

A cross-sectional study on bovine trypanosomosis in Jawi district of Amhara Region, Northwest Ethiopia

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Abstract

A cross-sectional study was carried out from December 2008 to March 2009 in Jawi district of Amhara Regional State northwest Ethiopia to assess the prevalence of bovine trypanosomosis. Blood sample was collected randomly from a total of 300 cattle through piercing of the marginal ear vein to determine the prevalence and measure PCV values for the assessment of anemia. During sampling age, sex and body condition of the animals were recorded to infer risk factors for the occurrence of the disease. The buffy coat technique was employed for the detection of trypanosome and to measure PCV values. Thin blood smear was made from positive samples for species identification of the parasite. The prevalence of trypanosomosis was found to be 11.33% (95% CI: 0.08 - 0.15%) in Jawi district of which higher prevalence with species of trypanosome was detected to be for *T. congolense* (65%) than *T. vivax* (35%). The prevalence showed no significant difference in susceptibility between sex categories and in age groups. The infection rate between body condition score in parasitaemic and aparasitaemic animals was significantly different ($P < 0.05$) that poor body conditioned animals were more affected by trypanosomes than good conditioned animals. The mean PCV values in parasitaemic animals was $24.29\% \pm 5.58SD$ while in aparasitaemic animals $27.46\% \pm 5.67SD$ with a statistical significant difference ($P < 0.05$). Therefore, the study conclude that in Jawi district of Amhara region the presence of high prevalence of trypanosomosis necessitate implementing control program and further studies on vector dynamics and trypanocidal drug efficacy to be essential.

Keywords: Bovine/ Prevalence/ Trypanosomosis/Jawi/Amhara/ Northwest Ethiopia.

Introduction

Trypanosomosis is the most serious veterinary and animal production problem in sub-Saharan Africa and prevents the keeping of ruminants and equines over 10 millions of square kilometers of potentially productive land (PATTEC, 2001). The limitations imposed by tsetse and trypanosomes problem continue

to frustrate efforts and hampers progress in crop and livestock production there by contributing to hunger, poverty and the suffering of entire communities in Africa (PATTEC, 2001). Tsetse transmitted trypanosomosis in man and domestic animals pose a serious threat to the lives and livelihood of entire communities and constitute the greatest single constraint to livestock and crop production in sub-Saharan Africa (Hoare, 1972). Out of 165 million cattle found in Africa, only 10 million are found within the tsetse belt and these are mostly low producing breeds which are maintained on high drug management regimes to keep trypanosomosis. Trypanosomosis in Africa costs livestock producers and consumer an estimated US \$1billion each year (Kristajonson et al., 1999). In Ethiopia, trypanosomosis 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 Southwest and Northwest part of the country following the greater river basins of Abay, Omo, Ghibe and Baro with a high potential for agricultural development (MoA, 1995; Getachew Abebe and Yilma Jobre, 1996; Getachew Abebe, 2005). Currently about 220,000 km² 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* (NTTIC, 2004). The most important trypanosome species affecting livestock in Ethiopia are *Trypanosoma congolense*, *T. vivax* and *T. brucei* in cattle, sheep and goats, *T. evansi* in camels and *T. equiperdum* in horses (Getachew Abebe, 2005). As a result tsetse transmitted trypanosomosis threat a large proportion of the livestock population is forced to reside in tsetse free highlands but economically and environmentally fragile. Hence regular assessments of bovine trypanosomosis in tsetse infested areas have a paramount importance for the control of the disease. Therefore, the objective of the present study was to assess the current prevalence of bovine trypanosomosis in Jawi district of Amhara region northwest Ethiopia.

Materials and Methods

Study Area

The study was carried out in Jawi district of Amhara region, northwest Ethiopia as shown in figure 1. The climate alternates with long summer rain fall (June-September) and a winter dry season (October-May) with mean annual rain fall of 1569.4mm. The mean temperature varies between 16.68 °c-37.6 °c and the altitude ranges from 648-1300 m.a.s.l. The land is covered by different vegetation types namely savanna grass land, forest, riverine and bush lands with major agricultural products like sorghum, maize, sesame and cotton. The

livestock population of the Jawi district comprises about 70403 cattle, 6549 sheep, 24995 goats, 1232 equines, 30997 poultry and 7520 bee hives (AAZARD, 2008).

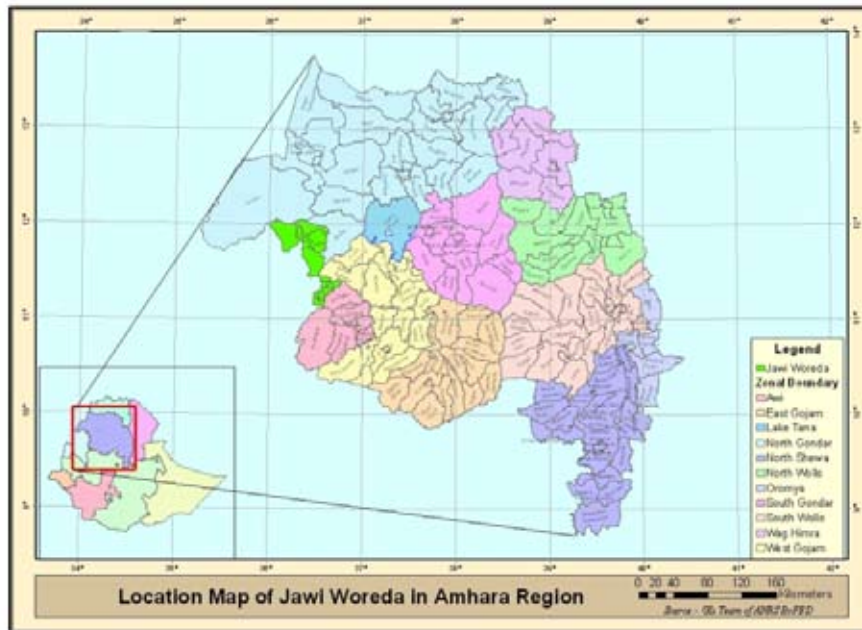


Figure 1. Map of Amhara regional state showing the study area (Jawi Woreda)

Study Animals

The study populations were local breed of cattle and the rearing system of cattle population in the district depends on natural grass and crop residues and kept in traditional management system. Animals obtain water in both wet and dry season are from the major rivers Adwanj, Ayima and Beles.

Study Design

Sampling method

A cross-sectional study was conducted to determine the current prevalence of bovine trypanosomosis in the study area. Blood sample was obtained from cattle using simple random sampling method. During sampling PAs, age, sex

and body condition score of the animals were recorded. The age was categorized in to three (0-2 years, 3-5 years and greater than five years) and the body condition score was grouped in to poor and good conditioned animals based on the appearance of ribs and dorsal spines applied for Zebu cattle (Nicholson and Butterworth, 1986). The desired sampling size was calculated according to the formula given by Thrusfield (2007). The sample size was determined based on the expected prevalence of 20%, 95% confidence level and 5% precision as result 245 samples were required. But to improve the degree of precision a total of 300 samples were taken for the present study.

Parasitological study

A total of 300 cattle were examined for blood sample collection. Blood sample was collected by puncturing of the marginal ear vein of each animal with a lancet and drawn directly into heparinized capillary tube and centrifuged with capillary hematocrit centrifuge (Woo, 1970) for PCV measurement and the presence of trypanosomes was done by the dark ground buffy coat technique (Murray *et al.*, 1977). Positive samples were further processed for thin blood smear for confirmation of trypanosome species using their morphological characteristics (Paris *et al.*, 1982) with Giemsa staining techniques.

Data Analysis

Descriptive statistics, student t-test and chi-square tests were used to express results and analysis of variables. The trypanosomosis with variables; peasant association, age, sex and body condition score was compared by chi-square test. The mean PCV of infected and non infected animals were compared with student t-test.

Results

Parasitological Findings

The overall prevalence of trypanosomosis was 11.33% in Jawi district in the study period as shown in Table 1. *Trypanosoma congolense* was the most prevalent species with 65% followed by *T. vivax* with 35%. The prevalence of trypanosome species in cattle within peasant association during the study period varied from 7% in Chankula to 16% in Elala and Kurand but there is no significant difference between PAs ($P>0.05$). The prevalence of trypanosomes infection differed between age categories 0-2 years, 3-5 years and greater than 5 years but not significant ($P>0.05$). Higher prevalence observed 14.38% in age group greater than 5 years compared to the 0-2 years age category 6.2%. The

prevalence of trypanosome infection was slightly higher in male 12.35% than female 10.14% animals but there was no statistically significant difference ($p>0.05$). The prevalence of trypanosomosis between body conditions score was 14.6% and 6.1% in poor and good body condition respectively and it was statistically significant ($P<0.05$) (Table 2).

Table 1. The prevalence of bovine trypanosomosis infection in age and sex groups inJawi district of Amhara region northwest Ethiopia.

Variables	No. animals examined	No. animals infected	Prevalence (%)
Age	0-2	44	6.2
	3-5	103	8.74
	>5	153	14.38
	Total	300	11.33
Sex	Female	138	10.14
	Male	162	12.35
	Total	300	11.33

Chi-square=2.995, df = 2, $p= 0.224$ for age, Chi-square= 0.3592, df=1, $p= 0.549$ for sex

Table 2. The prevalence of bovine trypanosomosis infection in body condition score inJawi district of Amhara region northwest Ethiopia.

Variables	No examined	No. infected	Prevalence (%)
Good	115	7	6.1
Poor	185	27	14.6
Total	300	34	11.33

Chi-square = 5.1080, df=1, $P = 0.024$

Haematological Findings

The mean PCV value in infected animals was $24.29\% \pm 5.58SD$ while in non infected animals was $27.46\% \pm 5.67SD$ and the variation between the two was 3.17% ($27.46\% - 24.29\%$). There was statistically significant difference ($p<0.05$) in the mean PCV value between the infected and non infected animals. The overall mean PCV value of the study was $27.10\% \pm 5.74SD$ (Table 3).

Table 3. Mean PCV of parasitaemic and aparasitaemic animals in Jawi district of Amhara region northwest Ethiopia.

Status	No. examined	Mean PCV (%)	Standard deviation
Parasitaemic	34	24.29	5.58
Aparasitaemic	266	27.46	5.67
Total	300	27.10	5.74

Chi-square = 5.1080, df=1, P=0.043

The comparison of anemic status measured by PCV of parasitaemic period both infected with *T. vivax* and *T. congolense* infections indicated that *T. congolense* infection reduced PCV significantly higher than *T. vivax* infection (P<0.05) as indicated in Table 4.

Table 4. Mean PCV values between trypanosome species in parasitaemic animals in Jawi district of Amhara region northwest Ethiopia.

Species	No. affected	Mean PCV%	Standard deviation
<i>T. congolense</i>	22	22.41	4.76
<i>T. vivax</i>	12	27.75	5.48

Chi-square = 5.1080, df=1, P=0.023

Discussion

The present study indicated that trypanosomosis is still of much concern and represents a major obstacle to cattle production in Jawi district of Amhara region, northwest Ethiopia. The parasitological examination revealed a prevalence of 11.33% for bovine trypanosomosis with *T. vivax* and *T. congolense* being the pathogenic trypanosome identified during the study period. As compared to the extensive studies done on tsetse and trypanosomosis in south western Ethiopia, little efforts were exerted in north western parts of Ethiopia. Trypanosomosis has a long history in areas touched by Abay (Blue Nile) river valley. Thus, in the late 1960s tsetse (*Glossina*) and sick cattle were observed in Gojjam province with the area of infestation extending as far as Lekemt (Langridge, 1976; Slingenebergh, 1992; Solomon Wolde-Mariam *et al.*, 2003). This study is roughly agreed with the findings of previous findings 20.51 % (Thomas Cherenet *et al.*, 2005) and 9.3% (Shimelis Dagnachew and Getachew Abebe, 2007) in Jawi district. The value of 20.51% prevalence was done before any intervention and low awareness of the people about the diseases during that period. In tsetse infested area of Ethiopia, 20-30% of cattle were affected by trypanosomes and in some high tsetse challenge areas the prevalence

of the disease reaches up to 50 % (Getachew Abebe, 2005). Several studies (Leak *et al.*, 1999; Rowlands *et al.*, 1995; Leak *et al.*, 1993) have indicated *T. vivax* is highly susceptible to treatment while the problems of drug resistance are higher in *T. congolense*. This is shown in the present study that the prevalence of *T. congolense* was (65%) higher than the prevalence of *T. vivax* (35%). The presence of many drug vendors, and drug administration largely by non-professional in the presence of trypanosomes species in Jawi district may explain the increase in prevalence even some intervention of the disease undertaken and awareness of the disease is created. The high proportion of *T. congolense* were detected in Jawi district agreed with reported by Shimelis Dagnachew and Getachew Abebe (2007) which is 58% due to *T. congolense*. This high ratio of *T. congolense* may also suggest that the major cyclical vectors or *Glossina* species (*G.m. submorsitans* and *G. tachinoides*) are more efficient transmitters of *T. congolense* than *T. vivax* in east Africa (Langridge, 1976) and *T. congolense* is mainly confirmed in the blood, while *T. vivax* and *T. brucei* also invade the tissues (Hoare, 1972; Stephan, 1986; Whitelaw *et al.*, 1988).

One of the main symptoms of the disease is anemia (Murray, 1979) consequently the present study also indicated significant difference between mean PCV values of infected and non infected cattle. Out of the observed animals, 34 of them were positive and their mean PCV value was 24.29% and 266 of them were negatives and their mean PCV was 27.46%. Comparison of the mean PCV of infected animals within species of trypanosome out of 34, twenty two were infected with *T. congolense* and their mean PCV was 22.41% and 12 were infected with *T. vivax* and their mean PCV was 27.75%. Mostly *T. vivax* invades other tissues in addition to blood such as lymph nodes, eyes and heart (Hoare, 1972; Stephan, 1986; Whitelaw *et al.*, 1988) but *T. congolense* confirmed in the blood that might results low PCV values. Other than this it can also be assumed that numerous concurrent diseases like helminthiasis, tick born diseases and nutritional imbalance cause anemia in both trypanosome positive and negative animals. The body condition is also important indication for trypanosome infection both of the individual animal and of the herd level (Murray, 1979). The present study indicated significant difference ($P < 0.05$) between poor and good condition animals that animals grouped as poor are more affected by trypanosomes. In the present study higher infection rates were observed in male and in adult animals but not significant ($P > 0.05$). The possible explanation for relative increment of prevalence in male and adult animals could be associated to the fact that these animals travel long distance

for grazing, water, draught as well as harvesting crops to high tsetse challenge areas.

Conclusion

Trypanosomosis is an important disease and a potential threat affecting health and productivity of cattle as result the present study also indicates the significance of the disease with a prevalence of 11.3% of bovine trypanosomosis in Jawi district of Amhara region northwest Ethiopia. The result revealed that *T. congolense* was the most prevalent species in the study area and the infection significantly reduced the PCV values and body condition. Consequently the disease has significant effect on cattle productivity and agricultural activities which need an integrated control of the parasite and the vectors.

Acknowledgements

The authors gratefully acknowledge the financial support of Gondar University and the technical and logistic support of Bahir Dar regional veterinary laboratory during sample collection.

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