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Prevalence of Bovine Trypanosomosis in and around Mersa Town of South Wollo Zone, Amhara Regional State, Ethiopia

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Keywords

Bovine,
Mersa town,
Prevalence,
Thin smear,
Trypanosome

Abstract

A cross-sectional study was conducted in the in and around Mersa Town, South Wollo Zone, Amhara Regional State, Ethiopia; from December 2011 to June 2012 to investigate the prevalence and to assess the associated risk factors of *Trypanosome* infections. From a total of 384 randomly selected animals in three selected peasant associations of the study district. Blood samples were collected and processed using Giemsa stained thin smear examination. Therefore, the overall prevalence of the *Trypanosome* infection was found to be 5.73%. Among the total of 22 cases of trypanosome infections detected 19(86.4%) of the infections were due to *T.vivax* and the rest 3(13.6 %) were due to *T. congolense* from direct smear positive samples. *Trypanosome* infections were higher in female (4.2%) than male (2.5%) and in adult (5.9%) than young (4.7%) animals. But, there were not significant differences ($P > 0.05$) observed between sex groups and age categories. Moreover, with respect to body condition score, the prevalence of infection was significantly ($P < 0.05$) higher in poor body condition score animals (12.9%) followed by animals with a medium score (6.4%) and good (2.8). A significant association was observed ($P<0.05$) among the disease positivity and body condition score. In conclusion, trypanosomsis was found to be important disease in the study area and it requires wide area coverage epidemiological survey in order to propose suitable control strategies.

Introduction

Bovine trypanosomosis is one of the most prevalent and important disease in Ethiopia limiting livestock productivity and agricultural development (Abebe and Jobre, 1996). Once it was estimated that about 38% of the national cattle herd was affected or at risk of trypansomosis infection. The huge livestock resource, particularly cattle are utilized as they provide traction power (a vital contribution to the overall farm labour requirements), provide milk, meat, cash income, manure and serve as a capital asset against risk. Despite the importance of livestock to the largest sector of the population and to the economy at large, the sub-sector has remained untapped (MoA, 2001). The disease is very economical because of it highest prevalence in the most arable and fertile land with high potential for agricultural development in the South West and North West part of the country along the great river basins of Abay, Omo, Ghibe and Baro which are infested with vector tsetse fly. There are also studies which showed the disease to be equally important in non-tsetse infested highland part of the country (Cherenet *et al*., 2006). Previous Studies revealed the prevalence of the disease in many districts of Amhara region with obvious economical consequences (Bitew *et al*., 2011; and Dagnachew *et al*., 2005).

The diagnosis of *Trypanosome* infection is based on clinical signs but animal trypanosomiasis presents special problems since; the clinical signs of the African Animal Trypanosomiasis are indicative but are not sufficiently pathognomonic and the standard techniques for the detection of *trypanosomes* are not sufficiently sensitive. Direct microscopic examination of blood, either by the wet film method; but, it is insensitive as half of the infected animals may be missed and it will not be enough to identify the species of the trypanosome properly. Stained thin and thick smear techniques permit detailed morphological studies and identification of the trypanosome species by light microscopy (Sekoni *et al*., 2004). Sensitivity can be improved through concentration of the parasites by centrifugation and by blood inoculating into susceptible laboratory animals, which is more sensitive than direct microscopic examination of the blood sample. This, however, is not a practical technique because diagnosis is not immediate and the cost of maintaining the animals makes the method prohibitively expensive for routine diagnosis, especially in the field. It can thus be seen that despite several improvements in the techniques for trypanosome detection, a high proportion of infections still go undetected as the majority of infections are chronic and the intermittent parasitaemia may preclude detection of the parasites even in acute infections. Moreover, the techniques are not practical enough to be applied in the field (Boulange *et al*., 2002).

Mersa town is one of the districts in South Wollo Zone with serious complaint of animal trypanosomosis. Therefore; controlling this economically important disease in this area could have enormous benefit to improve the livelihood of the rural population by increasing milk, meat, surplus capital from the sale of livestock and livestock products and improving the availability of ploughing oxen and no previous study conducted in the district to show the situation of the disease and to integrate all efforts towards combating the disease and reducing economic losses. Hence present research project was undertaken with the aim to determine the prevalence of trypanosome infection in cattle and their associated risk factors in and around Mersa town.

Materials and Methods

Study area

The study was conducted in selected sites of Mersa town, South Wollo zone, Ethiopia; from December 2011 to June 2012. It is located 160km western part of Dessie. It far from Addis Ababa 561km. The animal population lived in this town are bovine 110600, ovine 30823,caprine 63625, equine 122448, and camel 6. The type of soil presents in this area sand, leum, clay and clay ileum. The major crops grown were teff, weat, sorghum, barely, beans and different vegetables. Annual rain fall of the town 700-1200 and annual mean To 17-27oc and the land use coverage in the town were cultivated land 51%, grazing land 15%, vegetation land 10%, and other 24%. The altitude of the town was 1200-2800 m.a.s.l. (CSA, 2013). The livestock production systems in the area include: extensive, semi-intensive and intensive types but predominantly it is extensive type.

Study population

The study population constitutes Cattle of various sexes, age groups and body condition scores managed under smallholder mixed crop-livestock farming system. Cattle found in the study area were the target animals, and a total of 384 cattle were selected as study animals.

Sample size determination and Sampling technique

The sample size was determined by assuming the expected prevalence of 50% infestation (no previous prevalence study was conducted in the district). The desired sample size for the study was calculated using the 95% confidence interval and at 5% absolute precision (Thrusfield, 2007).

Hence the sample size is estimated as

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

Where, N=required sample size
P exp=expected prevalence
d^2=desired absolute precision

$$n=\frac{(1.96)^2\, 0.5(1-0.5)}{(0.05)^2}=384$$

From the confidence interval d=5%=0.05. Using the above formula, the minimum sample size would be about 384.

During sampling sex, age and body condition of animals were recorded. Body condition for each cattle

was estimated based on Nicholson and Butterworth scores (1986) for evaluating the body condition of zebu cattle. The age of the animals was also grouped as young (1-3 years) and adults (≥ 3 years) according to the classification used by Bitew (2011) and based on owners' information and their dentition as described by (Pasquini *et al.*, 2003).

Study design

A cross-sectional study design was employed from April 2017 to June 2017 for determining the prevalence of trypanosome infection in cattle population in Mersa town. A simple random sampling method was used to select the study animals and prior to taking the blood sample, age was determined by dentition and the body condition of each animal was also assessed by the visual and palpation of the body as good, medium, and poor and with the amount of fat covering of the rump, loin and degree of depression in tail head area (Nicholson and Butterworth, 1986).

Data collection

Relevant data of the study animals was recorded along with blood specimen collections. The individual animal details such as age, sex and body condition score estimation of the animal was recorded.

Laboratory procedures

Blood samples were collected from the jugular vein by sterile sharp needle and were collected in vacutainer tubes (Mervat *et al.*, 2010). A thin blood smear was prepared for Giemsa stain purposes. After thin smear, the following laboratory procedures were conducted: Thin blood smear: a drop of blood was placed at one end of a clean microscope slide and a thin film was prepared by spreading it using another clean slide at an angle of 45°. The film was then air-dried briefly, fixed in methyl alcohol for 2 minutes and allowed to dry. Then the smear was flooded with Giemsa stain (1:10 solution) for 30 minutes. Excess stain was drained and washed by using tap water. Then it was allowed to dry and examined under the microscope (x100) with oil immersion objective lens (Borden, 2005).

Data management and analysis

Data collected from the study animals were recorded properly and entered into a Microsoft Excel spread sheet and coded. Then it was summarized using descriptive statistics by SPSS version 16 soft ware. The point prevalence of trypanosome infection was calculated as the number of infected individuals divided by the number of sampled animals and multiplied by 100 (Murray *et al*, 1990). Chi-square test was used to evaluate the presence of association between the prevalence of trypanosome infection and considered factors such as sites, sex, age, and body condition scores. In all the analyses, the confidence level was held at 95% and $P < 0.05$ was considered as statistically significant.

Results

From a total of 384 cattle examined, in the three selected villages of the district with Giemsa stained thin blood smear examination, 22 animals were found infected with trypanosome giving the overall prevalence of 5.73%. The *Trypanosome* species identified were *Trypanosoma vivax* and *T. congolense*. Among the total of 22 cases of trypanosome infections detected 19 (86.4 %) of the infections were due to *T. vivax* and the rest 3 (13.6 %) were due to *T. congolense* (Table 1). The prevalence of trypanosome infection based on sex was assessed and it was higher for female (4.2 %) than for male (2.5%) animals. Regarding age, it was higher for adult (5.9%) than for young (4.7%) animals. However, statisticallly significant differences (P > 0.05) were not observed for sex and age categories. With respect to body condition score, the prevalence was higher with poor body condition (12.9%) followed by in animals with medium body condition (6.4%) and good (2.8%). The body condition score was statistically significant (P < 0.05) (Table 2).

Table 1: The prevalence of Trypanosoma species at different altitudes in the study area

Altitude	**Species of Trypanosoma**		**Total prevalence (%)**
	T. Vivax	***T. congolense***	
Midland (Gondande Goji)	4	1	1.3%
Lowland (Merera and Keletew)	15	2	4.43
Total	19	3	5.73%

Table 2: Prevalence of bovine Trypanosomosis and its association with various risk factors in Mersa town with Giemsa stain.

Risk factors		No. examined animals	Infected animals (prevalence)	X^2 Value	P. Value)
Age	Young	64	3(4.7%)	0.13	0.524
	Adult	320	19(5.9%)		
Sex	Male	241	6(2.5%)	0.72	0.896
	Female	143	16(4.2%)		
Body condition score	Poor	93	12(12.9%)	52.14	0.000
	Medium	47	3(6.4%)		
	Good	244	7(2.8%)		
Overall		384	22 (5.73%)		

Discussion

The present study revealed that an overall trypanosomosis prevalence of 5.73%, taking into account the low sensitivity of the parasitological diagnostic methods (thin smear examination result) and the uncontrolled use of trypanocidal drugs, the real prevalence of infection is probably substantially higher. This finding is comparable with the reports of Cherenet *et al.,* (2006), Tasew and Duguma (2012) and Ayana et *al*., (2013) in Ethiopia elsewhere. This similarity in prevalence with the current study may be due to the presence of similar agro-ecological conditions, study period and management systems practiced.

In the present study the over all prevalence is lower than the findings of Cherenet *et al., (*2006) who found 20.9% and 25.7% in the tsetse-free and the tsetse-infested zones of the Amhara Regional State, Northwestern Ethiopia, respectively. Similarly, Basaznew *et al*., (2012) also found 9.89% in Genji District, Western Ethiopia. The relatively low prevalence of trypanosomosis in the current study, according to Dagnachew and Shibeshi (2011) may be related to the absence of tsetse flies in the study area, study type, study period, agro-ecological differences and it may be due to the differences in veterinary services employed in the area which all contribute to the low prevalence of the disease (Cherenet *et al.,* 2006).

On the other hand; the present finding is also higher than the findings of Ayana *et al.,* (2012); Denbarga *et al*., (2012), and Wondwossen *et al*. (2012) who reported an overall prevalence of 2.1% - 4.43% in various areas of Ethiopia. Relative to these reports, the higher prevalence of the current study may be due to livestock movement especially from tsetse infested areas to non-tsetse infested areas (Dagnachew *et al*., 2005) in order to get sufficient feeds during summer and come back to the native area at winter; and where higher fly density is present at low lands may contribute for the infection of healthy animals.

The occurrence of trypanosomosis frequently corresponds with the fly density (occurrence of the vectors) which is in turn dependent on those climatic factors as temperature humidity and vegetation coverage of the area (Taylor *et al.,* 2007). The high prevalence of the disease especially at lowland could be due to the presence of suitable habitat for the biting flies which results in high fly density. Variation in fly density appeared to be the main factor for variation in the prevalence of trypanosomosis (Bitew *et al*., 2011). **A**ccording to Aiello and Mays (1998), there is difference in prevalence of trypanosomosis in different study areas and these differences between peasant associations (villages) is due to vegetation cover difference.

Age related prevalence of trypanosome infection in the current study was 4.7% in young and 5.9% in adult cattle. Previous reports by Cherenet *et al*., (2004), Tasew and Duguma (2012), Endashaw *et al.* (2014), have also revealed comparable results on trypanosome infection across different age categories. Abraham, *et al.,* (2012) also indicated that the incidence rate was similar in young and adult animals. However, other reports revealed that trypanosome prevalence in adult animals is higher than young animals (Feyissa *et al.,* 2011; Shimelis *et al.,* 2011).

This may be due to the exposure of adult animals for the biting flies when they are left freely for grazing and watering than young animals that are usually kept around homestead (Endashaw *et al.,* 2014), and immunosuppression due to stress factors such as lactation in the females and when they are traveling a long distance through tsetse challenge areas for drafting purpose in males. The low prevalence in young animals may also be due to the natural protection to some extent by maternal antibodies.

In the present studt the prevalence of trypanosomosis infection was a higher in female animals (4.2 %) than males (2.5 %), though it was not statistically significant. This is in agreement with the findings of (Feyissa *et al.,* 2011; Tasew and Duguma, 2012). Similarly, Basaznew *et al*. (2012) and, Gebreyohannes and Legesse (2014) found higher infection rate in females than males, some parts of Ethiopia. The reason for this difference might be associated with physiological variation between both sexes. However, Endashaw *et al*. (2014) reported that trypanosome infection in males was higher than in females with an infection rate of 9.6 % in males and 5.1 % in female animals. 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.

The occurrence of disease in three different body condition (poor, good and medium) animals shows the highest prevalence in poor body condition (12.9%) followed by in medium (6.4%) and good body condition (2.8%). With regard to the body condtion score Infection rate among the body condition scores; it is statistically significant ($P < 0.05$) and it is in agreement with Feyissa *et al.* (2011), Wondwossen *et al*. (2012) and Ayana *et al*. (2012) who recorded higher trypanosome infection rate in poor body condition score animals than in good and medium condition score animals. This is might be attributed to poor body condition animals are immunosuppressed and stressed status (Wondwossen *et al*., 2012). Due to poor body condition; animals are highly susceptible to diseases.

Conclusion and Recommendations

In conclusion bovine trypanosomosis caused by *T. congolense* and *T. vivax* with more prevalence of *T. vivax* was found to be an important disease of cattle in the study area. The sole presence of *T. vivax* in the midland area indicated According to the risk factors, the prevalence of trypanosomosis was higher in females than in males, and in adult than young but without significant difference between sex and age categories, but with respect to body condition score and origin of the animal significant difference ($P < 0.05$) was observed.

The potential for increasing livestock production can only be fully realized if the animals are adequately protected against the adverse effects of periodic stresses and diseases. For sufficient livestock production and fully realized country development, integrated approach to trypanosomiasis control is required to increase the present level of livestock production.

Based on the conclusion, the following recommendations are forwarded:

- Strategic control of bovine trypanosomosis including vector control should be strengthened to improve livestock production and agricultural development in the area. Vector should be implemented.
- Attempt should be made to expand government and private veterinary services to serve the community properly.
- Further surveys and studies should be conducted and appropriate, feasible control of trypanosomosis and/or vector should be implemented.
- Educating animal owners on the problems of trypanosomosis infection and on its control measure is more essential.

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