

Review Article

Review on epidemiology of bovine hemoparasites in Ethiopia

Gudina Mekonnen Ayana¹ and Wakgari Oljira Fayisa^{2*}

¹Ambo University College of Agriculture and Veterinary Science, PO Box: 19, Ambo, Ethiopia

²Jima Rare District Agriculture Office, Western Oromia, Ethiopia

Abstract

A literature-based review was made to assess available information on bovine hemoparasites related to their epidemiology, distribution, and economic importance in Ethiopia. Babesiosis, anaplasmosis, cowdriosis, theileriosis, and trypanosomosis are the major hemo-parasitic disease of bovine in Ethiopia. Their adverse effects on the health of the animals can decrease production and productivity. Hemoparasites generally cause fever, anemia, jaundice, anorexia, weight loss, milk drop, malaise, swelling of lymph nodes, dyspnoea, diarrhea, nervous disorders, and death by affecting blood vessels and/or lymphatic system of the animal. Reports from different parts of the country displayed there is a high distribution of bovine hemoparasitic disease throughout the country. Anaplasmosis, Babesiosis (redwater), Ehrlichiosis (Heartwater), Theileriosis, and Trypanosomosis are the major hemoparasitic diseases with heavy economic losses. Their mode of transmission was by arthropod vectors ticks and flies. Applying effective vector control and using vaccines drugs are the two most important control methods for hemoparasites diseases. Also having knowledge of parasite life cycles, their biological vector, and the immune response of bovines to vectors and parasites were also used in the successful application of control strategies. Creating awareness of the mode of transmission, method of control, and prevention of hemoparasitic disease of bovine to livestock owners were warranted to decrease the effect of the disease.

Introduction

Bovine hemoparasites are vector-borne diseases of tropical and subtropical parts of the world including Ethiopia [1]. Hemoparasites can affect about 80% of the world's cattle population which causes a great economic impact on livestock resources. The major Hemoparasitic diseases of bovines such as babesiosis, anaplasmosis, cowdriosis, theileriosis, and trypanosomosis are considered some of the major impediments to the health and productive performance of cattle. They can cause fever, anemia, jaundice, anorexia, weight loss, swelling of lymph nodes, dyspnoea, diarrhea, nervous disorders, and even death by affecting the blood and/or lymphatic system of the animals [2].

Anaplasmosis is caused by gram-negative bacteria genus *Anaplasma* which is obligatory intracellular that infects the blood cells of mammals [3]. In bovine it is caused by *A. bovis*, *A. marginale* and *A. centrale* infecting monocytes and red blood cells [4]. Babesiosis is caused by the protozoa genus *Babesia* and it is zoonotic tick-transmitted hemoparasites. The causative agents of Babesiosis are specific for particular

species of animals. In cattle: *Babesia bovis*, *Babesia bigemina*, *Babesiosis divergens* and *Babesia major*. Two species, *B. bigemina* and *B. bovis*, have a considerable impact on cattle health and productivity in tropical and subtropical countries [5].

Heartwater is caused by a rickettsia, previously known as *Cowdria ruminantium*, but recently reclassified as *Ehrlichia ruminantium*. It is a tick-borne disease in cattle, sheep, goats, and some wild ruminants. Heartwater is also known that there is far more genetic variability among *E. ruminantium* organisms than had ever been suspected [6].

Theileriosis is a disease caused by protozoan parasites belonging to the genus *Theileria*. *Theileria annulata* and *Theileria Parva* are the most important tick-transmitted pathogenic species causing bovine theileriosis [7]. In another way, Trypanosomosis is also an important protozoan disease that is caused by the genus *Trypanosoma*. It is transmitted through bites by different species of *Glossina* and mechanically by a number of biting flies such as *Tabanus* and *Stomoxys* species [8]. Three species of trypanosomes are recorded in Ethiopia. These are *T. congolense*, *T. vivax* and *T. brucei*. *T. vivax* and *T. congolense* are the main pathogens of cattle [9].

More Information

*Address for Correspondence: Wakgari Oljira Fayisa, Jima Rare District Agriculture Office, Western Oromia, Ethiopia, Email: wakgarikayo@gmail.com

Submitted: March 25, 2022

Approved: April 28, 2022

Published: April 29, 2022

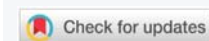
How to cite this article: Ayana GM, Fayisa WO. Review on epidemiology of bovine hemoparasites in Ethiopia. Insights Vet Sci. 2022; 6: 013-016.

DOI: 10.29328/journal.ivs.1001036

Copyright License: © 2022 Ayana GM, et al.

This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Keywords: Hemoparasite; Economic; Epidemiology; Bovine; Ethiopia



In Ethiopia, the widespread occurrence of many parasitic especially hemoparasites of bovines extremely reduces the production of livestock through morbidity and mortality. Thus, the objectives of this review were to assess available information on the epidemiology of bovine hemoparasites in Ethiopia.

Distribution of bovine hemoparasites in Ethiopia

In Ethiopia, quite several conducted epidemiological studies showed that there is the high distribution of hemoparasites of bovine. The major ones were trypanosomiasis, anaplasmosis, babesiosis, theileriosis and ehrlichiosis. These epidemiological studies were carried out using conventional parasitological techniques such as dark phase buffy coat, thin and thick smear, and different serological and molecular techniques (Table 1 & Figure 1).

Economic importance of bovine hemoparasites

Anaplasmosis poses important economic constraints to animal breeders, mainly due to the high morbidity and mortality in susceptible cattle herds. Besides the costs of the additional veterinary care, anaplasmosis causes abortion in animals, reduction of milk production, and body weight, and frequently leads to death [4].

In another way, Babesiosis in bovines also causes the most serious economic loss endangering half a billion cattle across the world [19]. Babesiosis, especially in bovines has great economic importance, because, unlike many other parasitic diseases, it affects adults more severely than young cattle, leading to direct losses through death and the restriction of movement of animals by quarantine laws. The disease is also a barrier to improving the productivity of local cattle by cross-breeding due to the high mortality of genetically superior but highly susceptible cattle, especially dairy cattle, imported from babesia-free areas [20].

A serious economic problem can occur with Heartwater in a massive area covering most of sub-Saharan Africa, its offshore islands, and several islands in the Caribbean. The disease generally prevents livestock farmers from upgrading their herds to modern high-yielding breeds, as these are more susceptible to infection than traditional stock breeds, which often have a measure of resistance. Since heartwater is so common in the endemic areas of Africa, farmers are usually unwilling or unable to pay for definitive diagnoses, so it is difficult to quantify the economic impact of the disease [21].

Tropical theileriosis is hemoparasitic infection responsible for substantial production losses. About 250 million cattle are

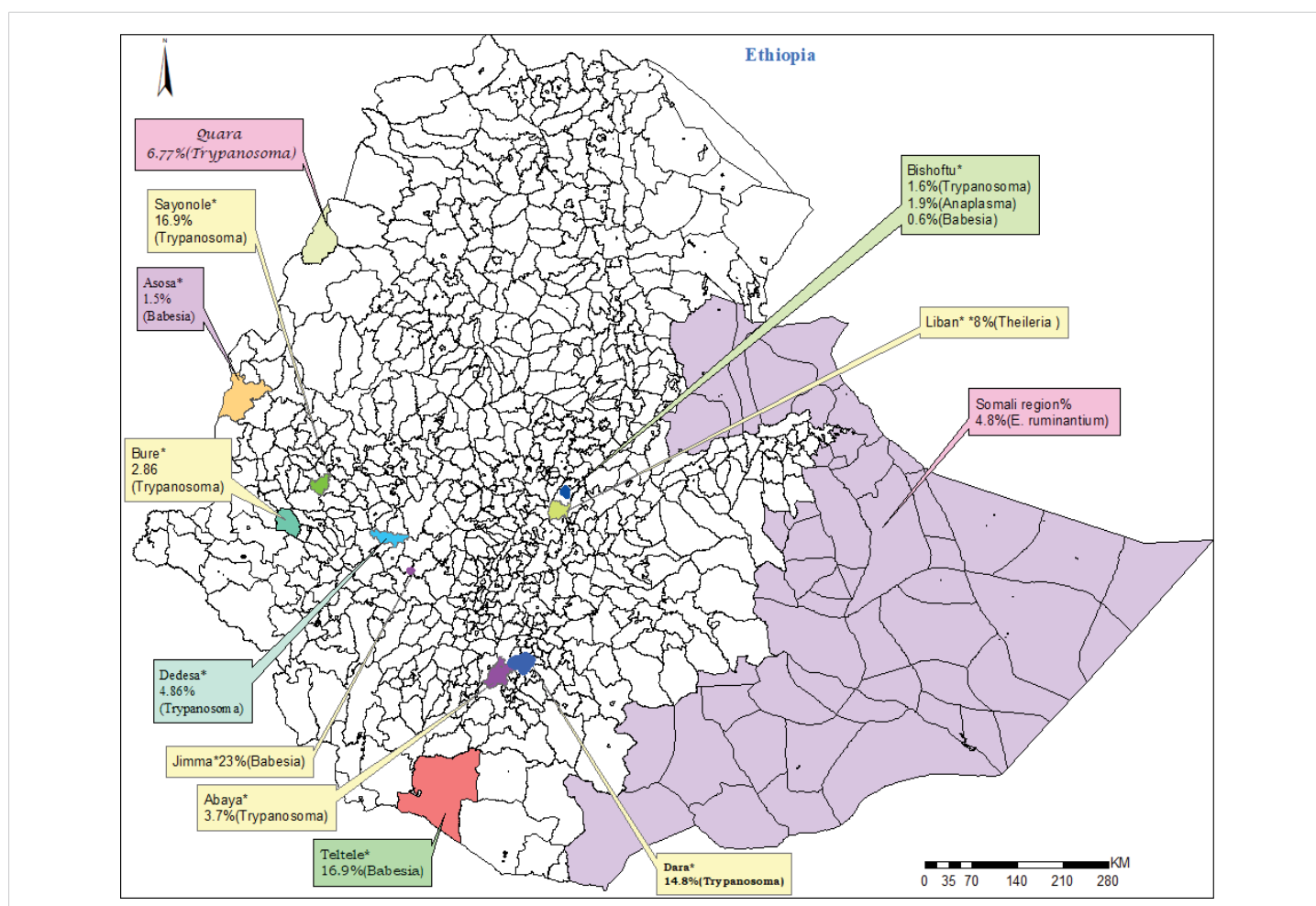


Figure 1: Map showing the location of prevalence reports on bovine hemoparasites in Ethiopia (Source: Created with Arch Map 10.2 software).

Table 1: Prevalence reports on bovine hemoparasites in Ethiopia.

Study district /Region	Hemoparasite of Bovine	Prevalence (%)	Author
Bishoftu (Central Ethiopia)	<i>Anaplasma</i>	1.9	Sitotaw, et al,2014 [1]
Somali region (Eastern)	<i>E. ruminantium</i>	4.8	Tomassone, et al, 2012 [10]
Asossa (Western)	<i>Babesia</i>	1.5	Wodajnew, et al, 2015 [11]
Teltelle (Southern)	<i>Babesia</i>	16.9	Hamsho, et al,2015 [12]
Jimma (South Western)	<i>Babesia</i>	23	Lemma, et al,2015[13]
Bishoftu (Central Ethiopia)	<i>Babesia</i>	0.6	Sitotaw, et al,2014[1]
Abaya (Southern)	<i>Trypanosoma</i>	3.7	Dawit, et al, 2015[8]
Bure and Wemberma (North Western)	<i>Trypanosoma</i>	2.86	Tadesse & Getaneh, 2015[14]
Bishoftu (Central Ethiopia)	<i>T. vivax</i>	1.6	Sitotaw, et al, 2014[1]
Dara (Southern)	<i>Trypanosoma</i>	14.8	Keffale, et al, 2015[15]
Didessa (West Wollega)	<i>Trypanosoma</i>	4.86	Feyisa, et al, 2015[16]
Quara (Northern Gonder)	<i>Trypanosoma</i>	6.77	Alemu, & Alamneh, 2015[17]
Sayonole (Western)	<i>Trypanosoma</i>	16.9	Kassaye, 2015[18]
Liban zone (Eastern)	<i>Theileria</i>	8	Tomassone, et al, 2012 [10]

at risk of Tropical theileriosis worldwide. This intracellular infection imposes an economic burden on cattle breeders in terms of mortality and morbidity as well as expenses spent on prophylactic measures against disease and treatment [22].

Trypanosomosis remains one of the largest causes of livestock production losses in Ethiopia. About 15% - 20% of the land believed to be suitable for livestock production is affected by one to two species of tsetse flies [23]. The effects of trypanosomosis are not only the direct losses resulting from mortality, morbidity, infertility of the infected animals, and costs of controlling the disease, but also due to indirect losses, which include exclusion of livestock and animal power-based crop production from the huge fertile tsetse infected areas. Since, bovine trypanosomosis is a highly devastating disease that has a great economic impact on the country's development [24].

Conclusions and recommendations

Bovine hemoparasites are the main constraints of livestock production in Ethiopia. The major hemoparasitic diseases with heavy economic losses are mainly Protozoal and Rickettsial diseases such as Anaplasmosis, Babesiosis (redwater), Ehrlichiosis (Heartwater), Theileriosis, and Trypanosomosis. These diseases are transmitted by arthropod vectors ticks and flies. Potential control methods for hemoparasites diseases include vector control, and vaccines drugs (Against vectors and parasites). Successful application of control strategies will be dependent upon a thorough understanding of parasite developmental cycles, the biology of the vectors, and the immune response of cattle to vectors and parasites. Therefore, based on this conclusion the following recommendations are forwarded:

- ✓ The economic effect of hemoparasitic diseases of bovine in Ethiopia is high. So the concerned organization should give attention to controlling and eradicating the disease.
- ✓ Awareness should be created on the mode of transmission, method of control, and prevention of hemoparasitic disease of bovine to livestock owners.

- ✓ Proper identification and characterization of arthropod vectors should be done in order to control hemoparasitic diseases.
- ✓ Proper vaccines and drugs should be produced that can eliminate/eradicate the hemiparasite diseases.

References

1. Sitotaw T, Regassa F, Zeru F, Kahsay AG. Epidemiological significance of major hemoparasites of ruminants in and around Debre-Zeit, Central Ethiopia. *J Parasitol Vector Biol.* 2014; 6(2):6-22.
2. Simuunza MC. Differential Diagnosis of Tick-borne diseases and population genetic analysis of *Babesia bovis* and *Babesia bigemina* (PhD Thesis, University of Glasgow): 2009.
3. Dumler JS, Barbet AF, Bekker CP, Dasch GA, Palmer GH, et.al. Recognition of genera in the families Rickettsiaceae and Anaplasmataceae in order Rickettsiales: unification of some species of *Ehrlichia* with *Anaplasma*, *Cowdria* with *Ehrlichia* and *Ehrlichia* with *Neorickettsia* description of six new species combinations and designation of *Ehrlichia equi* and "HGE agent" as subjective synonyms of *Ehrlichia phagocytophila*. *Int J Systemic Evol Microbiol.* 2001;51: 2145-2165.
4. Uilenberg G. Other Ehrlichiosis of Ruminants. In: Woldehiwet Z, Ristic M, Eds, *Rickettsial and Chlamydial Diseases of Domestic Animals*, Oxford Pergamon Press, Oxford, 293-332.
5. Yabsley MJ, Shock BC. Natural history of Zoonotic Babesia: Role of wildlife reservoirs. *Int J Parasitol Parasites Wildl.* 2012 Nov 22;2:18-31. doi: 10.1016/j.ijppaw.2012.11.003. PMID: 24533312; PMCID: PMC-3862492.
6. Allsopp BA, Bezuidenhout JD, Prozesky L. Heartwater, in: *Infectious diseases of livestock*, edited by Coetzer, JAW, Tustin RC. Cape Town: Oxford University Press Southern Africa. 2005.
7. Kohli S, Atheya UK, Thapliyal A. Prevalence of theileriosis in cross-bred cattle: its detection through blood smear examination and polymerase chain reaction in Dehradun district, Uttarakhand, India. *Vetl World.* 2014;7(3):168–171.
8. Dawit A, Alemayew T, Bekele K, Zenebe T, Kebede G, et al. Prevalence of Bovine Trypanosomosis, and it's Associated Risk Factors in Abaya District, Borena Zone, Ethiopia. *Nat Sci.* 2014;13(10).
9. Desquesnes M, Davila A. Applications of PCR-based tools for detection and easy method for species specific diagnosis of *Trypanosoma* species in cattle. *Vet Parasitol.* 2002;110:171-180.
10. Tomassone L, Grego E, Callà G, Rodighiero P, Pressi G, Gebre S, Zeleke B, De Meneghi D. Ticks and tick-borne pathogens in livestock from nomadic herds in the Somali Region, Ethiopia. *Exp Appl Acarol.*



- 2012 Apr;56(4):391-401. doi: 10.1007/s10493-012-9528-y. Epub 2012 Feb 17. PMID: 22349943.
11. Wodajnew B, Disassa H, Kabeta T, Zenebe T, Kebede G. Study on the Prevalence of Bovine Babesiosis and Its Associated Risk Factors in and Around Assosa Woreda, Benishangul Gumuz Regional State, Western Ethiopia. *Researcher*. 2015;7: 33-39.
 12. Hamsho A, Tesfamaryam G, Megersa G, Megersa M. A Cross-Sectional Study of Bovine Babesiosis in Teltele District, Borena Zone, Southern Ethiopia. *J Vetl Scie Technol*. 2015.
 13. Lemma F, Girma A, Demam D. Prevalence of Bovine Babesiosis in and Around Jimma Town South Western Ethiopia. *Adv Biologi Res*.2015;9:338-343.
 14. Tadesse E, Getaneh G. Prevalence of bovine trypanosomiasis and farmers perceptions in the management of the disease in Bure and Womberma districts of West Gojjam Zone, North Ethiopia. *World J Biol Med Sci*.2015;2: 42-56.
 15. Keffale M, Shabula Z, Tamerat N. Prevalence of bovine trypanosomiasis in Dara District Sidama Zone, Southern Ethiopia. *J Parasitol Vector Biol*. 2015;7(9).
 16. Fayisa G, Mandefro A, Hailu B, Chala G, Alemayehu G. Epidemiological Status and Vector Identification of Bovine Trypanosomiosis in Didesa District of Oromia Regional State, Ethiopia. *Intern. J Nutri Food Sci*. 2015;4(3):373-380.
 17. Alemu G, Alemneh T. Prevalence of Bovine Trypanosomiasis in Quara District, North-Western Ethiopia. *Global Veterinaria*.2015;15 (5):506-511.
 18. Kassaye BK. Prevalence of Bovine Trypanosomosis and Apparent Density of Tsetse Flies in Sayonole District Western Oromia, Ethiopia. *J Vet Sci Technol*. 2015;6:254.
 19. Saad F, Khan K, Ali S, UI Akbar N. Zoonotic significance and Prophylactic Measure against babesiosis. *Int J Curr Microbiol App Sci*.2015;4(7):938-953.
 20. Demessie Y, Derso S. Tick Borne Hemoparasitic Diseases of Ruminants: A Review. *Adv Biologi Res*.2015;9(4):210-224.
 21. Kifle G, Sori T. Molecular Detection of Ehrlichia Species in Amblyomma Ticks Collected from Ruminants in Abernosa Ranch, Ethiopia. *Global J Mol Sci*. 2014;9(2):12-18.
 22. Gachohi J, Skilton R, Hansen F, Ngumi P, Kitala P. Epidemiology of East Coast fever (*Theileria parva* infection) in Kenya: past, present and the future. *Parasites Vectors*.2012;5:194.
 23. Ntticc. National tsetse and Trypanosomosis Investigation and control center report for the period 7 June 2003 -6 July 2004, Bedelle, Ethiopia. 2002;1-4.
 24. Awoke K. Study of Trypanosomosis and its Vectors in Humbo and Mereb Districts. *Global Veterinaria*. 200;1(1):11-15.