

Research Article

Prevalence of Bovine Trypanosomiasis in Wolaita Zone Kindo Didaye District of Ethiopia

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Abstract

Cross sectional study was conducted in Kindo Didaye District of Wolayita administrative zone of southern region of Ethiopia, from November 2014 to April 2015 to estimate the prevalence of bovine trypanosomiasis. In the parasitological survey, blood samples of 120 cattle were examined using a buffy coat technique and thin blood smear under Giemsa stain. The Packed Cell Volume (PCV) value of each animal was also measured using hematocrit reader. The overall prevalence of trypanosomiasis was found to be 5.9%. The prevalence varied between different study areas; 5% in Halale, 8.3% in Shella, 5.4% in Zerada and 5.1% in Bosa-bortu areas. The most positive cases were due to *Trypanosoma congolense* (57.1%) followed by *Trypanosoma vivax* (28.6%) and mixed infection from *Trypanosoma congolense* and *Trypanosoma vivax* was also recorded in (14.3%) of the tasted animals. The mean PCV value (%) of parasitaemic and aparasitaemic animals during the study period were 19.43% and 27.14% with a statistically significance ($P < 0.05$) difference between the two groups. The study also demonstrated variations in the prevalence among different age groups and between both sexes were statistically insignificant ($P > 0.05$) but body condition has significant association with trypanosomiasis prevalence. As the study revealed bovine trypanosomiasis of the study area has great impact on production, implementing control of trypanosomiasis with an integrated approaches have vital importance in the study site.

Abbreviations:

- CSA : Central statistical agency
DVM : Doctor of Veterinary Medicine
ILCA : International Livestock Centre for Africa
ILRAD : International Laboratory for Research on Animal Diseases
Pas : Peasants Associations
PCV : Packed Cell Volume
SPSS : Statistical Package for Social Science

Keywords: Bovine Trypanosomiasis; Kindo Didaye; Prevalence

Introduction

Trypanosomiasis is a disease caused by several species of protozoan parasites (Trypanosomes) found in the blood and other tissues of vertebrates including livestock, wildlife and people. It is a major impediment to livestock farming in sub-Saharan Africa and limits the full potential of agricultural development in the 36 countries where it is endemic [1]. The tsetse infested area covers

one-third of the land area in eastern and southern Africa. In Africa, the overall loss (in both direct and indirect) is estimated as 500 billion dollars a year in terms of mortality, abortion, reduced fertility, milk meat production, and ability to work as traction animals [2].

In Ethiopia, tsetse infested area estimated around 10,997 hectares from the total of 122,190 hectares. The tsetse flies are confined to the southern, southwestern and north-western region where the primary vectors exist along the great rivers basin of Abay, Omo, Gibe and Baro. The fly has infested an estimated 130,000-200,000 square kilometers of fertile land in the country. In generally, in Ethiopia 20,000 heads of cattle die in every year and 14 million heads of bovine at risk contracting Trypanosomiasis at any time [3].

There are six pathogenic species of trypanosomes which are discovered in Ethiopia, namely *Trypanosoma vivax*, *T. congolense*, *T. brucei*, *T. evansi*, *T. equiperdum*, and *T. rhodesiense*. But the most important trypanosomes in the country are *T. vivax* and *T. congolense*. Both species affect a great number of cattle which are the most important species of the domestic animals in Ethiopia [4].

The problem of trypanosomiasis was also reported to be very serious in the study area. During a survey carried out by Sodo Regional Veterinary Laboratory, farmers reported that trypanosomiasis is the most important constraint to livestock development in the area. And trypanosomiasis was considered to be an important disease of cattle in different part of the country in reports of [5-10].

However, studies have not yet been carried out on the epidemiology, prevalence and economic significance of bovine trypanosomiasis in this study site. Therefore, the objectives of the study were to estimate the prevalence of bovine trypanosomiasis in study area, to identify the dominant species of trypanosomes and some associated risk factors and to compute Packed Cell Volume (PCV) in relation to trypanosomiasis.

Materials and Methods

Study Area

Kindo Didaye district is one of the districts of Wolayita zone in the South Nation Nationalities and Peoples Region of Ethiopia. The administrative center of this district is Halale town. The Kindo Didaye district is located at about 444Km of southwest of Addis Ababa and it has an altitude of 800-1690 meter above sea level. And its total area is estimated to be 16,687 hectare of land. The distribution of rain is bimodal, with short rain from January to April and long rains from June to mid-September. The average annual rainfall is 867 mm, the maximum and minimum daily temperature is 30.20 and 21°C respectively. The vegetation is savanna type with scattered bush. The livestock populations that are found in Kindo Didaye district include cattle, sheep, goat, horses, mule, donkey and poultry. Among these animals, cattle are the dominant species raised in the area. The cattle population in the district is estimated to be about 180,374[11].

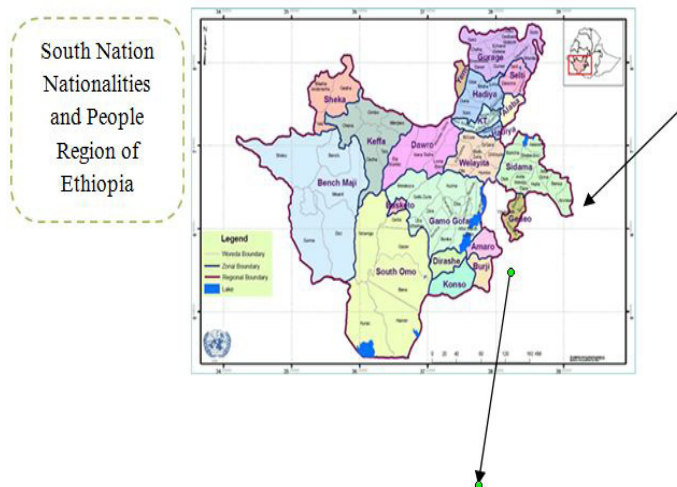


Figure 1: Map of study area Source: (Eyasu and Ahmed, 2013)[10].

Study Design

Cross-sectional type of study was conducted in four randomly selected peasant associations of Kindo Didaye district to estimate the prevalence of bovine trypanosomiasis, to identify the prevailing species of trypanosomes and to assess the host related risk factors of a disease.

Study Population

The study population constitutes zebu cattle which are managed under small holder mixed farming system. Animals were allowed to graze freely during the day time and housed during the night. The age of animals was grouped under less than 1 year, 1-3 year, and greater than 3 year of age, the body condition of the animals grouped under good, medium (moderate) and poor based on the method of scoring the body condition of Zebu cattle[12].

Sampling Method and Sample Size Determination

Two stage cluster sampling technique was followed to select the study animals. First, five peasant associations in Kindo Didaye district and house holders from each selected peasant associations are selected by simple random sampling method and all the cattle herds found in each house holder were selected for sample collection. During data collection age, sex and body condition of the animals were recorded.

The expected prevalence of 6.3% from [10] report on the prevalence of bovine trypanosomiasis in Kindo Koysha district of Wolayita zone, the boarder district to Kindo Didaye district, were taken to calculate the sample size. The number of animals to be sampled in the study was estimated by the formula described by [13].

$$n = 1.96^2 \times P_{exp} (1 - P_{exp}) / d^2$$

n=90

Where n is sample size, d is absolute precession and P_{exp} is expected prevalence

The 95% confidence interval and 5% precision was used, and the calculated sampling size was 90 but 120 samples were taken to increase the precision.

Parasitological and Hematological Examinations Techniques

Measuring of Packed Cell Volume (PCV)

Blood samples were obtained by puncturing the marginal ear vein with a lancet and blood was collected directly into a capillary tube and filled up to $\frac{3}{4}$ of the tube. The capillary tubes were placed in micro haematocrit centrifuge with sealed end outer most of one side. The tube was loaded symmetrically to ensure good balance. After screwing the rotary cover and closing the centrifuge lid, the specimens were allowed to centrifuge at 12,000 rpm for 5 min. Tubes were then placed in haematometer and the readings were expressed as a percentage of packed red cells to the total volume of whole blood. Animals with PCV < 24% were considered to be anemic[14].

Buffy Coat Technique

To do buffy coat technique, the capillary tube was cutted from 1mm below the layer of buffy coat to include the upper most layers of the red blood cells and the content of the capillary tube was expressed on to slide, homogenized on to a clean glass slide and covered with cover slip. The slide was examined under $\times 40$ objective for the presence of parasite[15].

Thin Blood Smear

A small drop of blood from a microhaematocrit capillary tube to the slide was applied to a clean slide and spread by using another clean slide at an angle of 45°, air dried and fixed for 2 min in methyl alcohol, then immersed in Giemsa stain (1:10 solution) for 30 minute. The excess stain was drained and washed by using

distilled water, allowed to dry by standing up right on the rack and examined under the microscope with oil immersion objective lens.

Data Management and Analysis

Raw data of individual animals and examination results were stored in Microsoft Excel spread sheets to create data base and transferred to SPSS version 20 software programs for data analysis. Chi square was used to compare the prevalence of trypanosome infection with different risk factors variables like peasant association, age, sex and body condition, while t-test was utilized to compare the mean PCV of the infected animals and non-infected animals. Significance difference was set at $p < 0.05$ and 95% confidence level.

Result

Parasitological Results

Out of the total 120 cattle examined, 7(5.83%) were found positive to trypanosomiasis. The prevalence of trypanosomiasis in selected peasant associations is 5% in Halale, 8.3% in Shella, 5.4% in Zerada and 5.1% in Bosa-bortu areas. But the association between peasant associations and the prevalence of trypanosomiasis is not statistically significant ($p > 0.005$).

The most prevalent trypanosome species in the study area was *T.congolense*(57.1%) followed by *T. vivax*(28.6%) and mixed infection from *T.vivax*and *T.congolense*was also recorded in (14.3%) of the tasted animals. The prevalence of trypanosome infection was higher in female (6.6%) than male (5.1%) animals; however, there was no statistically significant ($p > 0.05$) differences observed between the two sexes. A higher infection rate of 9.8% was observed in adult animals (animals above one year and below three years of age) and followed by 5.3% in old animals (above three years) and 0% in young animals with in the study area but the variation was not statistically significant ($p > 0.05$).

Cattle infected with trypanosome have poor body condition score than the non-infected animal. There was a statistically significant ($p < 0.05$) difference among the prevalence of trypanosomes in different body conditions.

Risk factors	Animals sampled	Number of animals infected			Overall infection	X ² value	p-value
		<i>T.congolense</i>	<i>T.viax</i>	Mixed infection of <i>T.congolense</i> and <i>T.viax</i>			
PAs:							
Halale	20	1	0	0	1(5.0%)	0.346	0.951
Shella	24	1	1	0	2(8.3%)	-	-
Zerada	37	2	0	1	2(5.4%)	-	-
Bosha-bortu	39	1	1	0	2(5.1%)	-	-
Sex:							
Female	61	3	1	0	4(6.6%)	0.118	0.731

Male	59	2	1	1	3(5.1%)	-	-
Age:							
Young (<1year)	30	0	0	0	0(0.0%)	3.235	0.198
Adult (1-3years)	52	4	1	1	5(9.6%)		-
Old (>3years)	38	1	1	0	2(5.3%)	9.717	0.008
Body condition							
Poor	29	2	2	1	5(17.2%)	-	-
Medium	50	2	0	0	2(4.0%)		
Good	41	0	0	0	0(0.0%)		

Table 1: Association of risk factors with prevalence of trypanosomiasis.

Heamatological Results

The PCV value ranging from 18 to 34 was found from the observed animals. Out of the observed animals, infected animals had a mean PCV value of 19.43% and non-infected animals had 27.14%, and the overall mean PCV value of the study also resulted in 26.69 %. Statistically significant difference ($P < 0.05$) in mean PCV was observed between infected and non-infected animals.

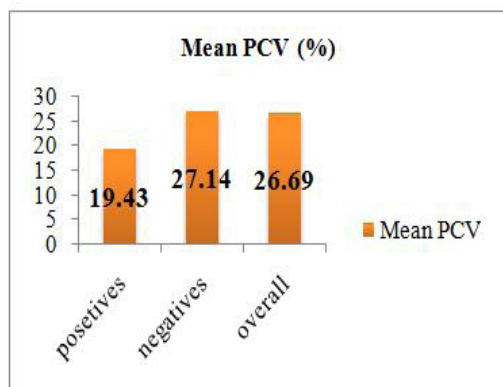


Figure 2: Mean PCV value comparison of infected and non-infected animals.

Discussion

The study revealed that the prevalence of bovine trypanosomiasis in the area was 5.83% which was relatively in agreement with the previous finding by [10] at Kindo Koyscha district of Wolayita zone (6.3%), but it was much lower than the reports of [16] at Humbo District of Wolayita zone (14.2%), [17] at Keto settlement area of southwestern part of the country (15%), and [18] at Humbo Larena of Wolayita zone (9.3%) and Konsod district (11.5%). The difference between reports might be due to the presence of large study time gap, application of relatively well designed meth-

ods of tsetse control and disease treatment, expansion of cultivation in the area which indirectly affects flies distribution, expansion of veterinary clinic, and awareness of people towards the control and treatment of the disease.

The findings of the infection rate with *T.congolense* in the present study which is 57.1% is in the line with the report of [10] at Kindo Koyscha district of Wolayita (58%), [3] report from tsetse infested areas of Ethiopia (58.5%), [19] in selected sites of southern region (63.4%) and [9] in West Gojam (54.3%). The increased proportion of infection with *T.congolense* in the study area may be due to the major cyclical vector of the savannah tsetse flies, (*G.moristans* and *G.palidpes*) which are effective in transmitting *T.congolense* than *T.vivax* [20] since the study area is located in the tsetse belt of Ethiopia.

Infection rate in poor body conditioned animals were significantly higher than good body condition animals ($p < 0.05$) and was in agreement with [9,21] Although higher infection rate was observed in animals of between 1 up to 3 years of age (9.6%) and animals above three years of age (5.3%), in the present study no statistically significant ($p > 0.05$) association was observed in age. This result is in agreement with the previous results reported by [7,9,21]. This could be due to the fact that all animals graze and used as draft as well as harvesting of crops to the same tsetse challenged areas. Young animals of under 1 years of age are protected from the disease and 0% prevalence was observed. This is may be due to suckling calves do not go out with their dams but graze at homesteads until they are weaned off. Young animals are also naturally protected to some extent by maternal antibodies [22]. This could result in low prevalence of trypanosome in calves.

The prevalence level also different in different areas but the association is not significant. Similarly, sex has insignificant association ($P > 0.05$) with infection rate as it was also reported by [9].

The mean PCV value of studied animals was significantly ($P < 0.05$) varying between parasitaemic (19.43%) and aparasitaemic (27.14%) animals. This result was in agreement with the previous results reported by [1]. Anemia is one of the most indicators of trypanosomiasis in cattle (Stephen, 1986). The level of anemia or PCV usually gives a reliable indication of the disease states and reduces performance of infected animals [23,24]. Even though significant difference is found in the study, PCV alone could not be used for diagnostic criteria for trypanosomiasis because there are also other factors causing anemia such as worm infestation and nutritional deficiency [14].

Conclusions and Recommendations

From this study, it is possible to conclude that trypanosomiasis is an important disease and a potential threat affecting the health and productivity of cattle in the study area. The major species of trypanosomes in the study area were *T. congolense* followed by *T. vivax* and mixed infection of the two species. Infection with trypanosomiasis negatively affected PCV and body condition. This indicated that trypanosome infection of cattle cause's loss of body weight and production

Based on the finding the following recommendations are forwarded:

- Further study on the occurrence of tsetse and trypanosomiasis at different season of the year, at different altitude and different species of animals should be conducted.
- Trypanosomiasis control measures which are practiced to all parts of Ethiopia, like reduction of tsetse population and mechanical vectors reduction methods should be applied

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