

## Research Article

# A Cross-Sectional Study on the Prevalence of Bovine Trypanosomosis in Ankesha District of Awi Zone, Northwest Ethiopia

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## Abstract

A cross-sectional study aimed at investigating the prevalence of Trypanosomosis was conducted in five selected peasant associations of Ankesha district, of Awi zone of North Western part of Ethiopia from November to December 2016. A total of 384 blood samples were taken from marginal ear vein by puncturing with sterile lancet and dropping down in to heparinized capillary tube to its 3/4<sup>th</sup> level after which it was centrifuged for 5 minutes at 12000rpm. This enhances to reveal the buffy coat at ease where Trypanosome is likely concentrated and is the locus where to be cut by diamond pencil to be seen under microscope for motility of Trypanosome species. Out of 384 samples only 28 of them were found to be positive with an overall prevalence of 7.29%. The attribute of difference in peasant association, and host related risk factors (age, sex, body condition, PCV value) were expressed in detail with their degree of statistical significance for correlation with occurrence of Trypanosome species. Furthermore, age, sex and species of trypanosome investigated in an infected cattle were assessed whether to be determinants for PCV of animal species in discussion. In comparison, all were found to be statistically insignificant ( $P>0.05$ ).

**Keywords:** Trypanosomosis; Species; Buffy coat; PCV

## Introduction

Trypanosomosis is the principal and a disease with the most significant effect on both settlement and socio-economic development of a major part of sub-saharan Africa according to the illustration of food and agricultural organization of the United Nations. An area estimated to be 7-10 million km<sup>2</sup> covered by tsetse fly in which only 20 million cattle are reared. It is supposed to be the home for 140 million heads of cattle and an increase in productivity of 1.5 million tones of meat provided that the suspected land is liberated from the problem mentioned [1].

Trypanosomosis is a widely spread protozoan disease complex which affects cattle and other wide range of hosts in sub-Saharan Africa. The course of the disease may run from a chronic long lasting to an acute and rapidly fatal depending on the vector-parasite-host interactions. The disease is mainly characterized by intermittent fever, progressive anaemia, and loss of condition of susceptible hosts which if untreated leads to heavy mortalities [2]. The etiological agent of the disease is unicellular flagellated protozoan parasite of a genus Trypanosoma. Trypanosomes are blood borne unicellular protozoan parasites dwelling in various body and tissue fluids. The parasite is known for more than a century, but still control of the disease remains elusive [3].

Several species of hematophagous tsetse flies of the genus Glossina are the vectors of African trypanosomosis and are responsible for cyclical transmission of the parasitic protozoan between numerous vertebrate hosts. The vector is distributed over wide range of habitats

covering about 10 million square kilometers of potential grazing lands in 37 countries which are rendered unsuitable for livestock breeding and farming across the African continent [4], exposing 160 million cattle to the risk of anaemia, emaciation, and death and 55 million people to the risk of fatal sleep [5]. As a result agriculture revolution which is a key element in the fight against poverty and the improvement of food security in developing countries failed in tsetse infested areas of sub-Saharan Africa [6].

In Ethiopia, trypanosomosis is one of the most important diseases that limit livestock productivity and agricultural development due to its high prevalence in the most arable and fertile land of southwest and northwest part of the country following the greater river basins of Abay, Omo, Ghibe, and Baro [7]. Currently about 220,000km<sup>2</sup> areas of the above-mentioned regions are infested with five species of tsetse flies, namely, *Glossina pallidipes*, *G. morsitans*, *G. fuscipes*, *G. tachinoides*, and *G. longipennis* [8]. More than 10 million heads of cattle in Ethiopia are at risk of variable degrees of trypanosomosis at any time of the year, of which six million are tsetse borne [9]. A number of studies have been so far undertaken in different parts of the country to determine the magnitude of this economically important disease [10-13].

Every year nearly 3 million cattle deaths is induced by bovine trypanosomosis and about 35 million doses of drugs is administered to make life suitable in tsetse infested area. While the economic losses in cattle production alone is up to US\$1.2 billion, the indirect impact engendered by the disease on the agriculture-livestock production is estimated to be about US\$4.5 billion a year [14]. The overall negative

**Table 1:** The prevalence of Trypanosoma species at different peasant association in the study area.

Area	Total examined	No. positive (%)	Prevalence (%)	P-value
Dikuna dereb	80	8	10	0.012
Inibara	77	10	12.9	
Anbela	80	3	3.7	
Kupar	75	5	6.6	
Wundigi wunbiri	72	2	2.7	
<b>Total</b>	<b>384</b>	<b>28</b>	<b>7.29</b>	

**Table 2:** Prevalence of Trypanosomosis infection with different potential risk factors.

Potential risk factors	Number of animals examined	Infected animals	Prevalence (%)	P-value
Age				0.124
Young	132	9	6.82	
Adult	252	19	7.54	
Sex				0.271
Male	234	16	6.84	
Female	150	12	8.00	
Body condition				0.003
Good	117	4	3.41	
Poor	267	24	8.99	

impact of trypanosomosis extends to the access and availability of cultivable areas, changes in land use and exploitation of natural resources, restriction of opportunities for agricultural diversification and intensification.

Trypanosomosis directly affects the milk and meat productivity of animals, reduces birth rates, increases abortion as well as mortality rates; all of these reduce the herd size and herd composition. The indirect impact of the disease mostly lies on crop production through the availability and cost of animals that provide traction power [15]. Trypanosomosis reduces work efficiency of oxen and discourages the introduction of drought animals in to crop farming [16]. Shaw et al. [17] discussed the economic benefits from intervening against bovine trypanosomosis. These authors reported significant benefits especially for Ethiopia, because of its very high livestock densities and the importance of animal traction. The estimated maximum benefit per square kilometer of tsetse infested area over a 20 year period is US\$10,000. Consequently, the total maximum benefits from dealing with bovine trypanosomosis in Ethiopia could be as much as US\$1 billion over a 20 year period.

Despite the enormous cattle wealth that Ethiopia possesses it was seen with no magnificent potential in changing the economy of the country solely due to cattle disease and disease causing factors in which control of the problem is the last choice.

## Materials and Methods

### Study area

A triangle-shaped district in the Agew Awi Zone, Ankasha Guagusa is bordered on the south by the Mirab Gojjam Zone, on the west by Guangua, on the north by Banja Shekudad, and on the east by Guagusa Shekudad. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 199, 826, of whom 99,285 are men and 100,541 women; 16,380 or 8.2% are urban inhabitants.

Ankesha district is found at 405kms and 126kms apart from Addis Ababa and Bahirdar respectively which is located in the direction of North Western part of the country. It is an area which is very suitable for mixed farming (crop-livestock production). The study was conducted in five peasant associations of the Ankesha district namely Dikuna dereb, Inibara, Ambela, Kupar, Wundigi wunbiri. The study area has enclosed about 839 km<sup>2</sup> in Ankesha district. The peasant associations selected were with low land agro-ecology and are very closest to Zindjini River which is one of the main tributaries of Abay River in the selected district. Human populations of 8374 are the beneficiaries of the study result among the peasant associations selected. The mean altitude for the peasant associations selected from the district is 1634 meter above sea level. The average annual rainfall is 2000mm for the district which ranges from the late of May to early September with the rest of months are dry season (long dry season). The land is covered by different vegetation types namely savanna grass lands, forest and bush lands. The annual mean temperature for most parts of the district is 14-26°C according to the report of Ankesha district office of Agriculture and rural development of 2009.

### Study population

Livestock is the main area of focus for the study though other susceptible species of animals are also there in the district. For the study area a livestock population of 38,909 has been registered which is estimated to comprise animals of different age, sex, body condition, and with various physiological parameters.

### Study methodology

A cross sectional study of sample collection was conducted for successive two months period from November to December 2016 in the selected peasant associations (Dikuna dereb, Inibara, Ambela, Kupar, and Wundigi wunbiri) that were believed to represent the ecology for tsetse and trypanosomosis to exist. A total of 384 animals were examined for the study. The sample size was determined based on sample size determination for prevalence study from infinite population with 95% confidence level, 5% of desired absolute precession and expected prevalence of 50% Thrusfield, 2005 [18]. During sampling sex, age and body condition of animals were recorded. The body condition score was categorized as poor and good taking the middle point as a border in the 9 scale scores of Nicholson and Butterworth (1986) method of body condition scores for zebu cattle [19].

### Sample collection

Blood Samples were collected by simple random selection of animals of the selected sites besides which relevant data such as age, sex, body condition, source of animal and other information believed to be necessary for the course of study was recorded. Blood samples were collected by marginal ear vein puncture using a sterile lancet in to heparinized capillary tubes (75x1.2mm) from each of the randomly selected animals. A total of 384 blood sample were collected from selected six villages of the district by simple random sampling method.

### Parasitological identification

Blood samples were collected to the level 3/4<sup>th</sup> of heparinized capillary filled tubes were sealed at one end with crystal seal and centrifuged at 12000rpm for about 5 minutes using microhaematocrit centrifuge. Then the PCV was measured using PCV reader to

**Table 3:** Prevalence of Trypanosomosis based on PCV value.

Animal status	Total examined	No. infected	Prevalence (%)	P-value
Anemic	143	21	14.67	0.000
Normal	241	7	2.90	
Total	384	28	7.29	

**Table 4:** Comparison of mean PCV of infected cattle on the basis of animal sex, age, and Trypanosome species.

Factors	No. of infected	Mean PCV	95% CI (%)	P-value
Sex				
Male	16	26.5	23.5-29.5	0.186
Female	12	25	20.00-30.00	
Age				
Adult	19	27.5	19.80-35.20	0.321
Young	9	26.1	21.20-31.00	
Species of Trypanosomes				
<i>T. vivax</i>	19	21.50	19.00-24.00	0.092
<i>T. congolense</i>	9	23.00	20.00-26.00	

estimate anaemia and the Buffy coat was drained onto microscope slide by cutting the capillary tube with sharp pointed diamond pencil 1mm below the butty coat. After which it was covered with a 22 X 22mm cover slip on microscope slide and examined under dark field microscope (40X power objective). Thin smears were prepared for positive samples for species identification [20]. The trypanosome species were identified according to their motility in the Buffy coat examination. Thin smear were made and stained with Gimsa staining technique from buffy coat positive samples for identification of Trypanosoma species.

### Data analysis

Data on individual animals and parasitological examination result was entered into MS-Excel spread sheets program. The prevalence of trypanosomosis and PCV, with corresponding 95% confidence intervals, was determined for different categories of study animals. The trypanosome infection rates with different variables like altitude, age and sex and body condition score were compared by chi-square test. The mean PCV of infected and non infected animals were compared using student t-test. Intercooled Stata 7.0 (Stata corporation 1985-2001) software was used to conduct the statistical analyses [21].

### Results

The prevalence of Trypanosoma species is a bit higher and significant ( $P < 0.05$ ) in the two peasant associations (Inibara 12.9% and Dikuna dereb 10%) relative to the rest of peasant associations with 6.6%, 3.7%, 2.7% in Kupar, Anabela, and Wundigi respectively as was shown below in Table 1. These probably is due to the extensive agriculture and bush clearing which is not suitable for tsetse flies not to exist and is currently underway in the least three low prevalent peasant associations unlike the intact ecology of tsetse fly in both Inibara and Dikuna dereb. On the other way round the registered percentages of prevalences in the three peasant associations with low trypanosomes challenges were subjected to *T. vivax* with high ratio and to *T. congolense* to the lowest level. The fact of being with high ratio of exposure to *T. vivax* in the three peasant associations is an indication of the presence of other mechanical biting flies to transmit the disease and is the common way of transmission in areas where the natural setting of the environment is not suitable for tsetse flies to exist.

In Table 2 host related risk factors such as sex (male, female), age (young <2 years, adult >2years), and body condition (good, poor) were assessed in depth whether they potentiate the occurrence of the trypanosomosis disease challenge in an animal or not. The study indicated that age and sex were not seen to produce any magnificent challenge ( $P > 0.05$ ) unlike body condition which due have great correlation with the disease in cattle ( $P < 0.05$ ).

The prevalence study of trypanosomosis based on packed cell volume (PCV) value assessment has shown that the occurrence of the disease in anaemic animal is three fold when compared to those animals with normal PCV value and the disease was found to be very significant ( $P < 0.05$ ) and highly PCV value dependent (Table 3).

### Haematological finding

As shown below on Table 4 both host related factors like age and sex were not disclosed as to observe their magnificence in the value of PCV and seen to be of less or no value in changing the PCV pattern of the study process ( $P > 0.05$  in both sex and age). The same is true in case of species of Trypanosome investigated in not bringing out magnificent change in the value of PCV of cattle ( $P > 0.05$ ) in this study in both animals contracting either or both of Trypanosome species, anaemia is inevitable to happen taking the PCV value 24 to 46% as normal for zebu cattle [22]. The fact that anaemia is predictable in both species of Trypanosome is because they rely solely on red blood cell of animals for their meal and reproduction thereby induce excessive breakdown of RBC and produce anaemia.

### Discussions

Out of 384 cattle blood samples taken in suspect of trypanosomosis, only 28 of them were found to be positive indicating that the overall prevalence of trypanosomosis in this specific study site is about 7.29% and was seen to be similar with the prevalence investigated by Yihunie who found a prevalence of 7.81% in Wenberma district of Western Gojjam and higher than the investigation recorded in Mecha district of west Gojjam in which a prevalence of 2.10 was listed by M. Ayana [23]. The present study was in the lower border of the range of prevalence reports by previous studies in the neighboring districts of west Gojjam zone and other areas of Amhara region. Prevalence reports from these previous studies varied from 6% in the mechanically transmitted trypanosomosis areas bordering lake Tana to 17% in mixed infection areas of districts bordering Abay basin as was reported by Yihunie [24].

As was tried to reveal the prevalence of Trypanosome species at different peasant associations in the study area; a relatively high prevalence rate 12.9% and 10% was recorded in Inibara and Dikuna dereb respectively and found to be statistically significant compared to the rest three peasant associations listed in Table 1. The relatively lower prevalence rate list in the three peasant associations was due to bush clearing & extensive agriculture currently underway in the sites. The other is the altitudinal difference has played a paramount role in between the two classes of peasant associations in that the former two are a little bit lower in altitude than the rest indicating the suitability of the ecology for tsetse flies to exist.

Animal related risk factors such as age and sex were found with zero cumulative significance effect as was seen on Table 2 with the variation in percentage of prevalence of not more than 1% in between

both categories of sex and age groups. This may indicate us to the conclusion that both age and sex groups do have the same probability to be exposed to the flies irrespective of their difference. Similar investigation studies have been made known by other investigators in Wemberma [24], and Assosa [23]. There was a double fold difference of prevalence rate and statistically significance ( $P < 0.05$ ) on the ground of body condition score this might be due to the stress induced by the parasite on the host. Similar conclusions have been said by Yihunie [24] & M. Ayana [23].

Lowered PCV (Anaemia) was extremely correlated with the occurrence of Trypanosomosis and revealed to be five fold in rate of prevalence (14.67% to 2.90%) and statistically significant (Table 3) when compared to those with normal PCV and is with many similarities of result with studies conducted in and around western Gojjam by M. Ayana [23].

Finally PCV value was assessed whether it varies with factors like age, sex, and difference in Trypanosome species in infected cattle and found to be with neither magnificent variation in percentage of prevalence nor statistically significant (Table 4).

## Conclusion and Recommendation

Trypanosomosis is a chronic debilitating disease of domestic animals of specifically mid and low land agro-ecology which has direct economic impact in the form of reduction of meat and milk production, lack of traction power, impairs of genetic improvement. On top of the aforementioned problems cost of treatment and control are some of the post disease challenges categorized as indirect causes of economic threats which are worth mentioning. It is the main impeding disease that affect agricultural production and animal's husbandry in North West, West and Southwest part of the country. The present study showed that prevalence of trypanosomosis is an important problem in Ankesha district; a problem on the productivity of cattle.

Therefore a very serious tsetse controlled operation should be taken by the concerned group.

If possible manage the animals on the backyard, to avoid contact with flies (vectors). Control of the vector in affected area not only reduces the prevalence of trypanosomosis and the huge economic loss but also helps in limiting the extension of the disease to the free adjacent areas.

The veterinary centers should be established and well organized to work autonomously, and to cop up with the fruitful expected end results. This requires adequate fund and financial administration on economic grounds.

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