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Trypanosomosis in cattle of three selected villages of Metu district, Oromia Regional State, Southwestern Ethiopia

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A cross-sectional study was conducted from December 2016 to April 2017 in Metu district, Southwestern Ethiopia with the objectives of determining the infection rate of trypanosomosis in cattle and assessing apparent density of tsetse flies. A conventional parasitological study using concentration technique was used for the determination of prevalence of trypanosomosis, whereas baited traps were used for the vector survey. Study animals were randomly selected (n=456), sampled and tested for the trypanosomosis. The overall prevalence of trypanosomosis was found to be 3.29% [95% confidence interval (CI)]. The relative infection rate of trypanosome species was 2.63, 0.21 and 0.43% for *Trypanosoma congolense, Trypanosoma vivax* and mixed infection of the two species, respectively. Significantly, the highest infection (10.13%) was recorded in poor conditioned cattle, followed by medium (4.25%) and good (0.42%) (P<0.05). Even though, the difference is not significant, females (10.71%) are more infected with the parasites than males (3.84%) (P>0.05). The mean packed cell volume (PCV) values of aparasitaemic and parasitaemic animals were 25.60 and 31.16%, respectively with a statistically significant difference (P<0.05). Three species of the genus *Glossina*: *Glossina pallidipes*, *Glossina fuscipes fuscipes, Glossina tachnoides* and *Tabanus* genera of other blood sucking flies were captured. The apparent density of *Glossina* species was 3.50 fly/trap/day. Trypanosomosis and its biological vector are prevalent in the study areas, requiring appropriate intervention measures.

Key words: Metu, prevalence, trypanosomosis, tsetse fly.

INTRODUCTION

African animal trypanosomosis is one of the top constraints to animal production in over 10 million km^2 of sub-Saharan Africa (Sligenebergh, 1992). The disease is hindering the production of cattle, small ruminants, equines, and camels and rarely swine (Juyal et al., 2005). Generally, there is a great threat of trypanosomosis that

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impedes the economic development of African continent and reasonable for the incalculable toll of human health (Abebe, 2005).

Three species of tsetse-transmitted trypanosomes are reported from Ethiopia and these are most important trypanosomes in terms of economic loss in livestock, posing great threat to livestock health in the country. In Ethiopia, tsetse flies are limited to southwestern and northwestern regions between longitude 33° and 38° E and latitude 5° and 12° N covering an area of 220,000 km². According to Langridge (1976), Blue Nile, Baro-Akobo, Ghibe-Didessa, and Omo are tsetse-fly infested river basins of Ethiopia. These river basins are infested with one or more species of tsetse flies, out of the five *Glossona* species found in Ethiopia. *Glossina morsitans submorsitans, Glossina pallidipes, Glossina tachinoides, Glossina fuscipes fuscipes* and *Glossina longipennis,* have ever been recorded in Ethiopia (NTTICC, 2004).

Trypanosomosis is one of the top constraints impeding livestock rearing in western and southwestern parts of Ethiopia. To design appropriate trypanosomosis and its vector control strategy, determining the infection rate of the disease and the density of tsetse fly is important task (Sumbria et al., 2016). To this end, this study was designed with the aim of estimating the prevalence of trypanosomosis in bovine and apparent density of its vectors in Metu district, Ilubabor zone, Southwestern Ethiopia.

MATERIALS AND METHODS

Study area

Metu is located in Ilubabor zone of Oromia regional state. It is situated at 600 km southwest of Addis Ababa. Metu is located at longitude 035.32° to 035.43°E and latitude 08.28° to 08.38° north of the equator. The area of the district is 687,230 hectares land. The agro-climate of the area alternates with winter dry season and summer rainfall. The mean annual rainfall varies from 1204 to 1275 mm. The mean annual temperature ranges from 24 to 27°C in Metu and the district is divided into two ecological zones, 17% lowland and 83% midland. Metu district has altitudes ranging from 1291 to 2027 m above sea level.

Sampling design and sample size determination

Three villages of Metu district were purposively selected to conduct cross-sectional study of bovine trypanosomosis. To select the study animals, simple random sampling technique was used. The size of sample was determined using 95% level of confidence, 50% expected prevalence and 0.05 desired absolute precision based on the formula given by Thrusfield (2005):

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

Accordingly, 384 samples were required for the study, although, 456 samples were collected and examined. The origin/villages and sex of animals were the explanatory variables used in association with the infection rate. The effect of trypanosomosis in body conditions of cattle was also assessed. Body condition of the study cattle was estimated based on Nicholson and Butherworth (1986).

Study methods

Parasitological and haematological study

Samples were collected randomly from cattle of the three villages. Blood samples were collected into heparanized microhaematocrit tubes, after piercing the ear vein. Then one end of the capillary tube was sealed with sealant and centrifuged at 12,000 revolutions/min for 5 min to separate the blood cells and concentrate the parasites using centrifugal force. Then Packed Cell Volume (PCV) was measured on haematocrit reader. Then, it was examined under 40X objective of compound microscope using dark ground buffy coat technique (Murray et al., 1977; Gupta and Singla, 2012) to detect the presence of motile trypanosomes after being expressed on a clean microscopic slides and covered with 22 × 22 cover slip.

Entomological study

Baited mono pyramidal (N=56) traps were deployed in the river banks and grass lands to assess the densities tsetse fly and other genera of biting dipteras that might be supposed to be the vector of trypanosomes. All traps were geo-referenced and baited with commercial odor attractants (octenol and acetone) and cow urine. Traps were deployed at an interval of 200 to 250 m. After two days of trap deployment time, the cages were collected and then the genus/species and sexes of captured flies were sorted based on their morphological characteristics.

Data analysis

The data were analyzed using STATA version 10 statistical software program. The infection rate was calculated by dividing number of samples positives for trypanosomes by the total sample examined multiplied by 100. The association between the prevalence of trypanosome infection and the explanatory variables were assessed by logistic regression, while the student's *t*-test was used to find out the significance in mean PCV values between diseased and non-diseased animals. If P<0.05 is calculated at 95% CI, significant association will exist between variables. The apparent density of tsetse fly population was calculated by dividing the total number of tsetse flies captured by the number traps deployed and number of days of deployment.

RESULTS

Parasitological findings

Out of the total 456 cattle examined, 15 (3.29%, SE= 0.0083617, 95% CI=0.02-0.05) cattle were found to be infected with trypanosomes. The prevalence was 1.78, 3.57, and 5.00% in Agelodheko, Algagosu and Dadelehora villages, respectively. Higher prevalence (10.13%) was seen in animals with poor condition than those with medium (4.25%) and good (0.42%) body conditioned cattle for the mentioned parasite. Prevalence was lower in males (3.84%) as compared to females (10.71%) cattle (Table 1).

On the other hand, the relative prevalence of trypanosome species were 2.63% for *Trypanosoma*

Table 1. Prevalence of bovine trypanosomosis and associated risk factors in three villages of Metu district.

Risk factor	Total examined (N)	Total positive/prevalence (%)	$\chi 2$	P-value
Village				
Agelodheko	168	3 (1.79)		
Algagosu	168	6 (3.57)	2.34	0.31
Dadelehora	120	6 (5.00)		
Body condition				
Good	236	1 (0.42)		
Medium	141	6 (4.25)	19.11	0.00
Poor	79	8 (10.13)		
Sex				
Female	279	10 (10.71)	0.96	0.33
Male	177	6 (3.84)		

Table 2. The mean PCV of examined cattle in Metu district.

Result	Mean PCV	SE	95% CI
Aparasitaemic	31.16	0.21	30.74-31.57
Parasitaemic	25.60	1.25	23.15-28.05
Total	30.97	0.21	30.56-31.39

Table 3. The Mean catch of tsetse fly and *Tabanus* species in Metu district.

Village	*Glossina* species caught						Total	FTD	*Tabanus*
	G.P		G.f.f		G.th				
	♂	♀	♂	♀	♂	♀			
Agelodheko	4	5	12	23	2	2	48	1.2	25
Algagosu	3	18	15	13	10	11	70	1.75	29
Adaleharo	31	55	52	89	16	31	274	8.05	14
Total	38	78	79	125	28	44	392	3.50	68

G.p, *Glossina pallidipes*; G.f.f, G. *fuscipes fuscipes*; G.th, *G. tachnoides*; FTD, fly/trap/day; ♂, male; ♀, female.

congolense, 0.21% prevalence result for *Trypanosoma vivax*, and 0.43% for the mixed infections of *T. congolense* and *T. vivax*, in which *T. congolense* was the dominant species.

Hematological findings

The mean PCV values of examined cattle was 30.97%, 95% CI=30.56-31.39. The mean PCV of trypanosomes positive and negative cattle was 25.60%, 95% CI=22.93-28.27 and 31.16%, 95% CI=30.74-31.57, respectively.

Of the infected animals, cattle infected with mixed species of *T. congolonse* and *T. vivax* had lower (22.50%) mean PCV value followed by *T. congolense* (27.78%) and *T. vivax* (30.67%) (Table 2).

Entomological survey result

Three villages of Metu district were surveyed for the vectors of trypanosomosis. As shown in Table 3, Adaleharo village has the highest catch of tsetse flies (8.05 FTD), followed by Algagosu (1.75 FTD), and Agelodheko (1.2 FTD). The tsetse fly species caught were *G. pallidipes, G. fuscipes*, and *G. tachnoides* (Table 3). The mean tsetse fly density of the district was 3.5 fly/trap/day. The relative abundant density of *G. pallidipes*, *G. fuscipes fuscipes,* and *G. tachnoids* was 1.03, 1.82, and 0.64 FTD, respectively. Male and female

tsetse fly accounted for 36.99 (145/392) and 63.01% (247/392), respectively.

DISCUSSION

Trypanosomosis is a top constraint to the health of livestock in lowlands of Ethiopia and affects livestock including cattle, which have a major role in agricultural economy of the country. The prevalence of bovine trypanosomosis was found to be 3.29%. This result is similar with report from Southwestern Ethiopia by Haile et al. (2016) where they reported a bovine prevalence of 3.9%. The infection rate was relatively moderate, which might be associated with prophylactic treatment of animals and vector control operations in the area. The prevalence was 1.78, 3.57, and 5.00% in Agelodheko, Algagosu and Dadelehora villages, respectively but no significant difference was observed (P>0.05). This may be due to the similarities in epidemiological factors.

The trypanosome species encountered in the area were *T. congolense* (2.63%), *T. vivax* (0.21%), and mixed infection of the two species (0.43%). These two trypanosomes species were also reported from western and southwestern part of Ethiopia (Lemecha et al., 2006; Tilahun et al., 2014). *T. congolense* was the predominant species in the studied area. Different reports from Western Ethiopia also indicate that *T*. *congolense* was dominant in western region of the country (Abebe and Jobre, 1996; Woyessa et al., 2014).

The difference between mean PCV values of parasitologically positive and negative cattle was significant (P=0.00). The mean PCV value of parasitaemic and aparasitaemic animals was 25.60 and 31.16%, respectively. The mean PCV is decreased with increasing infection rate. Dagnachew (2004), Dagnachew et al. (2005), Lelisa et al. (2014), and Zecharias and Zeryehun (2012) also reported such result from different parts of Ethiopia. This suggests that, development of anemia is one of the indications of the progress of the trypanosomosis. However, it can also be assumed that numerous blood parasites other than trypanosomes and nutritional factors can also leads to development of anemia (Van den Bossche and Rowlands, 2001; Radostitis et al., 2000).

In this study, three species of tsetse flies (*G. pallidipes*, *G. fuscipes fuscipes* and *G. tachnoides*) and other blood-sucking fly of the genus *Tabanus* caught in selected villages of the Metu district. These species of tsetse flies was also reported in Western Ethiopia by Tekle and Mekonen (2013) and Duguma et al. (2015). The apparent density of *Glossina* species was 3.50 flies/trap/day. Mulatu et al. (2016) reported similar value (3.40 flies/trap/day) from northwestern part of the country. Haile et al. (2016) from Southwestern and Kedir et al. (2016) from Western Ethiopia also reported tsetse fly densities of 3.70 and 4.27 fly/trap/day, respectively. Higher percentage of female (63.01%) tsetse flies was caught than males (36.99%) which are in line with various reports from different parts of Ethiopia (Lelisa et al., 2016; Habte et al., 2015; Teka et al., 2012). This could be adhered to longer lifespan of female tsetse flies than males (Lehane, 2005; Leak, 1999).

Conclusion

This study evidenced that animal trypanosomosis and its biological vector, tsetse fly, is a potential threat to the studied area, warranting an integrated control measures.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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