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Prevalence of Bovine Trypanosomosis in Gari Settlement Area of Eastern Wollega Zone, Ethiopia

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Abstract: A cross sectional study was conducted from November 2008 to March 2009 in Gari settlement area of East Wollega zone, western Ethiopia. A total of 410 local zebu cattle were sampled to determine the prevalence of bovine trypanosomosis in the area. The Buffy coat concentration technique was employed to diagnose the trypanosome infection. An overall prevalence of 4.15% (95% CI = 2.30 – 6.10%) bovine trypanosomosis was recorded during the present study in Gari settlement area. There is no statistically significant difference ($p > 0.05$) in prevalence of bovine trypanosomosis among different age groups as well as in between male and female. No infection was encountered in calves less than two years old. The prevalence in the young age group (2-5 years old) was 3.20% (95% CI =0.20 – 6.20%) and it is 4.94% (95% CI = 2.40 – 7.40%) in adult animals (greater than 5 years old). The prevalence in both sexes was observed to be 4.62% (95% CI = 2.0 – 7.20%) and 3.49% (95% CI = 0.80 – 6.20%) in the female and male animals, respectively. *Trypanosoma congolense, T. vivax* and *T. brucei* were identified as trypanosome species causing infection in the area the predominant species being *T. congolense* (58.80%) followed by *T. vivax* (35.30%). The mean PCV value of 21.18% (95% CI = 18.80 - 23.60%) and 25.20% (95% CI = 24.60 – 26.80%) was recorded for parasitemic and aparasitemic animals respectively. The mean PCV value of parasitemic animals was significantly lower ($p < 0.05$) than that of aparasitemic animals. The result of parasitological survey indicated that bovine trypanosomosis is a major constraint to the livestock production in the area and deserves appropriate control and treatment options to keep the disease in check.

Key words: Bovine trypanosomosis · Gari settlement · Prevalence

INTRODUCTION

Trypanosomosis is a group of parasitic disease caused by different species of unicellular parasites (trypanosome) found in the blood and other tissues of vertebrates including livestock, wild life and people. Bovine trypanosomosis causes a significant loss in animal production and it greatly hampers human settlement in a considerable part of the world [1].

In sub-Saharan Africa, about three million livestock die every year due to tsetse fly transmitted trypanosomosis. About 10 million km^2 areas of the Africa's greatest agricultural potential are infested by tsetse fly, which is the main vector of the disease. The wide occurrence of this disease in people and livestock retards agricultural and economic development in Africa and 30% of the continent cattle population, estimated to be 160 million and comparable numbers of small ruminants are at risk of trypanosomosis [2].

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In Ethiopia, trypanosomosis is one of the most important disease limiting livestock productivity and agricultural development. Estimates made decades ago reported that 180, 000 - 220, 000 km^2 land in the western and southwestern parts of the country to be suitable for tsetse [3]. Recent estimates indicate that, about 140, 000 km^2 fertile agricultural land which is roughly 12% of the country's landmass is found to be a suitable habitat for tsetse fly [4]. About 14 million heads of cattle are exposed to the risk of trypanosomosis [5]. It can be transmitted between the hosts mainly by tsetse flies cyclically and mechanically by biting flies [1, 6]. 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. equiperdium* in horses [7].

Gari settlement area is found in Ethiopian tsetse belt. It is one of the areas where the government settlement program is implemented. Previous studies conducted in this area reported high 22% prevalence of bovine trypanosomosis [8]. Since then, considerable control effort has been performed by government organizations and by the settlers. Therefore, the aim of this study was to determine the prevalence of bovine trypanosomosis in Gari settlement area of East Wollega zone after the control interventions.

MATERIALS AND METHODS

Study Area: The present study was carried out in Oromia national regional state, East Wollega zone, in Gari settlement area which is located in Guto Gida district, western Ethiopia. The district is located at 331 km from Addis Ababa to the west. The study area has an altitude range of 1450 - 1670m above sea level and receives an average annual rainfall of 1750mm. The annual mean temperature range from 15 to 31°C and the annual average temperature is 23°C. According to the district Agriculture and Rural Development office, the agro-climatic classification of the district is 53% lowland, 44.3% midland and highland coverage is 2.7%. Gari settlement area is specifically enclosed in the lowland zone and there is a potential risk to tsetse infestation.

Study Population: Guto Gida district has an estimated cattle population of 28, 529 of which about 3, 282 heads of cattle are kept in the study site of Gari settlement, which are all local zebu cattle. Animals involved in the study were indigenous breeds of cattle of all age and both sexes reared under traditional management system. The study animals were classified in to three different age groups. Calf less than 2 years, young 2 – 5 years and adult greater than 5 years old.

Study Design: A cross sectional study was conducted to determine the prevalence of bovine trypanosomosis from November 2008 to March 2009.

Sample Size and Sampling Method: The sample size was determined according to the formula given by Thrusfield [9] ($n = 1.96 \times P \exp. (1\text{-}P \exp.) / d^2$). The expected prevalence (22%) was taken from the previous prevalence study in the area [8] and the desired absolute precision was held at 5% at confidence interval of 95%. The estimated sample size was 263, but to increase our precision 410 cattle were sampled. Simple random sampling technique was used to represent all study population.

Sample Collection and Parasitological Examination

Sample Collection: Blood samples were collected aseptically from marginal ear vein after properly restraining of the animal by puncturing using sterile lancet.

Parasitological Examination: The buffy coat, the hematocrit centrifugation (HCT) and thin blood film methods were used to examine the presence of the Trypanosomes according to the procedure given by Paris *et al*. [10] and Murry *et al*. [11].

Data Management and Analysis: The data were entered into Microsoft Excel and the prevalence of bovine trypanosomosis in different age groups and sexes were analyzed by using Stata software version 12 (Stata Corporation, College Station, USA). Chi-square was used to assess association between variables (risk factors) and the disease. Indepent sample t-test was used to compare the mean PCV values of parasitemic animals and aparasitemic animals. In all cases differences between parameters were tested for significance at probability levels of 0.05 or less. Descriptive statistics such as mean, range, frequency and percentage were used to analyze the data.

RESULTS

Parasitological Findings: The overall prevalence of bovine trypanosomosis in the study area was 4.15% (95% CI: 2.21 – 6.10%) was recorded. The lowest

Table 1: Prevalence of bovine trypanosomosis by villages

Village names	No. examined	Number infected	Prevalence (%)
Eba	95	4	4.21
Laga galma	37	2	5.41
Kare degela	75	4	5.33
Haro	40	1	2.50
Jirenga	43	3	6.98
Duradema	120	3	2.50
Total	410	17	4.15

Table 2: Prevalence of Trypanosome infection in cattle by sex

Sex	No. examined	No. infected	Prevalence	X^2	P-value
Male	172	6	3.49	0.322	0.570
Female	238	11	4.62		
Total	410	17	4.15		

Table 3: Prevalence of Trypanosome infection in cattle by age group

Age group	No. examined	No. infected	Prevalence (%)	X^2	P-value
Calf	21	0	0	1.63	0.443
Young	126	4	3.17		
Adult	263	12	4.94		
Total	410	17	4.15		

prevalence was observed in Duradema and Haro (2.50%) villages and the highest was recorded in Jirenga (6.98%) village (Table 1).

From a total of 410 cattle examined, 238 were females and 172 of them were male animals. Of the female animals examined, 4.62% (95% CI: 1.94 – 7.30%) were positive for trypanosome infection while 3.49% (95% CI: 0.73 – 6.25%) of the male animals were infected. The trypanosome infection in female animals is slightly higher than in the male animals. However, statistically there is no significant difference in the infection rate between male and female animals ($X^2 = 0.322$, 1 df, $p > 0.05$).

The animals examined were categorized in different age groups as calf (less than 2 years old), the young (2 - 5 years) and adults (greater than 5 years old). The prevalence was found to be nil in calves, 3.17% (95% CI: 0.09 – 6.25%) in the young age group and 4.94% (95% CI = 2.31 – 7.57%) in adult animals. There is no statistically significant difference in prevalence among the different age groups ($X^2 = 1.63$, 2 df, $p > 0.05$).

During the present study, *T. congolense, T. vivax* and mixed infection (*T. congolense* and *T. brucei*) were detected. Among 410 cattle examined 17 animals were infected with trypanosome parasites of which 10 (58.8%) cattle were found to be infected by *T. congolense*, 6 (35.3%) by *T. vivax* and 1(5.9%) animals were found to be infected by both *T. congolense* and *T. vivax*.

Hematological Findings: The analysis of PCV value in the animals examined for trypanosome infection showed that the mean PCV value for the parasitemic cattle was 21.2% (95% CI = 18.8 - 23.6%) whilst the mean PCV value for the aparasitemic animals was observed to be 24.2% (95% CI = 23.8 - 24.6). There is statistically significant difference in the mean PCV value between the infected and non-infected animals ($t = 2.97$, $p < 0.05$).

Status	No. examined	Anemic	Mean PCV±SD	t-value	p-value
Parasitemic	17	13	21.2±4.6	2.97	0.003
Aparasitemic	393	191	24.2±4.1		
Total	410	204	24.1±4.2		

DISCUSSION

The overall prevalence of bovine trypanosomosis observed in this study was 4.15%. The result obtained in this study is by far lower than the previous reported for the same area. In 2003 a prevalence of 22% was documented for bovine trypanosomosis in Gari settlement area by NTTICC [8]. The reduction of bovine trypanosomosis in the area is attributed to the recent expansion of human settlement, widespread agricultural activities and extensive clearing of bushes in the area apparently affecting the tsetse ecology.

Multiple previous studies conducted in different parts of Ethiopia reported a wide range of prevalence a high prevalence of 27.5% was reported from Arba Minch, southern Ethiopia by Zekarias and Zeryehun [12], prevalence of 12.5% was reported by NTTICC [13] from Meda Jalala, western Ethiopia, Abebe and Jobre [14] reported a prevalence of 17.67% form tsetse infested areas of Ethiopia. Prevalence of 17.20% was reported from Pawe, North West Ethiopia by Afework [15], 12.28% from Bedelle, south western Ethiopia by Regaassa *et al* [16], 17.20% from Metekel district by Yohanes [17], 19.01% from Goro district, South West Ethiopia by Abiy [18], 16.10% in and around Bahir Dar by Adane [19] and 16.93% from Guduru district, Horo Guduru Wollega by Amante *et al* [20]. Recently, Leta *et al* [21] conducted a comprehensive Meta analysis of bovine trypanosomosis in Ethiopia and they estimated the prevalence of bovine trypanosomosis in Ethiopia to be 8.12%. The relatively low prevalence reported in this study may be attributed to the frequent use of chemotherapeutic drugs, an increase in agricultural investment and decreased tsetse challenge in the area. According to Leta *et al*. [21], prevalence bovine trypanosomosis varied over time, with lowest levels since 2010. Previous and on-going tsetse control activities in the affected areas of Ethiopia could be the

reason for the decrement in the prevalence of bovine trypanosomosis. Tilahun *et al* [22], Tadesse *et al* [23] and Girma *et al* [24], reported a relatively lower prevalence of bovine trypanosomosis from Kellem Wollega, West Gojjam and Gamogofa zones, respectively.

Although slightly higher infection was depicted in female animals, there was no statistically significant difference in prevalence of bovine trypanosomosis in male and female animals. This observation coincides with the findings of Getachew [25] from Tow districts of western Gojjam, Tefera [26] from Arba Minch districts, Adane [19] in and around Bahir Dar and Wellde *et al.* [27] from different areas of Ethiopia who reported no significant difference in susceptibility between the two sexes. In this study, there is no statistically significant difference among the various age groups. This result supports the result of the previous work by Alekaw [28] who concluded that there is no significant difference in infection rate between age groups. In the present work, calves appeared less affected and the possible explanation is that calves most often confined around homestead and there is less exposure to tsetse fly whereas the older age groups might have faced the vector challenge during grazing in the field and at watering points.

The predominant trypanosome species was *T. congolense* accounting for 58.8% followed by *T. vivax* which account for 35.3% and the remaining being a mixed infection by *T. congolense and T. brucei*. This result is in agreement with the previously conducted studies by Abebe and Jobre [14] and Muturi [29] and Afework [30] and Takele [31] and Langridge [32] and Terzu [33] who reported *T. congolense* to be the predominant trypanosome species from different parts of the country. However, recent studies reported *T. congolense* and *T. vivax* to be the two most predominant trypanosome species. The burden of non tsetse transmitted trypanosomosis like trypanosomosis caused by *T. vivax* is being reported to be considerable [20, 34]. According to Fikru *et al* [34] the occurrence of mechanically transmitted trypanosomosis caused by *T. vivax* is very widespread than previously thought. The high prevalence of *T. vivax*, most likely indicate the local transmission in the non tsetse infested area by biting flies. In the present study, though *T. congolense* is found to be predominant species; a considerable number of examined animals were also harboring *T. vivax* infection.

An assessment of the difference between mean PCV values of parasitemic and aparasitemic cattle was made. There was statistically significant difference in mean PCV values between parasitemic and aparasitemic. This result agrees with the report of the previous work of Alekaw [28] and Haile [35] who reported that the mean PCV value of parasitemic animals to be significantly ($p<0.05$) lower than that of aparasitemic animals.

CONCLUSION AND RECOMMENDATION

The relatively low prevalence report in this study indicates an apparently decreasing trend trypanosomosis in the area. This perhaps, may be attributable to the current mass settlement, agricultural expansion and extensive bush clearing practices in the area. However, the bovine trypanosomosis is potentially a major constraint to the livestock production in Gari settlement area as bovine trypanosomes negatively affect the mean PCV value. The significant decrease in mean PCV value indicates reduction in production and draft power performance of the animals. Strategic and environmentally friendly control strategy including vector control and parasite should be strengthened to improve livestock production and agricultural development in the area.

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