

Epidemiological Study on Prevalence and Associated Risk Factors of Trypanosomosis in Cattle of Jawi District of the Amhara Region, North Western Ethiopia

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Abstract: This cross-sectional study was conducted from November 2013 to May 2014 in Jawi district of Amhara regional state, north-west Ethiopia to determine the prevalence of cattle trypanosomosis, associated related risk factors of the disease, and to identify the prevailing species of trypanosomes. Blood samples collected from (n= 300) randomly selected cattle (*Bos indicus*) was examined using parasitological (buffy coat technique) and thin smear under Giemsa stain. An overall, (18/300, 6%) prevalence was recorded. The infection was caused by *Trypanosoma vivax* (10/300, 56%) and *Trypanosoma congolense* (8/300, 44%). The prevalence trypanosomosis was significantly higher (P<0.05) in animals with poor body condition (21.43%) when compared to animals with medium (3.21%) and good (5.55%) body condition. Although it was not found statistically significant (p>0.05), the prevalence was slightly higher (7%) in Woblase study site that has higher vegetation coverage followed by Workmeda (6.06%), whereas relatively lower prevalence was registered in Fendika (4.95%) a study site with low vegetation coverage. Similarly, prevalence of trypanosomosis was not statistically significant among the different age categories and between the two sex groups (P> 0.05) of study animals. Therefore, the result of the present finding showed moderately high prevalence of trypanosomosis in the study area implying the need for strategic and integrated approach to control the vector and to minimize the impact of the disease in the district.

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Key Words: Jawi District, Prevalence, *Trypanosoma*, *Trypanosomosis*.

1. Introduction

Trypanosomosis is among the well-known constraints to livestock production in Africa as it causes a serious and often fatal disease of livestock mainly in the rural poor community and rightfully considered as a root cause of poverty in the continent (Vreysen, 2006). Most trypanosomes that are transmitted by tsetse flies inhabit many parts of the continent that extended about 15° N and 20° S of the equator, biting flies may also act as mechanical vectors of trypanosomosis (Urquhart *et al.*, 1992).

Ethiopia is situated at the East end of the African tsetse belt. In Ethiopia, tsetse flies are confined to south western and north western regions between longitude 33° and 38° E and latitude 5° and 12° that covers an area of about 22,000 km² (NTTICC, 2004).

Trypanosomosis is a complex disease caused by unicellular flagellated protozoa called trypanosomes and found in the blood and other tissue fluids of vertebrates including cattle and man (Tesfaye, 2002; Uilenberg, 1998). Three elements influences the epidemiology of the disease namely, the distributions of the vectors, the virulence of the parasites (trypanosomes) and response of the host to tsetse fly bite. Trypanosome species affecting livestock in Ethiopia are *T. congolense*, *T. Vivax* and *T. brucei* in

cattle, sheep, and goats, *T. evansi* in camels and *T. equiperdium* in horses (Getachew, 2005).

The disease is characterized by severe anemia, weight loss, reduced productivity, infertility and abortion, with death occurring in some animals during the acute phase of the disease. Animals which survive often remain infected for several months or years, exhibiting a low level of fluctuating parasitaemia which serves as a reservoir for the disease occasionally; however, infected animals may undergo spontaneous recovery (Nantulyia, 1986).

The presence of trypanosomosis is a major obstacle to the introduction of highly productive exotic dairy cattle and draught oxen to lowland settlement and resettlement areas of Ethiopia for utilization of large land resource (Abebe and Wolde, 2010). In Ethiopia, the overall economic loss due to trypanosomosis was estimated to be between US\$ 1408 and 1540 million per annum (NTTICC, 1996). Baseline data collection and regular investigation on the prevalence of the parasite is essential to know the burden of the disease at different geographic locations and to recommend control measures on the disease. For the determination of trypanosomes infection status in rural Africa settings, microscopy-based techniques using direct observation of wet blood films,

microscopic examination of Giemsa stained blood smears and concentration technique (HTC) are the most common parasites detection methods available (Gonzales *et al.*, 2003).

There are different efforts at different sites and time to control tsetse and trypanosomosis in the country. The efforts are mainly directed at the parasites in the host through trypanocidal drugs. On the other hand several efforts applied were targeted at vector control include odour-baited, and insecticide impregnated targets and traps and insecticide application on the back of the the host animal (Silngenbergh, 1992). Although, different efforts have been made to control and minimize the impact of the disease to the level that it does not cause a serious impact to livestock production in Jawi district of the Amhara Region in the past, cattle trypanosomosis is still becoming the most serious disease impairing the production and productivity of the animals. Therefore, the present study was designed to determine the prevalence of cattle trypanosomosis, host related risk factors of the disease and to forward the possible control measures against the impact of the disease on the product and productivity of cattle in the study area.

2. Materials and Methods

2.1 Study Area

The study was conducted in Jawi district of Amhara regional, North-West Ethiopia from November 2013 to May 2014. The study area is located approximately 600 km North -West of Addis Ababa the capital city of Ethiopia. The climate alternates with long summer rain fall (June-September) and a winter dry season (October-May) with mean annual rain fall of 1569 mm. The mean temperature varies between 16.68^oc to 37.6^oc and the altitude range from 648 to 1300 meter above sea level (NMSA, 2013). The land is covered by different vegetation types namely savanna grass land, forest, river and bush land.

2.2 Study Design

A cross- sectional study was conducted in three randomly selected kebeles namely:(Wablase, Workmeda and Fendika) of Jawi district of the Amhara Region hereafter named sites to determine the prevalence of bovine trypanosomosis and to assess the host related risk factors of the disease.

2.3. Study population

The study animals were local (indigenous) Zebu cattle of both sexes and all age groups kept under extensive management system. The age of study animals was categorized in to young (<2 years), adult (3-5 years) and old (>5 years) of age (De-Lahunta,1986; Pace and Wake, 2003) and the body condition score was grouped in to poor, medium, and good based on the appearance of ribs and dorsal spines

applied for Zebu cattle (Nicolsonand and Butterworth, 1986). Livestock population of the Jawi district comprises about 70,403 cattle, 6,549 sheep, 24,995 goats, 1,232 equines (CSA, 2013).

2.4. Sampling methods and size determination

The type of sampling methods was simple random sampling techniques to establish the prevalence and host related risk factors of trypanosome infection in the study area. The desired sample size was determined using the formula given by (Thrusfeild, 2007).

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

where: n = require sample size

P_{exp} = expected prevalence

d = desire absolute precision

1.96² = z-value for the 95% confidence level

The prevalence of bovine trypanosomosis in Jawi district was reported to be 11.33% by (Habtamu *et al.*, 2011). Therefore, an expected prevalence of 11.33% was taken to estimate the required sample size. Taking 95% confidence level, 5% absolute precision and 11.33% expected prevalence 154 animals were needed to establish the prevalence. However, 300 cattle were sampled to increase the level of precision and randomness.

2.5. Blood sample collection and parasitological study

2.5.1. Buffy Coat Techniques

Blood sample were obtained by puncturing the marginal ear vein by a lancet after properly securing the animal and aseptically preparing the area around the ear vein and collected directly in to a pair of heparinized capillary tubes to the level of 2/3 of the height. The tubes were then sealed at one end with crystal seal, then placed in to microhaematocrit centrifuge with sealed end outermost and centrifuged for 5 minutes at 12,000 rpm. After centrifugation, trypanosomes were usually found in or just above the Buffy coat layer. The capillary tube was cut using a diamond tipped pen 1mm below 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 onto a glass slide, and covered with cover slip. The slide was examined under 40 X objective and 10 X eye pieces for movement of the parasites (Wool, 2000).

2.5.2. Thin blood smear

A small drop of blood from a micro-hematocrit capillary tube was applied to a clean slide and spread by using another clean slide at an angle of 45^o. The smear was dried by air and then fixed with methyl alcohol for 2 minutes and then the smear was stained with Giemsa stain for 30 minutes. Excess stain was being drained and washed by using distilled water. Then it was allowed to dry by standing up right on the

rack and examined under the microscope (100 X) oil immersion objective lens (OIE, 1982). Trypanosome species was identified according to their morphological description on Giemsa stained blood (Blood and Radostitis, 2000).

2.6. Data analysis

All the data collected were entered and managed in MS-Excel software program and analyzed using SPSS 20.0 software version. Descriptive statistics was used to summarize the data. Prevalence was calculated as the number of positive cattle harboring the parasite

divided by the total cattle examined. Chi-square statistics was used to test the association between variables. Significant was considered when P- value is < 0.05.

3. Result

Of the 300 sampled cattle, 18/300 (6%) were found infected with two species of trypanosomes. Out of the total infected animals, (10/300, 56%) and (8/300, 44%) were infected by *T. vivax* and *T. congolense*, respectively as shown in (Table 1) below.

Table 1: Identified Trypanosome Species in Jawi District

Species	No. animals examined	No. positive	Prevalence %
<i>T. Vivax</i>	300	10	3.33
<i>T. Congolense</i>	300	8	2.67
Total	300	18	6

Infection of cattle with trypanosome was found in all surveyed kebeles of the district. Slightly highest prevalence (7%) was recorded in Woblase study site which was with high vegetation cover followed by Workmeda (6.06%), whereas the lowest prevalence (4.95%) was recorded in Fendika study site that has low vegetation cover. However, the difference was not found statistically significant ($X^2=0.375$, $P>0.05$) as shown in (table 2).

The prevalence of trypanosome infection was higher in male than female animals; however, statistically significant difference was not observed between the two sex groups ($X^2=2.127$, $P>0.05$) as shown in (Table 2).

Similar to sex, trypanosome infection was computed in different age groups. Slightly higher prevalence (8.67%) was recorded in adult animals than young in the study district but the variation was not statistically significant ($X^2=1.823$, $P>0.05$) (Table 2).

Trypanosome infection in relation to body condition of sampled animals indicated higher prevalence (21.43%) in animals with poor body condition when compared to animals with medium (3.21%) and good (5.55%) body condition. The result indicated statistically significant difference between body condition score and trypanosome infection ($X^2=20.929$, $P<0.05$) as shown in (Table 2). The effect of age, sex, sites and body condition on prevalence of trypanosomosis is summarized in table 2 below.

Table2: Prevalence of cattle trypanosomosis and host related risk factors in Jawi district.

Risk factors	No. animals examined	No. positive	Prevalence %	X^2	p-value
Kebeles					
Woblase	100	7	7	0.375	0.829
Workmeda	99	6	6.06		
Fendika	101	5	4.95		
Total	300	18	6		
Sex	300				
Male	167	13	7.78	2.127	0.829
Female	133	5	3.75		
Total	300	18	6		
Age					
Young	52	2	3.84	1.823	0.402
Adult	92	8	8.67		
Old	156	8	5.12		
Total	300	18	6		
BCS					
Poor	42	9	21.42	20.929	0.000
Medium	222	7	3.15		
Good	36	2	5.55		
Total	300	18	6		

4. Discussion

The present study revealed an overall 18(6 %) prevalence of trypanosomiasis caused by two species of trypanosomes. This finding was virtually similar with the result of (Ayalew *et al.*, 2011) who reported 4.4% prevalence in Bench Maji zone of Southern Nations Nationalities and people region and 6.49% prevalence in Blue Nile river Basin, (Yehunie *et al.*, 2012) who reported 7.8% in Gojjam zone of Amhara Region, (Tasew and Duguma, 2012) whose finding showed 8.57% prevalence in Western Oromia Zone and (Mekuria and Gadisa, 2011) who reported 9.3% prevalence in Jawi district of Amhara Regional state.

Similarly, this finding was in line with the findings of (Adane and Gezahagne, 2007) whose report indicated 8.2% prevalence in East Gojjam zone of Amhara Region and (Eyasu and Ahmed, 2013) whose finding was 6.3% in Wolyta Zone of Southern Nations Nationalities and people region. In contrast the present finding was lower when compared with 25.7% prevalence reported by (Cherenet *et al.*, 2006) in tsetse infested area of Amhara Region, (Shimelis *et al.*, 2011) who reported 26.3% prevalence in Assosa district of the Benishangul Gumuz Regional State, and (Ali and Bitew, 2011) whose finding showed 24.7% prevalence in Mao-komo special district of the Benishangul Gumuz Region. The possible reason for such variation in the infection rate of trypanosomes could be attributed to the variation in climate and altitude that affect the vegetation, rain fall and temperature distribution of the localities that in turn are known to be the primary determinant factors for survival and proliferation of the vectors (tsetse and other biting flies).

Of the total cases recorded, 10(56%) and 8(44 %) were found to be caused by, *T. vivax* and *T. congolense* respectively. This finding was in consistent with the previous finding of (Adane and Gezahagne, 2007) who reported high proportion of *T. vivax* in East Gojjam Zone bordering the Blue Nile River. *T. brucei* was not registered in this study; however, it is important to note that *T. brucei* are capable of invading extra vascular tissue and accumulate in loose connective tissue, which makes their detection in blood films difficult (Ulienber, 1998).

Among the study sites, the highest and the lowest prevalence of trypanosomiasis were recorded in Woblase 7(7%) and Fendika 5(4.95%) respectively. However there was no significant difference ($p > 0.05$) in the prevalence of trypanosomiasis and the study sites. According to (Adale and Yasmine, 2013), there is difference in prevalence of trypanosomiasis in different study sites and the difference among kebeles is due to difference in vegetation cover; reproduction and

development of flies are highly influenced by climatic conditions which support this finding.

The prevalence of trypanosome infection was slightly higher in male animals 13(7.78%) than females 5(3.75%), although it was not statistically significant ($p > 0.05$). However, this finding was not in agreement with the previous findings of (Feyissa *et al.*, 2011); (Tasew and Duguma, 2012). Similarly, (Bogale *et al.*, 2012) found higher infection rate in females than males in some parts of Ethiopia. The possible reason for the current finding could be that male animals are used for draught purpose which in turn cause stress, starvation and emaciation to male animals, moreover, male animals are forced to travel long distance for grazing, watering, for draught purpose, harvesting crops and have high chance to move to tsetse challenge areas when compared with female animals (Habtamu *et al.*, 2011).

Higher prevalence of trypanosomiasis was observed in animals with poor body condition (21.42%) when compared to animals with medium (3.15%) and good (5.55%) body condition and the association was found statistically significant ($p < 0.05$) and this finding was in agreement with study carried out by (Lelisa *et al.*, 2015); (Teka *et al.*, 2012) and (Ayana *et al.*, 2012) who recorded higher trypanosome infection rate in animals with poor body condition than in animals with medium and good body condition. Slightly higher prevalence was registered in adult animals (8.67%) when compared with young (3.84%) and old (5.12%) animals and statistically significant association was not observed ($p > 0.05$) and the finding was in agreement with previous workers of (Cherenet *et al.*, 2006); (Tasew and Duguma, 2012) and (Terefe *et al.*, 2014), who reported comparable results on trypanosome infection across different age categories.

5. Conclusion

Trypanosomiasis caused by *T. vivax* and *T. congolense* remains a major obstacle to cattle production and productivity in Jawi district of Amhara Region, North-West part of Ethiopia. Parameters of study animals such as sex and age were not found to be a risk factor for trypanosome infection; however, parameter of study animals such as body condition was found to be one of the risk factors for trypanosome infection in the study district. To wrap up, the result of this finding shows moderately high prevalence of trypanosomiasis in the study sites signaling the need for strategic and participatory approach to control the vector and to minimize the impact of the disease in the study district.

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