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Research Article

Trypanosomosis: Prevalence in Cattle in Dibati District, Metekel Zone, North Western Ethiopia

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Abstract

A cross sectional study was carried out from March to May 2016 to determine the effect of trypanosomosis on cattle packed cell volume and body conditions of cattle and tsetse apparent density using parasitological, hematological and deployments of mono-pyrimidal traps in Dibate district, Northwestern Ethiopia. The overall prevalence of bovine trypanosomosis was 2.23%. *Trypanosoma congolense* and *T. vivax* were the two species of Trypanosome that were found to be the major trypanosomes affecting cattle in the area. Statistically significant difference was observed in the prevalence of trypanosomosis among the study sites ($p<0.001$) while there was no variation between sex of animals ($p>0.05$). A mean PCV of 26.26% (95% CI=25.87-26.65%) was recorded in aparasitaemic cattle while in parasitaemic animals it was 22.82% (95% CI=22.19-23.44%). PCV value was found to be decreased with increasing trypanosome prevalence. In conclusion, the trypanosomosis is the major constraint to cattle production and the most widely distributed trypanosome species are *T. congolense* followed by *T. vivax*. Therefore, an appropriate control measures should be employed to save the animal population under treat due to trypanosomosis and emphasis should be given to the vector control in integrated disease control strategy.

Keywords: Cattle; Dibati; Northwestern Ethiopia; Trypanosomosis

Introduction

Trypanosomosis impedes the livestock production in Africa where the presence of tsetse fly density access to fertile woody and savannah lands with good grazing potential and livestock rearing [1,2]. It is a top constraint to agricultural production in extensive areas of the tsetse infested regions [3], accounting over 10 million square kilometers of the tropical Africa, affecting cattle, sheep, goat, equines. Generally, there is a great threat of trypanosomosis that impedes the economic development of sub-Saharan region and reasonable for the incalculable toll of public health [4].

The most economically important trypanosomes in Ethiopia are *Trypanosoma congolense*, *T. vivax* and *T. brucei*, which are cyclically transmitted by *Glossina species*. *Glossina species* in Ethiopia are particularly found in the southwestern and northwestern river basins between longitude 33° and 38° E and latitude 5° and 12° N covering an area of 220000 km^2. The river valleys of Blue Nile, Baro, Akobo, Didessa, Ghibe, and Omo are infested with one or more tsetse fly species. The Ethiopia is infested with five species of tsetse fly including *G. morsitans submorsitans*, *G. pallidipes*, *G. tachinoides*, *G. f. fuscipes* and *G. longipennis* and the first four are widely distributed and economically important [5]. According to Langridge [6], tsetse transmitted animal trypanosomosis remain as one of the largest causes of livestock production losses in Ethiopia [7].

Trypanosomosis is found to be one of the top health problems of livestock in most lowlands of western and southwestern Ethiopia. However, the distribution and the magnitude of the disease and its vectors are not well understood. Therefore, the aim of this research was to estimate the prevalence of trypanosomosis in cattle and relative abundance tsetse fly in Dibate district, northwestern Ethiopia.

Materials and Methods

Description of study area

The study was conducted from February to March 2016 in Dibate district. The district is located in Benishangul Gumuz sate. The district is situated at 534 Kilometers North West of Addis Ababa. The mean annual rainfall in Dibate ranges from 1500-1700 mm. The annual temperature ranges from 22-39 °C. The district has altitudes ranging from 1200-1655 m.a.s.l.

Study population, sampling method and Sample size determination

The total cattle population in Dibate is 111,300. These cattle are indigenous local zebu breeds. They kept and share common grazing lands with other livestock species under the extensive husbandry system.

A cross-sectional study was conducted in purposively selected district, Dibate, from Metekel zone Benishangul Gumuz regional State, northwest Ethiopia. Simple random sampling technique was followed to select individual study animals. The sex, body condition and origin of cattle were explanatory variables used to associate with the infection rate. Body condition for the individual study animal was determined based on Nicholson and Butterworth [8] principle for body condition scoring of cattle and grouped as good, medium and poor.

The number of cattle required for the study was estimated according to Thrustfield [9] formula for simple random sampling, considering 50% expected prevalence (Pexp) and 0.05 desired

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absolute precision (d).

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

Accordingly, 384 cattle were needed for the study even though, 627 cattle were sampled and examined.

Parasitological survey and methodology

Study methodology:

Survey of trypanosomosis: Blood samples were collected into heparanized microhaematocrit tubes (Deltalab S.L, Bercelona, Spain) after piercing the ear vein using lancet. Then one end of the capillary tube was sealed with sealant (Hawksley Ltd, Lancing, UK) and centrifuged at 12,000 revolutions per minute (rpm) for five minutes to separate the blood cells and to concentrate trypanosomes using centrifugal force as buffy coat. Then packed cell volume (PCV) was determined using haematocrit reader and recorded. The capillary tubes were then broken just below buffy coat and expressed on microscopic slide, mixed and covered with a 22x22mm cover slip. Then it was examined under x40 objective of microscope using dark ground Buffy coat technique to detect the presence of motile trypanosomes and for positive samples Geimsa stain of thin blood smears were made, fixed with methanol for 5 minutes, and examined under oil immersion using x100 0bjective to identify the species of trypanosomes [10] .

Data management and analysis

The data collected were entered in to Microsoft Excel Data base system. The entered data were analyzed using STATA version 10 statistical software program. The prevalence of trypanosomosis was calculated by dividing the proportion of cattle infected with one and/or more trypanosome species by the total number of cattle examined multiplied by 100. The association between the prevalence of trypanosome infection and associated risk factors were assessed by logistic regression, whereas the student's *t*-test was used to assess the difference in mean PCV between trypanosome positive and negative animals. A statistically significant association between variables was said to exist if the calculated P<0.05 at 95% confidence level.

Results

Trypanosomosis survey result

Out of the examined cattle, 2.23% were found infected with trypanosomes. The infection rate of trypanosomosis was 1.96%, 2.29% and 2.08% for good, medium and poor body condition category respectively which indicated no significant difference (p>0.05) between them. The result was assessed for the type of trypanosome species observed and revealed that from the 14 (2.23%) positive animals examined, 2.07% were positive for *T. vivax* and 0.16% was positive for *T. congolense*. Significant difference (p<0.05) was observed for the infection rate between the trypanosome species.

The infection rate of trypanosomosis was higher for female (2.45%) than for male (1.92%) animals and statistically no significant difference (p>0.05) was observed between sexes. When different Peasant associations (Pas) of the district were compared the highest infection rate of trypanosomosis was recorded at Zigih (6.49%) and no trypanosome infection rate was recorded at Bechati and Debate zuria (Table 1 and 2).

Table 1: Trypanosomosis infection rate between different Peasant Associations (PAs).

PAs	Sample taken	Number of positive	Prevalence (%)	X^2	*P*-value
Bechati	98	0	0	16.26	0.006
Chancho	121	6	4.95		
Dibatezuria	132	0	0		
Galesa	127	2	1.57		
Yamp	72	1	1.38		
Zigih	77	5	6.49		
Total	627	14	2.23		

Table 2: Prevalence of bovine trypanosomosis and associated risk factors in Dibati district.

Risk Factors	No. of examined	No. of positive	*P*-value	$\chi 2$
Body Condition				
Good	51	1(1.96%)	0.98	0.03
Medium	480	11(2.29%)		
Poor	96	2(2.08%)		
Sex			0.66	0.19
Male	260	5(1.92%)		
Female	367	9(2.45%)		

Table 3: The mean Packed Cell Volume in infected and non-infected cattle.

	Observations	Mean PCV	SD	95% CI for mean	
				Lower	Higher
Aparasitaemic	613	26.28	4.57	25.91	26.64
Parasitaemic	14	25.71	4.92	22.87	28.56
Total	627	26.26	4.57	25.9	26.62

/t/=0.45, p=0.65, DF=625, where *t*-test, DF=Degree of Freedom, CI=Confidence Interval.

Hematological findings

The overall mean packed cell volume of examined animal was 26.26. Mean PCV is lower in infected cattle (Table 3).

Discussion

The overall prevalence of bovine trypanosomosis in the area was found to be 3.19%.This report is similar with different reports from different tsetse infested regions of Ethiopia. Tadese et al. [11], Haile et al. [12] and Ayanaet al. [13] reported 2.86, 3.9 and 2.10%, respectively. However, this report is lower than the reports of from northwestern Ethiopia by Mulaw et al. [14] (28.1%), Mulatu et al. [15] (8.5%). This might be associated with the trypanosomosis and/or its vector control operation in the current study area.

The high prevalence rate of trypanosomosis at Zigih and Chancho PAs could be due to the presence of suitable habitat for the vectors which results in high fly density. As the study by Leak et al. [16] indicates, the variation in tsetse density appeared to be the main factor for the variation of the prevalence rate of trypanosomosis.

The prevalence of trypanosomosis in male and female animals was 1.92 and 2.45%, respectively. The difference in prevalence between the sex groups was not statistically significant (p > 0.05). Higher prevalence of trypanosomosis was higher in animals in medium

body condition (2.29%) than in those in good (1.96%) and poor body condition (2.08%) indicating weight loss is one of the symptoms of trypanosomosis [17]. Nevertheless, this difference is not statistically significant ($p > 0.05$). This indicates there are other factors that cause weight loss in animals.

The most widely distributed species is found to be *T. vivax* followed by *T. congolense*.

The mean PCV of examined cattle was 26.62. The mean PCV of parasitaemic animals (25.71%) was lower than that of aparasitaemic animals (26.28%). Feyisa [18] reported from south west Ethiopia, mean PCV values of 21.65% and 25.54% in parasitaemic and aparasitaemic animals respectively. Sori [19] also reported 20.22% and 27.23% for parasitologically positive and negative cattle, respectively, from west Ethiopia.

However, the difference in mean PCV value of herd infected with trypanosomosis and non- infected animal was not significant ($P>0.05$). This indicates PCV alone could not be the reliable indication of trypanosomosis in cattle. This might be related with the low sensitivity of detection method (buffy coat technique) or delayed recovery of anemic situation after current treatment with anti-trypanosomes drugs. Infection with Babesia and Theileria [20] and nutritional deficiencies' can also result reduction PCV [21].

In general, although the severity of trypanosomosis in the studied district is moderate, the effect of trypanosomosis on the health and production of cattle should not be ignored. Hence, an immediate intervention is required in the study area in order to save the animal population under threat due to trypanosomosis.

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