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# Prevalence of Bovine Trypanosomiasis in Boloso Bombe Wereda, Southern Ethiopia

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## Abstract

Across-sectional study on bovine trypanosomiasis was conducted to determine the prevalence, to identify species of trypanosomes involved and to assess associated risk factors in BolosoBombe district, Wolaita zone, south Ethiopia. In the current study,overall prevalence of 5.4% bovine trypanosomiasis was recorded. Prevalence of 3.6% and 6.9% were recorded in cattle of one to three and greater than three years age of cattle. Prevalence of 2.8% and 6.25% was recorded in altitude of Midland (Herrje, 1575 mater) and lowland (Bedaye and Ajora, 1206 mater) respectively. Trypanosomes were not detected in cattle less than one year of age. Two species of trypanosomes; *Trypanosome congolense*, and *Trypanosome vivax* were detected with a prevalence of 3.7% and 1.7% respectively. Based on coat color, the finding of 6.3%, 5%,and 2.9% were recorded in red, black and mixed color respectively. On the basis of hematological finding, for PCV $\leq$ 24 and PCV >24 were 6.3% and 3.6% respectively. In conclusion, the study indicated that trypanosomiasis was the major constraint of livestock production in the study area; therefore concerned bodies should strengthen and continue their effort against this vector-borne parasitic disease.

**Keywords:** Bovine, Boloso Bombe, Prevalence, Trypanosomiasis

## Introduction

Trypanosomosis is the main hemoparasitic disease in domestic animals and is caused by the protozoan parasite called Trypanosoma.It is one of the major constraints on animal production in African which have the greatest potential for significant increase in domestic livestock production. The parasite is transmitted biologically by the tsetse-fly (Glossina) species and infects animal over an area known as the ‘ tsetse belt‘; which extends approximately 10 million $km^2$ across 37 countries in Africa, from the Sahara Desert in the North to South Africa in the south (Eisler*et al.*, 2001;De Koning *et al.*,2004). In Africa, the overall loss /both direct & indirect/ is estimated to be about 500 billion dollars a year in terms of mortality, abortion, reduced fertility, milk and meat production, and ability to work as traction animals (Peregrine 1994; Bett *et al*., 2004 ). In addition to these, the disease is also responsible for an annual loss of millions of dollars in livestock production as a result of the cost related to treatment, prevention & Vector control efforts (Assefa and Abebe, 2001).

In Ethiopia, the disease is major impediments to livestock development and agricultural production contributing negatively to the overall development in agriculture in general and to food self-reliance efforts of the nation in particular. The disease is more prevalent in the southern, western &Northwestern parts of the country where the primary vectors exist along the great river basin of Abay, omo, Ghibe &

Baro. The fly has infested an estimated 130,000 - 200,000 square kilometer of fertile land in the country. But some reporters showed the disease to be important in non-tsetse infested high land part of the country (Cherenet *et. al.,* 2006). In general, the countrylosses 20,000 head of cattle in every year by death that declines the number of cattle particularly, drought oxen (Abebe & Jobere, 1996).

In Ethiopia 14 million heads of Bovina are at risk of contracting trypanosomiasis at any time (Langridye 1976).Among these clinical manifestation anemia & emaciation occurred when becomes chronic (Radiosititiss *et, al.,* 1994). Thin smear examination is the best means used for identification of morphology of species of parasite and by thick smear examination have great chance to get parasite compared to thin smear but cannot found typical morphology of species. Concentration technique by using microhaematocritic centrifuge at 1200 revolution by the end of 5 minutes and identification of motile trypanosomiasis in the buffy coat zone of microhematocritic capillary tube using dark field illumination is most accurate of all diagnostic methods. In general, diagnosis is solely attained by parasitological methods like dark ground phase contrast. Buffy coat technique which can be used under field condition to detect the presence or absence of trypanosomes & trypanosomiasis is one of common & endemic and economically the first disease problem in BLOSO BOMBE district. The problem was seen to be prominent in districts board erring the Omo river basin where both cyclically & mechanically transmitted trypanosomiasis where reported. Boloso Bombe woreda is one of such district where there was a serious complaint of the disease, but no previous study had covered the district to show the situation of the disease. Several attempts have been made to control trypanosomiasis in the country, with chemotherapy,and chemoprophylaxis being the most widely applied method. Vector- targeted control practices have been implemented mainly through specifically designed joint projects of the Ministry of Agriculture and other non –governmental organization(Murray *et, al,* 1997).

Though Ethiopia is 10$^{th}$ in the world ranking of total livestock population & 1$^{st}$ in the case of Africa, the productivity of livestock is low in the world as well as in Africa or in the country as compared with this population. Despite the large size of livestockpopulation, health care system, nutritional status, reproduction or genetic and management system are very poor As a result cattle, sheep, Got and equines mortality rates are very high & productivity is decreased when compared to the developed countries. Addition to these in Ethiopia, there is also other long existed and deep-rooted socioeconomic problems, for instance, high population growth, high incidence of human disease, inadequate health, and education service. Due to these overall problems, Ethiopia leveled s one of the last developing nation in sub-Saharan Africa (EEA, 1998).

The economic base of farmers in Boloso Bombe woreda is agriculture. It employs about 91% of the total population and agriculture is mainly mixed. Livestock production at the area is cattle Goat & sheep and crops are produced in agriculture. As a result of the backwardfarming practice of agriculture's its productivity is low. Agricultural productivity has been usually low and food insecurity is a frequent problem of the woreda (IAEA, 1996). Even though the Trypanosomiasis was distributed in different wored's of the zone due to manly time and financial constraints, the scope of this research will concentrate on the prevalence assessment of Bovine Trypanosomiasis in Boloso Bombe woreda. The study will cover Boloso Bombe woreda in which a large number of live stocks and high incidence of trypanosomiasis occur. Therefore, general objective of the study was to assess the situation of Bovine Trypanosomiasis in Boloso Bombe woreda. Specific objectiveinclude determining the prevalence of bovine Trypanosomiasis in Boloso Bombe woreda, identifying the species of Trypanosomes in the study area (Bombe Woreda) and assessing of risk factor of the disease.

## Materials and Methods

### Study Area

Boloso bombe woreda is located about 435 km south of AddisAbeba, 219 km fromHawassa and 57 km from town ofwolaita Soddo. The woreda has a total area of 27220 hectares. IN 2005 E.C the human population was estimated at 126,640 and 51.47% of this were women. Altitude of the woreda ranges from 1150 m in the west to 2277 m above sea level in the southern part of the woreda. Road networking is poorly to moderate connected from woreda to kebeles and worda to other woredas. Mean annual rainfall range from 1500mm-1700mm (MOA, 2002). The mixed agricultural production system is practiced in highlands and flat/platue. The topography of woreda is mainly platue or flat and soil is mainly clay and sandy type. Almost

rainfall is uniform in the highland and flat/platue. Based on this natural variation, there are two major farming systems. In highland where rainfall is high and reliable, wheat, barely, enset, bean mainly, fruits such as avocado, bananas, and mango are widely grown. Because of the perennial nature of the crops and the small holding size, which is between 0.25-05 hactar,hand hoeing is the predominant method of cultivation. Livestock is oxen for farming, meat and mainly dairy cows kept for their milk and manure. Manure is commonly applied to enset, ginger, and taro and for others. Enset and coffee are cultivated near the homesteads. Extensive grazing areas which are about 5.14% of the total area are used for herding the oxen,cattle, donkey, goat, and sheep. The livestock production system is intensive and a population of 73139 cattle, 7885 sheep, 11330 goats, 6407 donkeys, 153 mules, 34 horse, and 66111poultry (FAO, 2005).

### Study Population

The animals used in the study were local zebu cattle which are managed under smallholder mixed crop-livestock farming system. Animals were allowed to graze freely during the day and housed at night. The age of animals also were grouped, less than 1 year, 1-3 years and greater than 3 years of age. The body condition of animals were also grouped as good, medium, or poor based on Nicholson and batter worth (1986) method of body causation scoring for zebu cattle.

### Sampling Method

For the questionnaires survey, A total of 75 farmers (25 in each from three peasant associations) were selected to assess the perception of farmers and veterinary personnel's on the occurrence of bovine trypanosomiasis, livestock management and constraints, herd composition, used and source of trypanocidal drugs for treating their animals and controlling methods of trypanosomiasis and tsetse fly. Animals were randomly selected by taking an age, sex, and skin color & body condition from three peasant association (Bedaye, Ajora,and Herrije).

### Sample size determination

The previous study on trypanosome reported the prevalence of 17% (Leta *et al.,* 2016). Therefor, by using 5% expected prevalence and 5% absolute precession at 95% confidence level, the number of animals required to estimate the prevalence of trypanosome was calculated to be 242 by using formula of Thrusfild (2005).

### Laboratory Examination

Dark ground/phase contrast buffy coat technique was used to examine the presence of trypanosome species. The capillary tubes were examined under a microscope for the presence of trypanosome and finally, tubes were broken and content of buffy coat dropped onto clean slide covered with coverslip and examined for trypanosomes. Thin blood smears were stained with Giemsa and examined with oil immersion to identify species of trypanosome as described by Murray et al. (1997).

### Statistical Analysis

Prevalence of trypanosomes was expressed as a percentage by dividing a total number of samples or animals positive to trypanosome to the total number of samples or the total number of animals examined.

## Results

Out of 242 cattle (116 female and 126 male) examined, 5.45% (13 of 242) were found carrying trypanosomes. The highest prevalence (7.6%) was observed in Bedaye while the lowest 3.03% was observed in Herrje Peasant association (Table 1). On the basis of species, both *T. congolense and T. Vivax* wereidentified in the current study area. *T. congolense* was seen in higher rate (69.2%) than *T. Vivax* which was observed in a rate of 30.8% (Table 2).Relatively, a higher level of trypanosome prevalence (6.9%) was observed in female cattle when compared to the prevalence of trypanosomes observed in male (4%) cattle (Table 3).On the basis of altitude, trypanosome prevalence of 2.7% and 6.5% were detected in Midland and lowland respectively (Table 4). The prevalence of 6.3%, 5 % and 2.95% were observed in red, mixed and black skin color of cattle respectively on the bases of skin color. The animals with red and black skin color are highly exposed for Trypanosomiasis than mixed colored animals (Table 5). The Cattle having PCV < 24% (an anemic) was affected by the rate of 6.35% while in the cattle having PCV ≥ 24% (non -anemic) was exposed in a rate of 3.6% as indicated in (Table 6).

**Table 1**: Prevalence of Trypanosomiasis in site basis.

| Peasant associations | No. Examined | No. positive | Prevalence(%) |
|---|---|---|---|
| **Herrje** | 68 | 2 | 3.0 |
| **Ajora** | 82 | 4 | 4.9 |
| **Bedaye** | 92 | 7 | 7.6 |
| **Total** | 242 | 13 | 5.4 |

**Table 2:** Prevalence of Trypanosomiasis on the basis of Trypanosome species involved.

| Trypanosome species | Infection | Prevalence (%) |
|---|---|---|
| *T. congolense* | 9 | 69.2 |
| *T. Vivax* | 4 | 30.8 |
| Total | 13 | 5.4 |

**Table 3:** Prevalence of Trypanosomiasis on a sex Basis.

| Sex | No. Examine | No. +ve | Prevalence % |
|---|---|---|---|
| **Female** | 116 | 8 | 6.9 |
| **Male** | 126 | 5 | 4 |
| **Total** | 242 | 13 | 5.4 |

**Table 4:** Prevalence of Trypanosomiasis on the basis of altitude.

| Altitude | No. Examined | No. Positive | Prevalence (%) |
|---|---|---|---|
| **Midland (1575m)** | 72 | 2 | 2.8 |
| **Lowland (120m)** | 170 | 11 | 6.5 |
| **Total** | 242 | 13 | 5.4 |

**Table 5:** Prevalence of Trypanosomes on the basis of skin color.

| Skin Colors | No .Examined | No. +Ve | Prevalence % |
|---|---|---|---|
| **Red** | 127 | 8 | 6.3 |
| **Black** | 80 | 4 | 5 |
| **Mixed** | 35 | 1 | 2.9 |
| **Total** | 242 | 13 | 5.4 |

**Table 6:** Prevalence of Trypanosomiasis on the basis of Hematology.

| PCV -Value | No. Examined | No. +Ve | Prevalence % |
|---|---|---|---|
| **Pcv<24** | 158 | 10 | 6.4 |
| **Pcv≥24** | 84 | 3 | 3.6 |
| **Total** | 242 | 13 | 5.4 |

## Discussion

The present study revealed that out of total 242 randomly selected cattle in study area, 13 (5.3%) were affected by Trypanosomiasis of which 2 (3%), 4(4.9%), and 7(7.6%) were recorded in Herrie, Ajora, and Bedaye respectively. The current finding was much lower than the finding (17%) reported by Soddo Regional Veterinary Laboratory (FAO, 2005 ) and the work of Tilahun *et al* , (1997) who reported

trypanosomiasis with infection prevalence of 22% at pawe, and the work of Muturi (1999) who reported trypanosomiasis with prevalence of 14.2% at Merab Abaya, Southern Ethiopia. However, it was higher than the work of Miruk *et al,* (2008) who reported a prevalence of 4.8%. In the current study, two species of trypanosomes (*T.congolense* and *T.vivaxhas*) had been identified. Out of the 13 trypanosomiasis *T.congolense* contributes 69.23% (9/13) while the rest 30.8% (4/13) was contributed by *T.vivax*. *T. congolense* was identified at a higher prevalence in all the three peasant associations. Higher prevalence of *T.congolense* compared to the prevalence of *T.vivax* was in agreement with previous works of Rowlands *et al*, (1995), Muturi (1999), Afewerk (2000), and Tewolde (2004)that identified *T. congolense* with the prevalence of 84%, 66%, 60.9%, and 75% in their study in Ghibe valley, In Merab Abaya, in pawe, and in western Ethiopia, respectively. Based on sex, 6.8% and 3.8% prevalence was observed in female and male cattle respectively. This current study finding support the general perception that female animals are more affected by the non-sex related disease as parturition and lactation cause relaxation of the natural immunity of female animals (Craig, 1998).

During the study period cattle with PCV< 24% were considered anemic (Van den Bossche Rowlands, 2000) which was said to be a principal sign of trypanosomiasis in livestock. The finding showed that the highest proportion (76.92%) of affected cattle had PCV < 24%. The result was relatively lower than the previous results by Afewerk (1998) at pawe, Northwest Ethiopia who reported 90% rate and Muturi (1999) at Merab Abaya, South Ethiopia who reported 88.9% rate. However, trypanosomiasis infection and mean PCVvalues obtained in this study of parasitemic cattle were in agreement with the report of Rowlands *et al* (1995) in Gihibe valley at south western Ethiopia, which was stated that the average PCV of parasitologically negative animals was significantly higher than the average PCV of parasitological positive animals. From the total cattle population sampled during study period, 65.3% of cattle population have PCV <24%. Almost 93.7% cattle`s having PCV <24% but they react negatively for trypanosomiasis infection and this may have occurred due to the inadequacy of detection method used (Murray *et al.* 1997) or delayed recovery of anemic situations after recent treatment with trypanocidal drugs or may be due the compound effect of poor nutrition and hematophagous helminth infection such as haemonchosis and bunstomaisis(Afework, 1998)

However, PCV values can be affected by many factors other than trypanosomiasis, but these factors are likely to affect both trypanosomiasis negative and positive animals (Van den Bossche Rowlands, 2000).

The present study also revealed that 3.6% of the cattle have a PCV value in the normal range (PCV≥24%) were reacting positively to trypanosomiasis infection and this may have occurred due to recent infection with trypanosomiasis. This result agrees with the previous result of Garoma (2009) who conclude that cattle`s having PCV value of normal range were shown to be infected with trypanosome parasite. When infection prevalence of trypanosomiasis was calculated among three age groups, a higher prevalence (6.9%) was observed in greater than three years of age groups of cattle followed by in age 1-3 years 3.6%. in the current study, trypanosomes were not detected in a group of cattle less than one year of age. This great difference in prevalence between less than one year of age group and the rest two age groups of cattle might be explained from the point of differences in management practices. Calves were managed by keeping them around houses and under shade in the night and in most part of day times unless in the morning and late in the afternoon.

Comparison conducted between different skin color of cattle indicated that, slightly higher prevalence was observed in cattle's having red skin color(6.3%) followed by 5% in black and 2.8% in mixed skin color. Tsetse flies by nature, attracted toward a red and black skincolor, so in animals having red skin color, there was a high prevalence of trypanosomiasis recorded. However, the red skin colored animals was relatively affected in high frequency than the black colored animals. The possible suggestion for the low prevalence in black skin color animals in the current study may be the number of samples taken from black skin color animals.

## Conclusion and Recommendations

In this cross-sectional study of trypanosomiasis in cattle, overall prevalence of 5.4% was observed. Trypanosomiasis was an important priority disease of cattle in Boloso Bombe district. Sex, coat color, altitude (site) and age of cattle are important factors affecting the occurrence of trypanosomiasis. Different level of prevalence was recorded in the different studied peasant associations whilethe highest prevalence being observed in Bedaye. Higher prevalence was observed in female cattle and in cattle

greater than three years of age, but there were no positive cattle in a group of cattle less than one year of age. Two species of trypanosomiasis, *T. congolense,* and *T. vivax* were identified. In conclusion, the study indicated that trypanosomiasis was the major constraint of livestock production in the study area. In light of the above conclusion, the following recommendations are forwarded:

- Strategic control of bovine trypanosomiasis including vector control should be strengthened to improve livestock production in the area.
- Further surveys and studies should be conducted and appropriate, feasible control of trypanosomiasis and/or vectors should be implemented at the area.

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