



Cattle Trypanosomosis and Associated Risk Factors in Abala Abaya District, Wolaita Zone, Southern Ethiopia

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KEYWORDS:

Bovine;
Buffy Coat;
Glossina;
PCV;
Trypanosomosis;
Ethiopia

ABSTRACT

Cattle trypanosomosis is a unicellular protozoan disease that causes serious economic losses due to its impact on production and productivity. A cross sectional study was done in Abala Abaya district, Wolaita zone, southern Region of Ethiopia. The study was conducted from November 2023 to April 2024 with the objective of estimating the prevalence of cattle trypanosomosis and assessing the associated risk factors for the occurrence of the disease. Systemic random sampling technique was used to select 256 study cattle. Buffy coat technique was used to examine for the presence of *Trypanosoma* spp. and to measure PCV of each studied animal. The overall prevalence of cattle trypanosomosis was 18.8% (n=48, 95% CI=14.4-24.0). Two species of *Trypanosoma* were identified in area, namely: *T. congolense* (62.5%) and *T. vivax* (22.9%). The proportion of *T. congolense* was significantly higher ($p < 0.05$) than *Trypanosoma vivax*. The mean PCV of cattle infected by trypanosome significantly ($p < 0.05$) lower than the non-infected cattle. Generally, this study revealed that the prevalence of trypanosomosis was higher in Abala Abaya. Further research to explore the prevailing lower overall mean PCV of cattle in the area and timely implementation of different feasible control measures are recommended.

Research article

INTRODUCTION

Ethiopia possessed huge number of livestock population. However, the low economic returns from these resources are associated with several factors such as animal diseases, poor management, and low genetic potential of indigenous breeds (CSA, 2022). Trypanosomosis is one of the protozoan diseases that puts a significant impediment to cattle production, and negatively influencing the overall growth of agriculture in general; and the nation's food self-reliance efforts in particular (Abebe, 2005).

Trypanosomosis is a haemoparasitic disease that is caused by unicellular protozoan parasites, genus *Trypanosoma*. *Trypanosoma* species are transmitted either cyclically by *Glossina* spp. or mechanically by biting flies like *Tabanus* spp. and *Stomoxys* spp. (Constable *et al.*, 2017; Oluwafemi *et al.*, 2007; Uilenberg, 1998). In Ethiopia, the most commonly reported and predominant *Trypanosoma* spp. include: *T. congolense* and *T. vivax* (Leta *et al.*, 2016). It reproduces in the bloodstream, lymphatic vessels, and tissue like central nervous system (Constable *et al.*, 2017). Trypanosomosis is characterized by intermittent fever, progressive

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<https://dx.doi.org/10.4314/eajbcs.v6i1.3S>

development of anaemia, and loss of body condition, and if untreated can lead to death of the infected animal (Constable *et al.*, 2017; Taylor *et al.*, 2007; Bourn *et al.*, 2001).

Animal trypanosomosis is a serious constraint to cattle production, posing a threat to household food security and livelihoods of the community. The disease costs the cattle sector through mortality, reduction in milk production and body weight, and cost of control and treatment (Kizza *et al.*, 2021). Moreover, *Trypanosoma* spp. influences the ovulatory and oestrous activity (Obasi *et al.*, 1999), pituitary function (Abebe *et al.*, 1993) and reproduction (Ogwu *et al.*, 1984) of cattle.

Animal trypanosomosis is one of the livestock diseases that impaired cattle productivity in Abala Abaya district. There is a complaint from livestock owners in the district. Therefore, the purpose of the current study was to estimate the prevalence of cattle trypanosomosis, and to assess the potential risk factor predisposing to the infection.

MATERIALS AND METHODS

Description of the Study Area

The study was carried out in five selected kebeles of Abala Abaya, namely: Mareka, Ajaja, Shoya, Gafata and Faricho. Abala Abaya district is found in Wolaita Zone, Southern Regional State, Ethiopia. Geographically, the Abala Abaya district lies between 37°44'10" and 37°54'20" E longitudes and 6°35'0" to 6°45'10" N latitudes. The altitude ranges the district is 700 to 2275 meters above sea level. The average annual rainfall of the area is 854 mm, and the mean annual temperature is 21.9°C. The area is known

by mixed farming, crop and livestock, practice, and the community in the area kept livestock that include cattle, sheep, goats and equines.

Study design

The study, a prospective in type, was conducted from November, 2023 to April, 2024. The prevalence of bovine trypanosomosis was estimated, and the potential risk factors were investigated by using a cross-sectional study design. Also *Trypanosoma* spp. prevailing in the area was identified.

Study population

The study animals were cattle (i.e. both local and cross breeds) that include both male and female, different age groups and body condition scores. The study cattle were managed under extensive production system. The body condition score of the study animals were grouped in to three: poor, medium and good as described by Nicholson and Butterworth (1989). Their ages were estimated based on teeth dentition (Dee Fails and Magee, 2018) and information obtained from the owners.

Sample size determination and sampling method

The required sample size for the study was computed according to the formula described by Thrusfield (2018). For sample size computation expected prevalence of 5% that reported by Hundessa *et al.* (2021) was taken in to account. The computed value was 73 animals, but to increase accuracy of the study this value multiplied by 3.5, and hence, the total sample size of the study was 256 cattle. The study

considered 5% desired absolute precision and 95% confidence interval.

The study cattle were selected by systematic random sampling (i.e. Every 15 cattle were selected) method from purposively selected five Kebeles. The study cattle selection was done in the grazing field and in the morning.

Study methodology

Sample collection

Animals selected for study were properly restrained, and the marginal ear vein areas disinfected by 70% denatured alcohol. Then it was punctured by using blood lancet and then blood samples were taken with heparinized haematocrit tubes. The blood samples were collected with haematocrit capillary tubes to the level of $\frac{3}{4}$ of its length and one end of the tube sealed by crystal seal.

Laboratory examination

The laboratory work was done at the site of sample collection by using portable laboratory equipment (Microscope, centrifuge, generator, capillary tube, hematocrit reader, microscopic slide, cover slide, blood lancet and field table). On the field, the tubes with blood samples were placed in haematocrit centrifuge with the sealed end kept outward, and then it was centrifuged at 12,000rpm for five minutes. After that the tube taken out of the centrifuge and the Packed Cell Volume (Uilenberg, 1998; Murray, 1977) was measured by using haematocrit reader and the reading expressed in percentage of the total

volume of blood. Those animals with PCV less than 24% were considered to be anaemic (OIE, 2008). The haematocrit capillary tube was cut by diamond tipped pencil 1mm below the buffy coat (Murray, 1977). The content of the capillary tube was then expressed onto a microscopic slide and covered by cover slip. Immediately it was examined under 10X and 40X objective lenses to identify the *Trypanosoma* spp. based on the movement pattern of the parasite (OIE, 2018; Uilenberg, 1998; Paris *et al.*, 1982).

Data Management and Data Analysis

Collected data summarized by descriptive statistics like mean and percentage. Trypanosome infection prevalence was calculated by dividing the number of positive cattle by the total number examined and multiplying by 100. The association of cattle trypanosome infection and the potential risk factors (i.e. sex, age, and body condition score) investigated by univariable logistic regression analysis; and for this purpose STATA version 14 software was used for data analysis.

RESULTS

The overall prevalence of cattle trypanosomosis was 18.8% (n=48, 95% CI=14.4-24.0). The analysis of the potential risk factors considered during the study was shown below (Table 1). Two *Trypanosoma* spp., *T. congolense* and *T. vivax*, were in the study district. Of the positive cases, nearly 23%, 15% and 62% were because of *T.vivax*, *T.congolense* and mixed infection, respectively.

Table 1: Prevalence of trypanosome and univariable logistic regression analysis of the potential risk factors analysis

Risk Factors	Category	No. examined	No. positive (%)	95 % CI	OR	χ^2	p-value
Kebele	Mareka	50	8 (16.0)	8.1-29.1	Ref	-	-
	Ajaja	51	10 (19.6)	10.8-33.0	1.28	0.47	0.636
	Shoya	52	10 (19.2)	10.6-32.4	1.25	0.43	0.669
	Faricho	52	11 (21.2)	12.0-34.5	1.41	0.67	0.505
	Gafata	51	9 (17.7)	9.4-30.8	1.13	0.22	0.825
Body condition	Good	49	7 (14.3)	6.9-27.3	Ref	-	-
	Medium	136	21 (15.4)	10.3-22.6	1.10	0.19	0.847
	Poor	71	20 (28.2)	18.9-39.8	2.35	1.76	0.078
Age	1-3 year	87	18 (20.7)	13.4-30.6	1.27	0.63	0.528
	4-5 year	94	16 (17.0)	10.7-26.1	Ref	-	-
	≥ 6 year	75	14 (18.7)	11.3-29.2	1.12	0.28	0.781
Sex	Male	110	21 (19.1)	12.7-27.6	Ref	0.12	0.903
	Female	146	27 (18.5)	12.6-25.7	0.96	-	-
Overall		256	48 (18.8)	14.4-20.0			

The mean PCV of infected cattle was lower (19.8%) than the mean PCV of non-infected

cattle (24.8%) and the difference in mean PCV was statistically significant ($p < 0.05$) (Table 2).

Table 2. Mean PCV value of infected and non-infected cattle

Conditions	No. examined	Mean PCV (%)	SE	95% CI	t-test	P-value
Infected	48	19.8	0.48	18.8-20.7	12.6	0.000
Non-infected	208	24.8	0.32	24.1-25.4	Ref.	-
Overall	256	23.8	0.31	23.2-24.4		

DISCUSSION

Trypanosomosis is negatively influencing the growth of agriculture in general, and particularly the livestock sector. The overall prevalence of cattle trypanosomosis in Abala Abaya district was 18.8% (95% CI=14.4-24.0%). This observation is agreed with Ginta and Abegaz (2022) who reported 18.5% (95% CI= 13.1-23.9). On the other hand the present result is higher than the reports from various areas of Southern Region of the country (Fesseha *et al.*,

2022; Seyoum *et al.*, 2022; Eyasu *et al.*, 2021; Hundessa *et al.*, 2021; Takele *et al.*, 2020; Girma *et al.*, 2014; Begna *et al.*, 2011). Higher prevalence of trypanosomosis also reported from southern Region of Ethiopia (Zeryehun and Abraham, 2012). These differences in the prevalence of the disease among the studies might be partly related to the variation in ecology, tsetse fly contact with cattle, tsetse fly density and tsetse fly infection rate (Gebre *et al.*, 2022; Constable *et al.*, 2017; Leak *et al.*, 1999; Rowland *et al.*, 1993).

Two *Trypanosoma* spp., namely *T. congolense* and *T. vivax*, were encountered during the study in Abala Abaya district. Moreover, *T. congolense* (62.5%; 95% CI= 47.9-75.1) was the predominant species identified followed by *T. vivax* (22.9%, 95% CI=13.1-37.1). The predominance of *T. congolense* was reported from various areas of the country (Gebre *et al.*, 2022; Eyasu *et al.*, 2021; Tsegaye *et al.*, 2021; Teshome and Biamesh, 2020; Anjulo *et al.*, 2019; Leta *et al.*, 2016; Fayisa *et al.*, 2015; Biyazen *et al.*, 2014; Desta *et al.*, 2013; Zeryehun and Abraham, 2012; Daud and Molalegne, 2011; Abebe, 2005). This might be related the development of better immune response to *T. vivax* by the infected hosts (Taylor *et al.*, 2004; Leak *et al.*, 1993). Moreover, the predominance of *T. congolense* in Ethiopian cattle is largely due to higher transmission efficiency by tsetse flies, its greater pathogenicity and persistence, suitable environmental conditions, and ongoing vector control strategies.

The mean PCV of cattle infected with trypanosome was significantly lower (19.8%; 95% CI=18.8-20.7; $p < 0.05$) than the mean PCV of non-infected animals (24.8%; 95% CI=24.1-25.4). This observation is in a general agreement with many authors report (Fesseha *et al.*, 2022; Kedir *et al.*, 2016; Fayisa *et al.*, 2015). This difference could reflect the impact of trypanosomosis on the PCV of infected hosts.

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Lower PCV is one of the symptoms for trypanosomosis (Constable *et al.*, 2017). Reduction of PCV is an indication of anaemia, which is caused due to erythrophagocytosis, suppressed erythropoiesis and haemaolysis (Sudan *et al.*, 2023; Akinbamijo *et al.*, 1998).

CONCLUSIONS & RECOMMENDATIONS

The study revealed that an overall prevalence of cattle trypanosomosis in Abala Abaya district was higher (18.8%). This could greatly influence the health as well as the productivity of cattle. *Trypanosoma* spp. circulating in the study area includes *T. congolense* and *T. vivax*. The mean PCV of cattle infected by trypanosome was significantly higher than the non-infected one. The lower overall mean PCV of cattle in the area need to be further explored and different feasible control measures should be timely introduced in the study area.

Acknowledgements

The author would like to forward heartfelt gratitude to the animal owners for the permission provided to collect peripheral blood sample from their animals. We also extend our sincere appreciation for technical and material support provided by the research team of the STEP Southern Project Office.

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