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The Neglected Infectious Disease, Bovine Schistosomiasis: Prevalence and Associated Risk Factors for its Occurrence among Cattle in the North Gulf of Lake Tana, Northwest Ethiopia

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Abstract

Schistosomiasis is a snail-borne trematode infection in man, domestic animals and wild animals in tropical and sub-tropical countries and it is one of the neglected tropical infectious diseases yet having considerable impacts from the public health and economical dimensions. A cross sectional study was conducted from October, 2017 to April, 2018 in the North Gulf of Lake Tana, Northwest Ethiopia to estimate the prevalence of Bovine Schistosomiasis and to explore the different associated risk factors that influence its occurrence. Simple random sampling technique was employed to select 304 study cattle from three selected districts. Of the 304 cattle considered, 20.1% (61/304) were found to be positive for *Schistosoma bovis* on coprological examination. The prevalence of Bovine Schistosomiasis was highest in Takusa district (29.1%) followed by West Dembia (17.6%) and East Dembia districts (13.1%) respectively. The difference in prevalence of Bovine Schistosomiasis among three districts was statistically significant (x^2=8.612, P =0.013). With a statistically significant difference (x^2=10.920, P=0.004) in prevalence among the differently body conditioned animals, the highest prevalence of Bovine Schistosomiasis was recorded in the poor body conditioned animals (29.3%) followed by animals having medium (14.0%) and good (13.3%) body condition scores respectively. Age of animals was found to be an important risk factor for the occurrence of Bovine Schistosomiasis and the highest prevalence was recorded in age group of cattle between 2-5 years (30.2%) than in animals above 5 years of age (15.7%) and that of age group below 2 years (6.7%) and the variation in prevalence of Bovine Schistosomiasis among the age groups was statistically highly significant (x^2=16.426, P=0.000). With no statistical significant difference in prevalence of Bovine Schistosomiasis, higher prevalence was indicated in local (21.2%), females (20.7%), and extensively managed animals (21.2%) than the prevalence in the cross breeds (7.7%), males (19.3%) and semi-intensively managed animals (15.6%) respectively. This much prevalence of Bovine Schistosomiasis in the study area necessitates that prevention and control measures targeting the parasite, snail intermediate host and husbandry systems be designed to reduce the productivity, economic and public health impacts that the disease, Bovine Schistosomiasis, may pose.

Keywords: Bovine schistosomiasis; Cattle; Lake tana; *Schistosoma bovis*

Introduction

Livestock production constitutes one of the principal means of achieving improved living standards in many regions of the developing world [1]. In both developed and developing countries, livestock plays vital roles in generation of income, creating job opportunities, ensuring food security, providing draught power and serving as raw materials for industries. Livestock contributes as an asset, socio-cultural and environmental values, and sustain livelihoods [1,2].

Ethiopia is known for its vast wealth of livestock in Africa [3]. ere are an estimated 70.79 million heads of cattle, 28.48 million sheep, 25.91 million goats, 24.56 million donkeys, 11.39 million horses, 8.08 million mules, 8.39 million camels, 50.38 million poultry and 71.62 million beehives [4]. Ethiopian Human population is mostly dependent on agriculture, which contributes 46.3% of the country's Gross Domestic Product (GDP), 60% of exports, and 80% of total employment [5]. However, the economic bene t derived from the livestock sector does not commensurate with the potential due to a number of complex and inter-related factors [3].

Parasitism is a major challenge to livestock development and trematode parasitism is one of the major problems for both animal and human productivity around the globe [6]. Trematode parasites are found in immense water lodged and swampy grazing elds [7]. Bovine Schistosomiasis is a snail-borne trematode infectious disease in man, domestic animals and wild animals in tropical and sub-tropical countries [8]. It is an economically important disease caused by several Schistosoma species, which inhabit the vascular system of nal hosts [9]. It is one of the 15 neglected diseases in the tropics and endemic in sub-Saharan Africa, the Middle East, Far East, Central America and the Caribbean [10]. In the tropics and sub-tropical countries, where the disease is endemic, it poses significant e ects on livestock production [11]. Bovine Schistosomiasis a ects sheep, goat and cattle [12] and causes mortality and morbidity from severe infection and long term e ects of moderate and long standing chronic infections [13]. e distribution of Bovine Schistosomiasis has been determined principally by the distribution of snail intermediate host [14]. In the chronic stages of the Bovine Schistosomiasis, the pathology is associated with collagen deposition and brosis, resulting in organ damage and dysfunction [2]. Coprological analysis is commonly employed to diagnose Bovine Schistosomiasis [15]. Infections with all major Schistosoma species can

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be treated with praziquantel [16]. e goal of treatment is reduction of egg production via reduction of worm load: this reduces mortality and morbidity [17].

In Ethiopia, epidemiological studies suggest the endemicity of the disease particularly in the areas with large permanent water bodies and marsh pasture areas [18]. e prevalence of *S. bovis* has been reported by di erent studies conducted in di erent localities of Ethiopia. To mention, a few of the reports are: a 1.2% prevalence in Gewane and a 5.5% prevalence in Awassa by Lemma [19] in Bahir Dar town a prevalence of 33.8% by Hailu [20], 22.06% prevalence by Solomon [21] and prevalence of 24.3% by Belayneh and Tadesse [22] and in Kemisse a 28% prevalence by Ameni et al. [23] and a 13.7% prevalence in Fogera by Mersha et al. [24] in and around Debre Tabor Town, a 7.6% prevalence by Mihret and Samuel, [15] a prevalence of 27.13% in Dembia district by Alemseged et al. [25] in and around Bakko Town, a prevalence of 22.92% by Miressa, and Feyissa, [14] in South Achefer district, a 26.9% prevalence by Kerie and Seyoum, [13] in Dangila District, a prevalence of 11.5% by Adane and Mulat, [26] and in North Western Ethiopia, a prevalence of 23.9% by Kassahun et al. [10].

ough the study area, North gulf of Lake Tana, is rich with wetland

Varying prevalence of Bovine Schistosomiasis among the districts were found, which indicated a 29.1% prevalence at Takusa district, a 17.6% prevalence at West Dembia district and a 13.1% prevalence at East Dembia district. In this study the prevalence of Bovine Schistosomiasis between the two sex categories was found to be 20.7% and 19.3% in female and male cattle. Regarding the in uence of the age of animals on the occurrence of Bovine Schistosomiasis, the prevalence of Bovine Schistosomiasis in age groups between two and ve years were higher (30.2%) than that of age groups greater than ve years (15.7%). And less prevalence of Bovine Schistosomiasis was recorded in age groups less than two years.

Discussion

e overall prevalence of Bovine Schistosomiasis was found to be 20.1% (61/304). e overall prevalence is almost similar with the other previous studies conducted by Kerie and Seyoum [13], who reported a 24.6% prevalence in South Achefer district, by Tadesse and Belayneh [22], who reported a 24.3% prevalence in Bahir Dar town, by Samrawit [11], who reported a 24.3% prevalence in Bahir Dar town and its surrounding areas, by Miressa and Feyissa [14], who reported a 22.9% prevalence in Bako Town of Oromia, and by Kasahun et al. [10], who reported a 23.9% prevalence in the North western Ethiopia. In this study, lower prevalence of Bovine Schistosomiasis was found when the overall prevalence is compared with previous reports of Hailu [20] in Bahir Dar area, Almaz and Solomon [34] in selected sites of Bahir Dar Alemseged et al. [25] who reported overall prevalence of Bovine Schistosomiasis to be 29%, 37.3%, and 27.13% respectively. e di erence in the overall prevalence of Bovine Schistosomiasis between the ndings of the current study and the studies conducted previously may be attributed to the encouragement of livestock owners to improve their husbandry practices following semi-intensive (tied and feed with concentrate and roughage feed) management systems that reduce the exposure of the animals to the marshy area grazing lands and watering from the surrounding lake Tana. It would be due to the activity of veterinarians in the study area towards the health care of animals. It may also be due to the fact that Trematode is intermittent egg layers so that the chance of detecting eggs by fecal examination may be minimal. In addition to these, not all Schistosoma eggs are excreted in the faces, half of the eggs remain in the blood circulation and most of these eggs get trapped in the liver and spleen or in the bladder and ureter [35]. e number of adult parasites established in the mesenteric veins and the stage of infection may also determine fecal egg output.

e overall prevalence of this study was found to be relatively higher than the overall prevalence reports of Yalelet [36] in and around Bahir Dar, Lo and Lemma [37] in Hawassa, Abebe et al. [38] in Agaro, Alemayehu and Asrat [12] in Dangila district, Mersha et al. [24] in Fogera cattle, and Mihiret and Samuel [15] in Debre Tabor, who reported overall prevalence of 17.4%, 5.5%, 4.59%, 11.5%, 13.7% and 7.6% respectively. e di erence in the overall prevalence of Bovine Schistosomiasis between the report of the current study and previous reports might be due to variations in drainage system for irrigation practice (favors the development and multiplication of snail intermediate hosts), environmental factors such as agro-ecology and climate, sampling periods, epidemiological factors such as hosts breed, availability of stagnant water body, river, marshy area and animal management/husbandry practices of animals like freely grazing on the pasture land and/or the watering system of the animals.

With regards to the di erent districts considered in the study, a highest prevalence (29.1%) of Bovine Schistosomiasis was recorded in Tsakusa district. is highest prevalence record in Tsakusa district might be due to the presence of the river known as Givaza that passes between GirarMeda and Sensay communal grazing land that may create conducive environments for the intermediate host and is the major water source to animals originated from the capital city of Tsakusa district, Delgi and the surrounding rural kebeles. e highest prevalence may also attributed to the presence of Girar Meda Toka, Sensay Toka, Chegera Toka and Chach Ena Alwa village Toka marshy and swampy pasture lands at the gulf of lake Tana from which animals graze in common. In support of this theory, Getachew et al. [18] has explained that bovine Schistosomiasis is an endemic disease particularly in areas with large permanent water bodies and marsh pasture areas.

e prevalence of Bovine Schistosomiasis in west Dembia district, Gorgora city and the surrounding rural kebeles was the second highly prevalence record (17.6%). is result might be due to the presence of highly swampy communal range land near to Lake Tana called, Kidame Gebaya, and most of the animal owners in the area were found to water their animals in the Lake Tana. e least prevalence (13.1%) of Bovine Schistosomiasis was recorded in east Dembia district. is di erence may be due to having seasonal marshy areas which are found at some

distance far from lake Tana and the presence of dry lands which are the communal grazing lands of most animals managed extensively in the area. Not only this, this may also be attributed to the presence of small rivers which serve as the watering system of animals rather than Lake Tana.

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