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Prevalence of Bovine Trypanosomosis and Apparent Density of Tsetse Flies in Botar Tolay Districts of Jimma Zone Oromia Regional State South West Ethiopia

[1]Aman Yusuf, [1]Aliyu Nesru, [2]Yosef Deneke, [2]Fuad Adem, [2]Sultan Aman and [2]Samson Takele

[1]National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis (NICETT), Bedele Tsetse Fly and Trypanosomosis Control and Investigation Center, Bedele, Ethiopia
[2]Jimma University, School of Veterinary Medicine, P.O. Box: 307, Jimma, Ethiopia

Abstract: A cross sectional study was conducted in Botortolay district of Oromia Regional State from January 2019 to June 2019 to determine the prevalence of bovine trypanosomosis and apparent density of tsetse flies. Simple random sampling was used to select 260 cattle from the purposively selected seven PAs for collection of blood sample. Buffy-coat technique was used to determine prevalence of bovine trypanosomosis in the study area and trap was deployed for collection of tsetse no flies. The overall prevalence of trypanosomosis was (28) (10.77%). The major species of trypanonosomes identified in the study area were *T. congolense* 17(60.71%) and *T. vivax* 11(39.28%). There were statistically significant differences ($p < 0.05$) between body condition, sexes and ages. Identification on entomological survey shows three species of tsetse fly identified was *G. morsitans, G. pallidepe*and *G. fuscipes*. The higher prevalence of trypanosomosis infection was observed in animals with poor body condition statistical significant difference (P<0.05). About 60 traps were deployed for 48 hours (2 days) for collection of tsetse fly. A total of 313 flies were collected from a study area, of which the higher density was for tsetse fly 246 (2.05 FTD) followed by 18 *Tabanus*, 36 *Stomoxys* and 13 *Heamatopota*. Generally, this study showed that trypanosomosis is still present and becomes a constraint for livestock production of the study area. So control and prevention mechanisms must be continued to reduce prevalence of the disease and tsetse flies population.

Key words: Bovine · Trypanosomes · Tsetse Flies · PCV

INTRODUCTION

Trypanosomosis is the main haemoparasitic disease in domestic animals and is caused by the protozoan parasite *Trypanosoma*. The parasite is transmitted biologically by the tsetse fly (*Glossina*species) and infects animals over an area known as the 'Tsetse belt', which extends approximately 10 million km^2 across 37 countries in Africa, from the Sahara Desert in the North to South Africa in the south [1-3]. Some trypanosome species such as *Trypanosoma vivax*can be transmitted by biting flies mechanically and can establish itself even outside the tsetse belt, placing an estimated 160 million cattle and 260 million sheep and goats at risk [4]. Trypanosomosis in livestock causes great losses in terms of mortality, abortion, reduced fertility, milk and meat production and ability to work as traction animals [5]. In addition to these, the disease is also responsible for an annual loss of millions of dollars in livestock production as a result of the cost related to treatment, prevention and vector control efforts [6]. In Ethiopia, the disease is more prevalent in the southern and western regions where the primary vector exists. Recently, however, new areas are being invaded and settled communities are being evicted continually by the advancing infections. Several attempts have been made to control trypanosomosis in the country, with chemotherapy and chemoprophylaxis being the most widely applied methods. Vector-targeted control practices have been implemented mainly through specifically designed joint projects of the Ministry of

Corresponding Author: Aman Yusuf, National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis (NICETT), Bedele Tsetse Fly and Trypanosomosis Control and Investigation Center, Bedele, Ethiopia. Tel: 251-912812542, E-mail: amanyusuf542@gmail.com.

Agriculture and other non-governmental organisations. Knowing the current status of typanosomosis and its vectors are crucial to integrate all efforts towards combating the disease and reducing economic losses. Therefore, this study was conducted to determine the prevalence of bovine trypanosomosis in the Botartolay districts bordering Giberiver in the Jimma zone Oromia state, Ethiopia, as well as to identify vectors and their apparent density in the area.

MATERIALS AND METHODS

Study Period and Area: The study was conducted from January, 2019 to June, 2019 in Botortolay district, which is located in Jimma zone of Oromiaregional States, South Western Ethiopia.It is located about 445 kilometers from south west of Addis Ababa. Geographically, Botortolay town falls between 7°C ``N latitudes and 12°C``E longitudes. The study was conducted in Seven peasant associations namely; Madaajalala, Kata boso, Yatudhahe, Garangara, UrjiiOromiya, Biftubari and Algesidamo are sellected areas. The total land area covers 159 km^2 with altitudes of 900 to 3347 meter above sea level. The annual mean temperature ranges from 25°C to 32°C and receives annual rainfall between 1200-2400mm. The human population of the district is both rural and urban 83, 888 and 10752 respectively. The total of human population of the district is 94, 640. The livestock populations of the district were estimated to be 2, 191, 138 cattle, 7700 sheep, 44, 626 goats, 68, 521 poultry, 272 horses, 385 mule and 68, 92 donkeys. Crop and livestock sales are important source of income for all wealth groups [7].

Study Animals: The animals used in this study were local zebu cattle (*Bosindicus*), which are usually kept under an extensive husbandry system. Animals were allowed to graze freely during the day and housed in poorly constructed barns at night. The age of animals was determined by dentition [8] and categorised into two age groups (Adult and young). The body condition of animals was also grouped as 'medium and'poor' based on criteria described by Nicholson and Butterworth [9].

Sample Size and Sampling Method: The simple randomsampling technique was followed, to select the animals tobe used for the study of the prevalence of bovinetrypanosomosis in the study area. A sample size was determined by the expected prevalence of bovine trypanosomosis in the district was 12.24 % [10] and the minimum sample size for this cross-sectional study was calculated using the formula by Thrusfield [11] with 95% confidence level and 5% absolute precision. Accordingly, 165 desired sample sizes for the study were calculated.

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

where:
n = required sample size; exp= expected prevalence and
d = desired absolute precision.

Accordingly, $n=1.96^2 * 12.24\ \% (1-12.24\%)/0.05^2 = 165$ Cattle where the calculated sample size.

However, a total of 260 cattle were included in thestudy to increase the sample size and for maximizing the precision of the study under taken.

Parasitological Study: Blood sample collection was performed by piercing the marginal ear vein with a sterile lancet and blood was drawn by a heparinised capillary tube. After the first 24 samples were taken, the capillary tubes were centrifuged at 12000 rpm for 5 min and the packed cell volume (PCV) was determined and recorded. The buffy coat was used for detection of trypanosome parasites and thin blood smears were prepared from positive samples for species identification [12].

Entomological Survey: The apparent densities of tsetse flies were determined based on the mean fly catches in traps baited with acetone and cow's urine. A total of 60 traps with a monoconical, prymidal and biconicalshape were placed approximately 100-200 m apart and left in position for two consecutive days. The flies caught per trap were identified, counted and the apparent fly density per trap per day (f/t/d) was recorded. This was repeated for two months (January and June). The tsetse flies were identified to species level [2].

Statistical Analysis: Raw data were entered into a Microsoft Excel spreadsheet and descriptive statistics were used to summarise the data. The point prevalence was calculated for all data as the number of infected individuals divided by the number of individuals examined and multiplied by 100. The association between the prevalence of trypanosome infection and risk factors were assessed by logistic regression, whereas the study's *t*-test was used to assess the difference in mean PCV between trypanosome positive and negative animals. All statistical analyses were conducted using SPSS version 22.0 software [24]. The test result was considered significant when the calculated *p*-value was less than 0.05.

RESULTS

Parasitological Findings: Twenty eight out of the total number of cattle examined (260), tested positivefor trypanosome infection (10.77%). *Trypanosoma congolense* was the dominant species identified 17(60.71%) followed by *T. vivax* 11(39.28%).

Risk Factors

Prevalence of *Trypanosomosis*: A total of 260 cattle blood sample were examined to determine the presence of trypanosomosis by Buffy coat technique and Trypanosomosis were detected in 28 cattle with an overall prevalence of 10.77%. The prevalence of bovine trypanosomosis within the seven PAs were 4(13.3%) at Madajalala, 7(22.5%) at kata boso, 6(15.4%) at Yatudhahe, 2(8.6%) at Gerangera 6(8.8%) at Urji Oromia, 2(6.06%) at Biftubari and 1(3.25%) at Algesidamo. The prevalence of bovine trypanosomosisin females and males were 11(12.8%) and 17(14.4%), respectively. Though the prevalence of trypanosome infection was higher in male than in females there is statistically significant difference ($p<0.05$) between the two sex groups.

Haematological Findings: The mean PCV value of infected animals (22.96 ± 4.56s.d.) was significantly lower ($p < 0.05$) than that of non-infected animals (28.60 ± 5.78s.d.).

Entomological Results: A total of 60 traps (Monoconical, biconical and prymidal) were deployed approximately 100-200m apart and left in position for two consecutive days (48 hrs). The average tsetse fly density in the area was 246 (2.05 F/T/D) .and out of the total 246 flies caught *G. morsitans* 120 (48.78%), *G. pallidipes* 96 (39.02%) and *G. fuscipes* 34 (13.82%). In the deployed traps there is also other biting flies such as 36 (0.34%), 13 (0.13%) and 18 (0.18%) were *Stomoxys*, *Hematpota* and *Tabanus*, respectively. The flies caught per trap were identified, counted and apparent fly density per trap per day (f/t/d) was recorded [2].

DISCUSSION

The overall prevalence of bovine trypanosomosis in the study area was 10.77%, which is lower than previous reports: 12.24% in the same district [10] 20.40 % in the Wolyta and Dawero zones of southern Ethiopia [13] and 20.9% and 25.7% in the tsetse-free and the tsetse-infested zones of the Amhara region of north-western Ethiopia, respectively [14] And higher than 8.55% studied in two districts of East Wollega Zone, Ethiopia [15]. The relatively low prevalence of trypanosomosis in this study may be related to tsetse distribution and low fly–animal contact and parasite and vector control programmes practiced in the area by National Tsetse and Trypanosomosis Investigation and Control Centre [16] annually.

Amongst the trypanosome species, *T. congolense* (60.71%) and *T. vivax* (39.28%) were detected. A similar proportional trend was also reported byMamoudou *et al*. [17] and Solomon and Fitta [18]. Such a high ratio of *T. congolense* may be caused by the presence of a biological vector (*Glossina*), whereas *T. vivax*is more readily transmitted mechanically by biting flies than tsetse flies. The finding of this study was also in agreement with previous reports, in that only *T. vivax* was recovered in apparently tsetse-free areas [14]. According to Abebe [19] *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infected cattle in the tsetse-infested and tsetse-free areas of Ethiopia, respectively.

The prevalence of bovine trypanosomosis was studied in different age and sex groups of cattle. Significant variation was observed, which may be because of equal chance of exposure to the parasite. Similar findings were also reported by Cherenet *et al.* [14] and Habtamu [20] in the Jawi district of the Amhara region, Ethiopia. In this study, there was a significant difference in the prevalence of trypanosomosis between animals with 'good' and 'poor' body conditions, as well as between the mean PCV values of infected and non-infected animals. These two factors may be related to the debilitating nature of the disease [21]. In the absence of other diseases causing anaemia, a low PCV value of individual animals is a good indicator of trypanosome infection [19, 22, 23].

The risk of trypanosomosis is also influenced by apparent density and types of vectors in the area. The apparent density of *Glossina*, *Stomoxys, Hematpota* and *Tabanus*were 2.05 f/t/d, 0.3 f/t/d, 0.10 f/t/d and 0.15 f/t/d, respectively. This finding was lower than the report of Solomon *et al*. [18] who reported 6.49 f/t/d and 0.65 f/t/d for tsetse and biting flies, respectively. The low level of tsetse population may be caused by the expansion of settlements and farmlands. This difference could be attributed to environmental conditions, agro ecological differences and the season in the study area.

Table 1: The overall Prevalence of trypanosomosis in seven PA's with trypanosome species at botortolay district

Species	Madajalala	Kataboso	Yatudhahe	Gerangera	Urjioromia	Biftubari	Algesidamo	Total	Prevalence	χ^2	P-value
Tc	2	5	4	1	4	1	0	17	60.71	3.8	0.00
Tv	2	2	2	1	2	1	1	11	39.28		
Total	31	31	38	25	69	34	32	260	100.00		

Tc: *Trypanosome congolense*, Tv: *Trypanosome vivax*

Table 2: Apparent density of flies in the district according to peasant association

		Glossinaspesies					Other biting flies						
PA	No.trap	M	P	F	Total	FTD	T	S	H	Total	FTD	Over all total	Over all FTD
Madajalala	10	25	14	7	46	2.3	3	8	2	13	0.65	313	2.60
Kata boso	10	20	17	5	42	2.1	5	6	1	12	0.60		
Yatudhahe	10	17	11	3	31	1.55	1	4	3	8	0.40		
Gerangara	8	7	13	6	26	1.63	3	3	1	7	0.44		
UrjiOromia	8	31	15	2	48	3.0	2	7	4	13	0.81		
Biftubari	8	16	19	10	45	2.8	3	3	0	6	0.37		
Algesidamo	6	4	7	1	12	1.0	1	5	2	8	0.67		

Morsitans(M), Pallidipes(P), Fuscipes(F), Tabanus(T) Stomoxys(S), Hematpota(H), Fly/Trap/Day(FTD) and Peasant association

CONCLUSION

The present study showed higher prevalence oftrypanosomosis among cattle that are sampled at the Botar Tolaydistict of Jimma zone Oromia regional state. During the study sex, age and body condition were identified as important risk factors for the occurrence of trypanosomosis in cattle. Therefore, appropriate strategies have to be designed and implemented in this area to minimize the effect of the disease on livestock.

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