



A Study On Prevalence Of Bovine Trypanosomosis In And Around Jimma Town Oromia Regional State, South West Ethiopia

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Abstract: A cross sectional study was carried out in and around Jimma town from November 2015 to May 2016 to determine the prevalence of trypanosomosis species in naturally infected cattle and its associated risk factors. From three selected peasant association 384 cattle were randomly selected and examined for trypanosomosis by taking blood sample for laboratory analysis. The overall prevalence of bovine trypanosomosis was 31(8.1%) of which 20(5.2%), 5(1.3%), 6(1.8%) was *T. congolense*, *T. vivax* and *T. brucei* respectively which was highly statistical significant ($P=0.00$). A significant association was observed ($P<0.05$) between the disease positivity and body condition score also. Sex wise prevalence of trypanosome infection was higher in male 28(10.5%) while 3(2.5%) female animals and The mean PCV value of parasitemic and aparasitaemic animals was recorded as ($PCV>24\%$) and ($PCV\leq 24\%$), respectively. This study result indicates the high prevalence of *T. congolense* which indirectly indicate that high distribution of tsetse fly. Therefore, Strategic control of bovine trypanosomosis including vector control should be strengthened to improve livestock production and agricultural development in the area and educating the public in the tsetse belt or affected areas of trypanosome to participate in control strategies.

[Mohamed Husen, Masire Mesay, Beshatu Ferede, Bihonegn Wodajnew. **A Study On Prevalence Of Bovine Trypanosomosis In And Around Jimma Town Oromia Regional State, South West Ethiopia.** *J Am Sci* 2020;16(9):77-83]. ISSN 1545-1003 (print); ISSN 2375-7264 (online). <http://www.jofamericanscience.org>. 6. doi:[10.7537/marsjas160920.06](https://doi.org/10.7537/marsjas160920.06).

Keywords: Bovine, Jimma, PCV, prevalence, Trypanosome

Introduction

In the developing countries, livestock industry plays an important role that constitutes like milk, meat, for cultivation of land and foreign incomes from skin and hides. Increasing the livestock productivity can have significant impact of achieving food security and alleviating poverty in Sub-Saharan Africa, as it is important assets especially in the rural small holder house. Ethiopia possesses the largest livestock population in Africa. The country ranked 8 in the world averaging 23 million between 1995 and 2000, 46 million in 2003 and 44 million in 2004 [1].

Trypanosomosis is a serious disease in domestic livestock causes a significant negative impact in food production and economic growth in many part of the world, particularly in Sub-Saharan Africa. African animal trypanosomosis and its vectors occur in vast areas of Sub-Saharan Africa with devastating impact on livestock productivity. Its epidemiology and impact on livestock, especially cattle production are determined largely by the prevalence and distribution of the disease and its vectors in the affected area [2].

African animal trypanosomiasis (AAT) is a parasitic disease that causes serious economic losses in livestock from anemia, loss of condition and emaciation. Many untreated cases are fatal. AAT is found mainly in those regions of Africa where its biological vector, the tsetse fly, exists. One organism, *Trypanosome vivax*, has become established in South America, where biting flies acting as mechanical vectors transmit it. Protecting animals from trypanosomiasis is difficult in endemic areas, as bites from tsetse flies and a variety of other insects must be prevented. A tsetse fly eradication program being conducted in Africa may help control this disease, as well as other forms of trypanosomiasis that affect human [3]. Ethiopia has a number of Livestock populations of which are help to alleviate poverty by making economic contributions to the household income. This is unhidden fact to Ethiopia as a whole as it encourages national production and improved

gross economy of a country [4]. Trypanosomiasis is probable the most serious veterinary and animals production problem in sub-Saharan Africa and prevent, or seriously crucial, the keeping of ruminant and equine [5], [6].

In Ethiopia, trypanosomiasis is one of the most important disease limiting livestock productivity and agricultural development due to its high prevalence in the most arable and fertile land of south west and north west part of the country following the greater river basins of Abay, Omo, Ghibe, and Baro with a high potential for agricultural development. Currently, about 220,000 square kilometer areas of the above mentioned area infested with five species of tsetse flies including *G. pallidipes*, *G. morsitans*, *submorsitans*, *G. fuscipes*, *G. tachinoides* and *G. longipennis* [7].

Although, this study area particularly Sekka district is potentially a productive place for agricultural activities and raise livestock from the others. Unfortunately, the area is infested with medium to high tsetse transmitted trypanosomiasis which have direct impact on draught power and productivity that is manifested by low level of meat, milk and other animal products that compromise the socio-economic and nutritional status of inhabitants. Even though, there is high impact on economy and animal production due to this disease [3]. There is no any surveillance conducted previously regarding the prevalence and associated risk factor of trypanosomiasis in the study area. Therefore, the main objectives of this study are; to determine the prevalence of bovine trypanosomiasis in and around Jimma town; to identify the major associated risk factors of the disease in the study area.

Materials and Methods

Description of the Study Area

The study was conducted from November 2015 to May 2016 in and around Jimma Town which is located at 355km south-western of Addis Ababa. The area lies between a latitude of 7°41'N and longitude of 36°50'E and has an elevation of 1704 meters above sea level. The area characterized by a humid tropical climate of heavy annual rainfall that ranges from 1200-2000 mm per year. About 70% of the total annual rainfall received during rainy season, which lasts from the end of May to early September. The mean annual maximum and minimum temperature ranges from 25°C-30°C and 7°C-12°C [8].

Sample Size Determinations

The sample size was determined according to [9] with 95% of confidence interval, 5% of desired absolute precision and 50% of expected prevalence.

$$n = \frac{(1.96)^2 p_{exp} (1 - p_{exp})}{d^2}$$

Where n= sample size required

1.96=the value of Z at 95% confidence interval

P_{exp} = expected prevalence

d= desired absolute precision

Hence, the required sample size was 384 individual animals.

Study Design

A Cross-sectional study was conducted on the total of 384 bovine that was selected from the study population by simple random sampling technique. The study populations was indigenous breed of bovine coming to air open veterinary clinic in Jimma University and by presenting study area of in and around Jimma Zone of Oromia, Ethiopia.

Study Methodology

Parasitological Study

A total of 384 blood samples were collected from ear veins of cattle. During blood collection, the necessary bio-data of each animal was recorded. The Buffy coat technique using phase contrast microscope was used for the detection of trypanosomes in the blood. Species identification was done by morphological examination of trypanosomes on Giemsa stained thin blood smears prepared from the positive animals and examined under a microscope using the oil immersion 100 × objectives [10].

Measuring of packed cell volume (PCV)

The capillary tubes were placed in micro haematocrit centrifuge with sealed end outer most by soap. 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 haematocrit 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 [11].

Buffy coat technique

Blood was collected from an ear vein using heparinized micro-haematocrit capillary tube and the tube was sealed by soap. A heparinized capillary tube containing blood was centrifuged for 5min at 12,000 rpm. After the centrifugation, trypanosomes were usually found in or just above the buffy coat layer. The capillary tube was cut using a diamond tipped pen 1 mm the buffy coat to include the upper most layers of the red blood cells and 3 mm above to include the plasma. 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 ×40 objective and ×10 eye pieces for the movement of parasite [12].

Thin blood smear

A small drop of blood from a micro haematocrit 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 50 min. Drain and wash of excess stain using distilled water, allowed to dry by standing up right on the rack and examined under the microscope with oil immersion objective lens [11].

Data Management and Analysis

The data was entered and managed in Microsoft excel. All data were analysed by (SPSS) software version 20. Descriptive statistics such as percentage and frequency distribution was used to describe the nature and the characteristics of data. The prevalence

of bovine trypanosomosis was analyzed using percentage. The association of different risk factors with prevalence of bovine trypanosomosis was computed by Chi-square test.

Results

Descriptive results

From the total of 384 cattle examined with using a buffy coat technique, wet smear technique and PCV technique, 31(8.1%) were positive for trypanosomes that indicate the overall prevalence. The prevalence of bovine trypanosomosis concerning the different peasant associations (PA) was 5(5.0%), 9(7.9%) and 17(9.9%) in Ifa bula, in Manna and Sekka accordingly, which was statistically not significant ($P>0.05$) (Table 1).

Table 1: Prevalence of bovine trypanosomosis in relation to animal origin

	No of animal examined	No of animal positive	Prevalence (%)	<i>T.congolense</i>	<i>T.vivax</i>	<i>T.brucie</i>	X ²	P-value
Ifabula	99	5	5.0	4	0	1	2.028	0.363
Manna	114	9	7.9	2	2	1		
sekka	171	17	9.9	10	3	4		
Total	384	31	22.8	20	5	6		

Trypanosome congolense, *Trypanosoma vivax*, and *trypanosoma brucie* were the Trypanosoma Species identified by Giemsa stained thin blood smear examination. Among the total of 31 cases of trypanosome infections detected 20(64.5%) of the

infections were due to *T. Congolese*, 5(16.1%) were due to *T. Vivax*, the rest 6(19.3 %) were due to *T. brucie* and no mixed (0%) infections detected with statistical significance difference ($P=$) (Table 2).

Table 2: Prevalence of trypanosoma species identified

Specie	Number of animal Positive	Prevalence (%)	X ²	P –value
<i>T.congolense</i>	20	64.5		
<i>T.vivax</i>	5	16.1	3.491	0.745
<i>T.brucie</i>	6	19.3		
Total	31	99.9		

Table3. Prevalence of trypanosomosis infection with different potential risk factors

Potential risk factors	Number of animals Examined	Number of animals	Number of positive Infected (prevalence)	animals	X ²	P-Value
Age						
Young	115	9	7.8		0.159	0.923
Adult	186	16	8.6			
Old	83	6	7.2			
Total	384	31	23.6			
Sex						
Male	266	28	10.5		7.021	0.003
Female	118	3	2.5			
Total	384	31	13.0			
Body condition						
Good	111	0	0.0		39.921	0.000
Medium	169	8	7.0			
Poor	104	23	13.0			
Total	384	31	20.0			

Sex wise prevalence of trypanosome infection was higher in male 28(10.5%) and small in female 3(2.5%) animals (Table 3). However, statistical significant difference ($P > 0.05$) was not observed between sexes. With respect to body condition score, the prevalence was 23(13.6%) 8(7.0%), 0(0%) in poor, in medium and in good, body condition score, respectively with a significant variation ($P < 0.05$) between them (Table 3). Age based prevalence was 16(8.6%) in adult, 9(7.8%) in young, and 6(7.2%) in old animals years of age respectively. Although adult cattle have higher infection rate statistical significant

difference ($P > 0.05$) was not observed between age group (Table 3).

Hematological Findings

The analysis of PCV value in the animals examined for trypanosome infection showed that the mean PCV value for the aparasitemic cattle was having $PCV \leq 24\%$ (non-anemic) was 294 in number from this eight were positive to trypanosomosis so the prevalence was 8(2.7%) and parasitic cattle was having $PCV > 24\%$ (anemic) was ninety in number from this total 23(25.5%) was positive to trypanosomosis (Table 4).

Table 4: Mean PCV of infected and non – infected animals sampled

Animal	No of animal examined	No of positive animals	Mean PCV prevalence	X ²	p-value
Non Infected	294	8	2.7		
Infected	90	23	25.56	48.413	0.000
Total	384	31	28.3		

Discussion

The distribution of the most common species of trypanosomes infesting cattle in Ethiopia varies greatly from one area to another [4]. In this study the observed prevalence was 31 (8.1%) which suggests that trypanosomosis is an important diseases of cattle in the study areas. this prevalence of trypanosomes concord with prevalence of 8.55% of Sasiga and Diga district of East Wellega [13]. and 9.1% in Mada Talil, Hawa gelan district [14]. The similarity of prevalence between these studies might be due to similarity in altitude and fly density of the study areas. Significant differences were observed in areas with differing altitude but not in areas with similar elevations [15] In contrast this study result is lower than the report of 12.41% in Metekel and Awi zones of northwest Ethiopia [16] and 20.40% in Wolyta and Dawero zones of southern Ethiopia [17]. higher than the report of [18] and [19] found prevalence of 4.2% and 4.15% in Kenaf and Gari settlement areas of East Wellega, similarly, 4.2% was also recorded in South Achefer district in Amhara regional state by [20]. The higher prevalence in the current study area might be due to less and infrequent use of various trypanocidal drugs as well as the increase of tsetse challenge because of higher density of vectors in the study area. The prevalence of trypanosomosis infection decreases substantially during the long dry season and persisted high during the early dry season (end of rainy season) [21].

The variation between reports might be due to, application of relatively well designed methods of tsetse control and 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 diseases. An epidemiologically important observation

in this study was the infection of animals with tsetse transmitted trypanosome: *T. vivax* and *T. congolense*. There are rivers and forest at the study area, therefore; it is more likely that tsetse flies migrate up land, from their original habitat, following the river courses. The movement of tsetse away from their prime habitat when climatic conditions are not favorable in the surrounding areas has been described by [23]. In the current study the species of Trypanosome identified were, *T. congolense* 20(64.5%) higher in prevalence while *T. vivax* 5(16.1%) which is lower was recorded. This is relatively agreement with [22] indicated a prevalence of trypanosomosis ranging from 4% to 9.6% due to *T. vivax* in the three highland districts bordering Lake Tana. This prevalence of *T. congolense* infection in cattle may be due to high number of serodemes (serological variation) of *T. congolense* as compared with *T. vivax* and the development of better immune response to *T. vivax* were depend on infected animal [22]

Higher infection rates were observed in male animals than female 28 (10.5%), 3 (2.5%) respectively in the present study but the difference was not significant (0.008). This result was similar to the finding of [24]. The higher infection rate in males compared to females may be attributed to stress factors related to work where male animals are used for drought purpose and they have to walk long distance in areas where there is a high risk of tsetse challenge. This finding is agree with the result of [25].

During the study, the prevalence of bovine trypanosomosis was assessed in three different body conditions (good, medium and poor). Animals' shows the highest prevalence in poor body condition 23(13.6%) followed by medium 8(7.0%) while good body condition score was 0(0%). Infection rate in poor body conditioned animals were higher than good and

medium body condition animals which was highly statistical significant ($P=0.000$) and was in agreement with [26] and [27] although higher infection rate was observed in animals of less than 3 years of age and animals above three years of age. However, it would be difficult to conclude either poor body condition predispose to trypanosome infection or trypanosome infection cause loss of body condition based on such cross-sectional study and it should be verified by using a longitudinal study designs [28].

The disease itself results in progressive emaciation of the infected animals; nevertheless, non-infected animals under good body condition have well developed immune status that can respond to any foreign protein better than those infected cattle with poor body condition which can be immune compromised due to other diseases or malnutrition, since malnutrition and concurrent infections depress the immune responsiveness in some cases [29].

The animals examined were categorized in three age groups as young, adults and old. The trypanosome infection prevalence was 8(7.8%) in the young age group 16 (8.6%) in the adult age group and 6(7.2%) in the old age group animals. However, statistically there is no significant difference in infection rate among the different age groups (0.923). The higher infection rate observed in adult animals might be associated with the higher animal and tsetse contact resulting from the concentration of flies on river banks where there was green pasture and access to drinking water. There is also evidence that *T. congolense* infection was chronic diseases that increase infection rates with age [30]. The cumulative effect of exposure to tsetse flies and new strains of trypanosomes in adult animals accounts for the observed infection rate. The reduced infection rate in older animals might be associated with the innate resistance of cattle, which increased by repeated exposure of the same population of Trypanosomes in a given area and additionally young animals are naturally protected to some extent by maternal antibodies [31].

From the total cattle populations sampled during the study period, 90 of cattle populations have $PCV \leq 24\%$, however 23(25.5%) of them were positive to Trypanosomosis on this test and some of them react negatively for trypanosomosis infection and this may have occurred due to the inadequacy of detection method used or delayed recovery of anemic situations after recent treatment with trypanocidal drugs or may be due to the compound effect of poor nutrition and hematophagous helminthes infection such as haemonchosis and bunostomiasis [32].

The present study also revealed that almost 294 cattle have a PCV value in the normal range ($PCV > 24\%$) but 8(2.7%) of them were positive to trypanosomosis which were react positively to

trypanosomosis infection. This may have occurred due to recent infection with trypanosomosis which is in agreement with the result of [33], [34], [35] and [36] Taking the PCV value 24-46% as normal for zebu cattle [37]. The difference in mean PCV between parasitaemic and aparasitaemic animals indicates that trypanosomosis reduces the PCV values in infected animals. The level of anemia or PCV value usually gives a reliable indication of the disease states and reduces performance of infected animals [38]. However, PCV values can be affected by many factors other than trypanosomosis, but these factors are likely to affect both Trypanosomosis negative and positive animals [39].

Conclusions And Recommendations

The major species of *Trypanosomes* in the study area were *T. congolense* followed by *T. vivax* and *T. brusi*. Besides this study, results indicate the high prevalence of *T. congolense* which indirectly indicate that high distribution of tsetse fly at the study area. According to the host risk factors, the prevalence of bovine Trypanosomosis was higher in females than in males, in older and younger than adult it was the highest in those animals with poor body condition. In general, Trypanosomosis is economically important disease that affects the health as well as productivity of cattle in and around Jimma town. Based on the above conclusion, the following recommendations are forwarded:

- ✓ Educating the public in the tsetse belt or affected areas of Trypanosome to participate in control strategies.
- ✓ It is better to restrict the Movement of animal around tsetse area.
- ✓ Further surveys and studies should be conducted and appropriate, feasible control of Trypanosomosis must be done.
- ✓ Strategic control of bovine trypanosomosis including vector control should be strengthened to improve livestock production and agricultural development in the area.

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9/24/2020