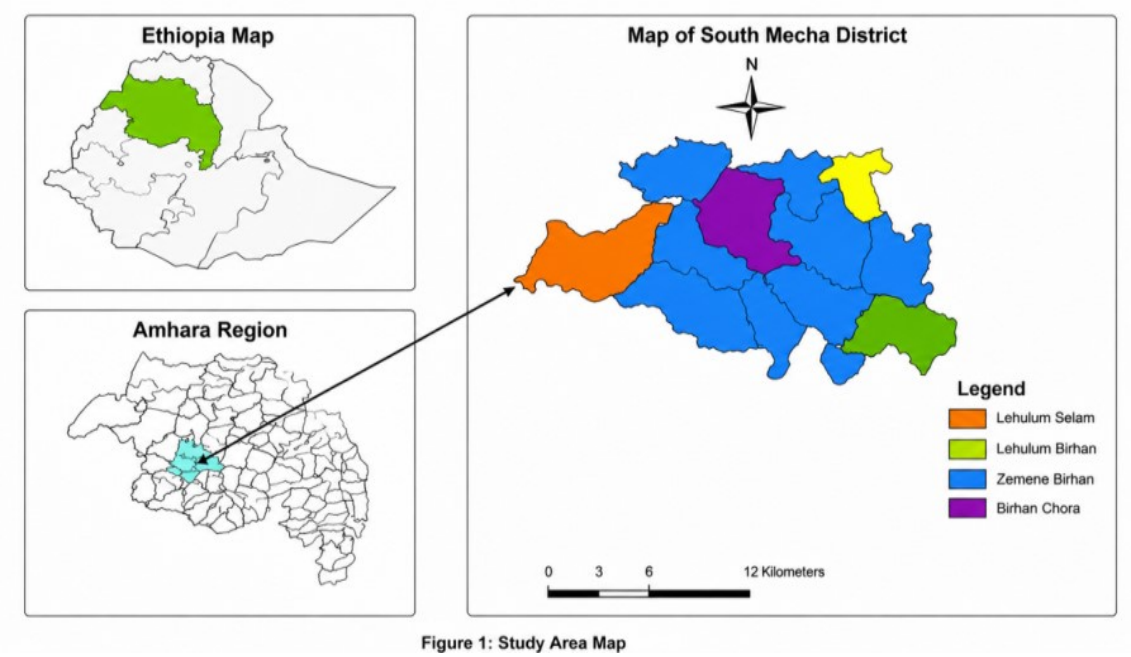

Figure1. The study map of South Mecha district

2.2 Study Design and animal population

A cross-sectional study was carried out between May 2025 to February 2026 to estimate the prevalence of bovine schistosomiasis and associated risk factors. The study included indigenous animals of all ages greater than six months, both sexes , different body condition which encompassing extensive management systems. Age groups were categorized as <2 years, 2-5 years and >5 years old. The age of each animal was estimated using the dentition pattern and ask owners (Pope, 2008). The body condition score was estimated according to the standard described by (Ferguson, 2011).

2.3 Sample Size Determination and Sampling Methods

The selection of the study areas (both districts and kebeles) was performed purposely, taking into consideration the livestock population and the ecology of disease. But, the selection of individual animal was based on a simple random sampling approach. The sample size was determined by using the formula recommended by Trusfeld (2005). In the study, with 95% confidence level, 5% desired absolute precision and 9.6% prevalence, as reported by Dagninet Molla, 2024 were considered. Accordingly The sample size calculated as; $n = Z^2xPexp(1-Pexp)/d^2$.

Where n= the required sample size, Z=critical value of the normal distribution at the required confidence level (1.96), Pexp. =expected prevalence (9.6. %), and d=desired absolute precision (0.05). Hence, the sample size was calculated to be 120 cattle considering the previous prevalence. However, to increase the precision of the study, the sample size was increased to 300 for fecal sampling.

2.4 Fecal Sample Collection and Laboratory Examination

Fecal samples were directly collected from the rectum using sterile hand glove. The collected samples were preserved in 10% formalin in clean and labeled screw cap universal bottles to prevent the hatching of miracidia. All samples were clearly label with the date of sampling, sex, age and body condition score and the samples were placed in an icebox and transported to the veterinary parasitology laboratory of Bahir Dar University and were examined within 24hour of collection. For the trematodes eggs 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. Approximately 3g of feces was placed into a centrifuge tube, and 40ml of water was added and then mixed thoroughly. The suspension was filtered through a tea strainer into another centrifuge tube and left for 15min. Thereafter, the supernatant was decanted, and the sediment was suspended. This step was repeated 3 times until the supernatant was clear. Finally, the sediment was transferred with a pipette to a clean slide and observed under a low power (10xs) microscope. The slides were judged positive when oval to spindle-shaped with centrally bulged and terminal spines on one side of an egg were identified (Elsheikhaand Khan, 2011).

2.5 Data analysis

The collected data was entered and stored into Microsoft Excel spread sheet 2007. The data were imported from the Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 20. Descriptive statistics was used to determine the prevalence of schistosomiasis and Pearson's chi-square ($\chi 2$) test was used to assess the association of the potential risk factors like age, sex, body condition and origin which is responsible for the occurrence of the schistosomiasis in the study area. In this analysis p value less than 0.05 at 5% level of significance were considered as statistically significant.

3. Results

3.1 Coprological prevalence of Schistosomiasis in the Study Area

The prevalence of schistosomiasis in bovine was investigated based on the presence of *Schistosoma bovis* eggs in the faecal samples. Accordingly a total of 300 fecal samples were examined and out of them 68 (22.7%) of bovine samples were found to be positive for Schistosoma eggs. Across risk factor wise comparably higher prevalence of bovine schistosomiasis were recorded in sex of females (25.8%) and highest prevalent in the age of < 2 years (28.6%) and poor body condition of animals. Geographical, the highest prevalence was recorded in kebele A (33.0%) among the selected sites (Table1).

Table1. Prevalence of bovine schistosomiasis in south Mecha District, Ethiopia

Risk factors	Category	No. Examined	Positive	Percentage (%)
Sex	Male	141	27	19.1%
	Female	159	41	25.8%
Age	< 2 years	63	18	28.6%
	2-5 years	138	34	24.6%
	> 5 years	99	16	16.2%
Body condition	Poor	97	32	33.0%
	Medium	96	18	18.8%
	Good	107	18	16.8%
Origin	LehulumSelam	60	19	31.7%
	LehulumBirhan	107	24	22.4%
	ZemenBirhan	49	7	14.3%
	BirhanChora	84	18	21.4%
Total		300	68	22.7%

3.2 Risk Factor Analysiss in the Prevalence of Schistosomiasis

The prevalence of Schistosoma infection in the two sex groups of animals was compared and the finding apparently was higher prevalent in females (25.8%) than males (19.1%). But, the difference was not found statistically significant difference between the two sexes (P > 0.05) (Table2). The highest prevalence of schistosoma infection was recorded in cattle with the age range of <2 years (28.6%) followed by 2- 5 years of age (24.6%) and the lowest prevalence was observed in cattle of greater than 5 years of age (16.2%).Even though the findings were found apparently different, there was no statistically significant difference in prevalence among the different age groups of cattle (P> 0.05) (Table2). The prevalence of schistosomiasis with regard to body condition score was found the highest prevalent in poor body conditioned animals (33.0%) followed by medium body conditioned animals (18.8%) and lowest in those with good body conditioned (16.2%). The difference also found statistically significant in the prevalence in relation at (p <0.05) (Table2). The prevalence of schistosoma infection was compared between animals sampledfrom different origin of four kebeles. The highest prevalence was recorded in Lehulum Selam (31.7%) followed by Lehulum Birhan (22.4%) and the least were observed in Zemen Birhan (14.3%). But the difference was not statistically significant at (p <0.05) (Table 2).

Table 2. Risk Factor Analysiss in the Prevalence of Schistosomiasis in south Mecha District

Risk factors	Category	No. Examined	Positive	Prevalence (%)	Df	X^2	P-value
Sex	Male	141	27	19.1%	1	0.171	1.88
	Female	159	41	25.8%			
Age	< 2 years	63	18	28.6%	2	0.139	3.95
	2-5 years	138	34	24.6%			
	> 5 years	99	16	16.2%			
Body condition	Poor	97	32	33.0%	2	8.82	0.01
	Medium	96	18	18.8%			
	Good	107	18	16.8%			
Origin	Lehulum Selam	60	19	31.7%	3	6.54	0.09
	Lehulum Birhan	107	24	22.4%			
	Zemen Birhan	49	7	14.3%			
	Birhan Chora	84	18	21.4%			

Logistic regression analysis was conducted to measure the strength of association of for associated risk factors. A multivariable logistic regression analysis was carried out utilizing variables that were found to be significant (p<0.05) and risk factors which were not fond significant. Despite conducting a multivariable regression analysis, there was no significant difference in the occurrence of *Schistosoma bovis* between males and females (p=0.052). Furthermore, there was no significant difference in the occurrence of schistosomiasis between animals of different age group (p=0.140) and origin (0.632)of animals. However body condition score was found also statically significant at (p<0.05) in multivariable regression analysis with poor body condition (p=0.011) (table3). The odds ratio of bovine Schistosoma infection in medium body condition is 2.65(CI; 1.335-5.260) times higher affected than good body condition and poor body condition is 1.23 (0.584-2.580) times higher affected than medium and 3.88 times higher affected than good body condition animals while good condition cattle are held constant at (p <0.05) table 3).

Table 3. Logistic Regression analysis of Risk Factor with Prevalence of *Schistosoma bovis*

Risk Factors	Category	No. Examined	Positive	95% CI (Percentage)	OR(95% CI)	P-value
Sex	Male	141	27	19.1%	Ref.	
	Female	159	41	25.8%	0.54(0.291-1.006)	0.052
Age	< 2 years	63	18	28.6%	Ref.	
	2-5 years	138	34	24.6%	1.89(0.812-4.403)	0.140
	> 5 years	99	16	16.2%	1.76(0.797-3.903)	0.161
Body condition	Good	107	18	16.8%	Ref.	
	Medium	96	18	18.8%	2.65(1.335-5.260)	0.011
	Poor	97	32	33.0%	1.23(0.584-2.580)	0.005
Origin	Lehulum Selam	60	19	31.7%	Ref.	
	Lehulum Birhan	107	24	22.4%	1.21(0.559-2.599)	0.633
	Zemen Birhan	49	7	14.3%	0.82(0.362-1.853)	0.632
	Birhan Chora	84	18	21.4%	0.45(0.173-1.170)	0.101

4. Discussion

Schistosomiasis is widely recognized and among well-known primary helminthes infection to pose livestock and public health in Ethiopia. A cross-sectional study was conducted to assess the status of Bovine Schistosomiasis and associated risk factors in the study using coprological test. Accordingly from the total of 300 sampled animals, 68 (22.7%) were found positive for bovine Schistosomiasis in this study area. According to this finding bovine schistosomiasis one of the most important parasite and can cause a significant impact on livestock production in South Mecha northern Gojam, Ethiopia. The present finding is in line with the finding recorded by Yihunie *et al*., 2019, who reported 22.2% in the South Achefer district and Solomon, 2008, who reported 22.06% in and around Bahr Dar.

But this finding higher than the study conducted in different part of the country such as by Abriham et al., 2018 with report of 5.7% in and around Nekemte;Kifle *et al*., 2022 who reported 13.02% in Tis Abay District; Molla *et al*., 2022 with record of 16.7% in the selected areas of the South Wollo and Oromia Zones of the Amhara Region and Wudeneh, 2018 with the finding of 16.28% in Fogera Woreda North Western of Ethiopia. On other hand this finding is relatively lower than the other finding conducted by Habtamu and Mariam who reported 37.3% in selected sites of Bahir Dar woreda; Hailu , 1999, wit report of 29.4% in and around Bahir Dar and Ameni*et al*., 2001, with report of 28% in Kemissie, Oromia Zones of the Amhara Region. The variation of the study may be affected by sample size, geographical area, and season of the study and availability of suitable agro-ecological factor for the intermediate host.

The prevalence of bovines chistosomiasis apparently higher than in female (25.8%) than males (19.1%) But the difference was not found statistically significant difference (P>0.05) between the sexes. This study also in line with the study conducted by Abera *et al*., 2020, in around Bahir Dar town, northwest Ethiopia; Alemayehuand Asrat, 2015, Factors in Dangila District, Amhara National Regional State and Aylate *et al*., 2017, in and around Kemissie, Dawa Cheffa District who reported that sex has no significant association with the diseases and results in an equal chance of developing the disease.

Bovine schistosomiasis also found varies across different age group of the animal with higher prevalence was observed in young animals (<2years) (28.6%), while the lowestprevalence was observed in old animals >5 years (16.2%) followed by adult animals (2-5years) (24.6%).But

the difference was not found statistically significant. This result is in contrast to with the findings of Taylor *et al*.,2007, who reported that the prevalence of the disease is influenced by the age of the cattle, with a higher prevalence observed in animals less than 2 years old. On other hand this result agreed with the result of Belayneh and Tadesse, 2014, and Abebe *et al*. 2011, who reported age was not found significantly associated with the diseases at Jimma town municipal abattoir. This variationmay be due to study design, sample sizeproportionality ageof animal selected for each study.

The present study also investigated the prevalence of bovine schistosomiasis on different body condition of animals and revealed different with highest occurrence (33.0%) in animals of poor body condition, followed by animals in moderate (18.8%) and good (16.8%) body condition condition. Accordingly the occurrence of bovine schistosomiasis among animals with varying body conditions was found to be significantly associated.These findings are in agreement with the occurrence reported by Almaz *et al*., 2011, in the North Gulf of Lake Tana, Northwest Ethiopia and Miressa and Feyissa, 2017, in and around Bako town. Being poor in body condition 1.23 times higher affected than medium and 3.88 times higher affected than good body condition animals in odd ratio logistic regression analysis. But unfortunately animals which suffer from the diseases were poor in body condition due to the outcome of the diseases. So poor body condition both a predisposing factor.

5. Conclusion and Recommendations

The occurrence of schistosomiasis affected by different factors which are important for the development and multiplication of the intermediate host (snail) a carrier for the parasite. In this finding, the overall prevalence of bovine schistosomiasis was found to be 22.7%. So this result indicates bovine schistosomiasis is the most import dieses of the study area and significant livestock production loss and income over all. Among risk factors consider for the study only body condition of animals was found significant association with the disease. As observed the higher prevalence the attributed to the marshy area of study site and other agricultural practices was suitable for the survival of the snail. By considering the above conclusions, responsible bodies should take tangible and measurable action on the diseases to reduce at lowest possible level of prevalence and farmers should avoid practice of extensive grazing and agricultural mal practice.

Data availability

The data used for this manuscript is available from the corresponding author upon reasonable request.

Ethical Approval and Consent

This research involved the use of ethical statements. Ethics approval was obtained from South Mecha livestock and fisher resource development office in accordance with the principles established by the institution. Verbal informed consent was obtained from the animal owner before sample collection.

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Competing interest

The authors have declared no any conflict of interest.

Author`s contributions

AW: Data collection and conducted analysis; GF: writing the manuscript and conducted the experiments.

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