European Journal of Biological Sciences 11 (4): 121-126, 2019
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2019.121.126

Prevalence of Bovine Trypanosomosis in Gena Bossa Woreda, Dawro Zone, Ethiopia

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Abstract: A cross-sectional study was conducted from November, 2016 to June, 2017 in the area with the aims of assessing the prevalence of bovine trypanosomosis and determining the potential risk factors of the disease. The hematological and parasitological techniques were performed. A total of 384 blood samples were collected from cattle using random sampling method considering different age, body condition, coat color and sex of cattle. The packed cell volume (PCV) of each animal was measured using hematocrit reader after centrifugation at 12, 000 rpm for five minutes. The overall prevalence of bovine trypanosomosis was 7.03%. The identified trypanosome species were *T. congolense* (55.6%) followed by *T. vivax* (44.4%). The mean PCV was recorded as 21.0 in parasitaemic and 27.9 in aparasitaemic animals with significant statistical difference ($P<0.05$). The prevalence of bovine trypanosomosis was higher in females than in males, in older cattle than in younger and it was the highest in those animals with poor body condition and black colored. The results of the study indicated that bovine trypanosomosis is considered as one of the major livestock diseases causing continuous threats to the production and productivity of livestock sectors in the study area. Hence, further study on the occurrence of tsetse and trypanosomosis at different seasons of the year, development of control options that could minimize the tsetse and other biting flies, increasing the awareness of the livestock owners and stakeholders about the impacts of the disease and its management are needed for management of the disease.

Key words: Bovine · Trypanosomosis · Epidemiology · Risk factors · Dawro · Ethiopia

INTRODUCTION

Ethiopia has huge and diverse livestock population that plays an important role in the economies and livelihoods of farmers and pastoralists. Livestock are a "Living bank" or "Living account" for rural and urban poor farmer, or livestock owners. They serve as a financial reserve for period of economic distress such as crop failure as well as other cash income. Among livestock, cattle are the primary resource for people and government of Ethiopia. Despite the large population animal, productivity in Ethiopia is low and even below the average for most countries in Eastern and Sub-Saharan African countries, due to poor nutrition, reproduction insufficiency, management constraints and prevailing animal disease [1].

Trypanosomosis is a complex protozoan disease caused by unicellular parasites (trypanosomes) found in the blood and other tissues of vertebrates including cattle and man [2]. 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 [3].

Researches on the socio-economic impacts of trypanosomosis have revealed that, over 3 million heads of various livestock species in Africa are lost per year by deaths due to the disease. Furthermore, over 35 million doses of trypanocidal drugs are bought annually to treat animals against trypanosomosis and more than 70 million heads are at risk of contracting the disease, so that total direct and potential losses attributable to the disease

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worth over 4.5 billion dollars per year [4]. Even if tsetse transmitted animal trypanosomosis has been studied widely in Ethiopia, still remain as one of the largest causes of livestock production losses in the country [5]. Furthermore, the disease causes direct loss through mortality estimated to amount 1.5 to 2 billion birr per year and indirect losses due to decreasing productivity and restriction from international livestock trade in Ethiopia [3]. Currently, trypanosomosis is found to be one of the major factors impeding livestock production and productivity in mostly in western and south western part of the country Ethiopia. An understanding of the prevalence of the disease and its potential risk factors is important to design appropriate control strategies. Therefore, this research was conducted generally with the aim of estimating the prevalence of bovine trypanosomosis in study area. The specific objectives were: To determine the prevalence of bovine trypanosomosis and associated risk factors in study area and to identify the prevailing species of trypanosomes affecting cattle.

MATERIALS AND METHODS

Description of the Study Area: This study was conducted from November, 2016 to June, 2017 in Dawro zone Gena Bossa Woreda which is located in the west part of SNNPRS, demarcated south by Loma woreda, west by Mareka woreda east by Kembata Tembaro and north by Hadiya zones. The woreda is located longitudinally and latitudinal at 03°C and 0.7°N respectively. The altitude of the woreda ranges from 1400 m above sea level with 8 % highland 34 % midland and 58 % lowland. There are 36 rural kebeles, among them 3 kebeles (Zaba Dilba, Angella Duba and Deche Deneba) were purposively selected based on the previous history of disease prevalence and apparent tsetse density referenced from the local livestock and fishery office for the present study in the area. The temperature of the studied area ranges from 18-32 degree centigrade. The occupation of rural population is mixed farming practice where by crop and livestock are managed land-in- land together. The livestock population of the woreda is 158219 cattle, 26634 Caprine 326600 ovine 5757 equine and 58202 poultry [6].

Study Population: Local breeds of cattle with different age groups, body conditions and coat colors as well as both sex groups that were kept under traditional extensive husbandry system with communal herding were considered as study population. The animals examined were categorized in to different age groups as less than 2 years (young), between 2 up to 4 years (medium) and greater than 4 years (adult) according to their teeth dentition [7]. The body condition was estimated as per the recommendations of Macintosh HD (2007) for evaluating the body condition of the zebu cattle. The body condition of animals was recorded by classifying animals in the three groups as good, medium and poor based on the appearance of the ribs and dorsal spines. The animals examined were categorized into five groups according to their coat color as red, white, mixed, black and gray coat colors to observe whether coat color of animal have any influence on the disease prevalence.

Study Design and Sample Size Determination: A cross-sectional study was conducted in three purposively selected villages of Gena Bossa settlement area. Simple random sampling technique was followed to select the study animals. The number of animals required for the study was determined using the formula given by Thrusfield [8] for simple random sampling method. The size of sample was determined using 95% level of confidence, 50% expected prevalence and 0.05 desired absolute precision. Sample size was determined according to Thrusfield [8] formula which stated as:

$$n = \frac{1.96^2 x\ P(1-P)}{d^2}$$

where:
n = required sample size
P = expected prevalence
d = absolute precision

Therefore, the total numbers of cattle required to determine the prevalence of trypanosomosis in the current study areas were 384.

Sampling Strategy: In this study, Gena Bossa district of Dawro zone and the studied peasant associations were selected purposively. These three studied kebeles were selected based on the prevalence of trypanosomosis and apparent tsetse density. The study animals were determined by proportional sampling methods. Then, the study animals were selected by using simple random sampling methods.

Study Methodology:

Survey of Trypanosomes: Blood samples were collected randomly from cattle of the three peasant associations during the study periods. Blood samples were collected in to heparnized microhaematocrit tubes after piercing the ear vein using lancet. Then one end of the capillary tube was sealed with sealant and spun at 12, 000 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 read using hematocrit reader. The capillary tubes were then broken just below buffy coat and expressed on microscopic slide, mixed and covered with a 22x 22mm cover slip. Then it was examined under x40 objective of microscope using dark ground buffy coat technique to detect the presence of the parasites [9]. Confirmation of trypanosome species of positive samples by morphological characteristics was performed by thin smear technique and examination by light microscopy of 100X objective lens magnification [10].

Data Analysis: For the analysis of data, statistical software program: SPSS-20 for windows version was used. Prevalence of bovine trypanosomosis was expressed as the number of parasitaemic animals through buffy coat microscopic study to the total animals examined. Hematological findings were expressed as percentage of the RBC to the total blood content.

In all cases, a 95% CI were employed to extrapolate sample results to the target population in the study area. In order to compare trypanosomosis prevalence and the pooled data of mean PCV between aparasitaemic and parasitaemic animals of different factors, a combination of frequency distribution and student's t-test values and correlation were done to compare the relationship of PCV value with trypanosome infection rate.

RESULTS

Parasitological Findings: From 384 randomly selected cattle, 27 (7.03%) were found to be positive for trypanosomosis using buffy coat technique. *T. condolence* and *T. vivax* are the dominant trypanosome species as indicated in Table 1. The prevalence with respect to different risk factors like peasant associations (PAs), age, body condition and sex and coat color of cattle was determined. Although, different prevalence was found between both sex groups and among the three

Table 1: Prevalence of trypanosome species (N=384)

Species	No. of positives	Prevalence
T. congolense	15	3.91%
T. vivax	12	3.12%
Total	27	7.03%

N= Sample size

Table 2: Prevalence of trypanosomosis in relation with different associated risk factors

Variables	Classification	No. examined	No. of Positives	Prevalence (%)	Significance
PAs	Zaba Dilba	132	12	9.09	χ^2=2.191
	Angella Duba	126	9	7.1	P=0.320
	Deche Deneba	126	6	4.8	
Sex	Male	169	9	5.3	χ^2=0.600
	Female	215	18	8.4	P=0.464
Age	Young	48	1	2.1	χ^2=6.493
	Medium	127	6	4.7	P=0.025
	Adult	209	20	9.6	
Body condition	Poor	73	15	20.6	χ^2=26.606
	Medium	163	7	4.3	P=0.000
	Good	148	5	3.4	
Coat color	Red	134	10	7.6	χ^2=21.519
	White	78	2	2.6	P=0.001
	Mixed	64	5	7.8	
	Black	39	8	20.5	
	Gray	69	2	2.9	

Table 3: The mean PCV of parasitaemic and aparasitaemic animals

Status	No. of animals	Mean PCV% ± SD	T-test	Significance
Parasitaemic	27	21.03±5.297	8.40	P<0.001
Aparasitaemic	357	27.40±5.991		
Total	384	27.98±4.519		

peasant association, no statistical significance (P□0.05) was observed in overall prevalence of trypanosomosis between sexes and among the Peasant associations. In contrast, statistically significant (P<0.05) prevalence of trypanosomosis was observed with respect to age, body condition and coat color of examined animals as shown in Table 2.

Hematological Findings: The mean PCV of individual animals was measured and recorded before buffy coat examination to assess degree of anemia. As result the mean PCV of parasitaemic animals were 21.0 and aparasitaemic animals were 27.9 with significant statistical difference (P□0.05) as shown in Table 3.

DISCUSSION

The overall prevalence of bovine trypanosomosis in present study was (7.03%) in line with previous results recorded as 7.8% at Wemberma district of West Gojjam zone, North West Ethiopia [11]. The low prevalence observed in current survey might be due to an integrated tsetse and trypanosomosis control program under taken by STEP. It might be also due to chronic stage of disease. The chronic phase is characterized by low and transient parasitaemia or complete absence of detectable parasites in the blood [12].

The dominant trypanosome species in current study were *T. congolense* (55.5%) followed by *T. vivax* (44.4%) and The findings of the infection rate with *T. congolense* in the present study is in the line with the report of Eyasu and Ahmed [13] at Kindo Koysha district of Wolaita (58%). The increased proportion of infection with *T. congolense* in the study area might be due to the major cyclical vectors *Glossina* species (*G. pallidepes*) which are effective in transmitting *T. congolense* than *T. vivax* [14]. Since the transmission of *T. congolense* is cyclical, it requires the presence of tsetse flies, whereas *T. vivax is* most readily transmitted mechanically by biting flies [15].

There was no statistical variation (P>0.05) observed among peasant associations; this might be due to the study was carried out in similar agro -ecological zone. The occurrence of trypanosomosis frequently corresponds with vector density which in turn dependent on those climatic factors such as; temperature, humidity and vegetation coverage of the area [16].

The higher prevalence observed in female animals than male animals in current study was in line with previous reports of Konta Special woreda [17]. The possible explanation for higher prevalence of trypanosomes in female animals in present study site is that female animals were more likely exposed to tsetse flies as they were always released to common grazing site of tsetse infestation.

Statistically significant variation (P□0.05) was observed in adults (9.6%) than medium (4.7%) and young (2.1%) aged animals. This result is in line with the previous reports at Konta Special Woreda [17]. However, this variation could be due to the fact that adult animals travel long distance for grazing and draft as well as harvesting of crops to tsetse challenged areas. The low prevalence in young animals is due to Suckling calves do not go out with their dams but graze at home until they were weaned off [18].

Significantly highest infection rate (P < 0.05) was recorded in poor body conditioned animals (20.6%) than medium (4.3%) and good (3.4%) body conditioned animals. Even though other factors such as malnutrition or other diseases may also affect the PCV and body condition; presence of trypanosome infections resulted in a significant decline in PCV and body condition score [19].

Statistically significant variation (P<0.05) was observed between coat color of animals with highest prevalence in black (20.6%) and lowest in gray (2.9%) colored animals. Similar finding was reported at Konta special woreda [17]. The possible explanation for highest prevalence in black colored animals might be due to the nature of tsetse flies to be attracted toward black color. Tsetse flies have a preference for dark surfaces [20].

The mean PCV value of presently studied animals was significantly (P<0.05) varying between parasitaemic (21.0) and aparasitaemic (27.9) animals. Likewise, Thrusfield [21] stated that average mean PCV of parasitologically negative animals was significantly higher than those of parasitologically positive animals. Therefore, trypanosomosis may adversely lower PCV value of infected animals, even though other diseases such as helminthosis, thick borne disease and nutritional imbalances contribute to the low PCV values. It is known that the development of anemia is the most reliable indication of the progress of the trypanosome infection.

But it can also be assumed that numerous blood parasites other than trypanosomes and nutritional factors can also leads to development. Development of anemia is a common consequence of trypanosomosis [22].

CONCLUSION

Bovine trypanosomosis is an important disease and a potential threat affecting the health, production and productivity of cattle in the study area. Among disease problem mentioned in the district, trypanosomosis was found to be one of the most important diseases in the area. According to the associated risk factors, the prevalence of bovine trypanosomosis was higher in females than in males, in older cattle than in younger and it was the highest in those animals with poor body condition and black colored. The major species of trypanosomes most commonly encountered in the study area were *T. congolense* followed by *T. vivax*. Infection with trypanosomosis negatively affected PCV and body condition and it is an indication that trypanosome infection of cattle causes loss of body weight and production. Based on this conclusion, the following recommendations were forwarded. An integrated tsetse and trypanosomosis control action should be strengthened in the study area. All of the livestock owners should be aware of tsetse fly and other mechanical vectors as well as their control approach. Strengthen veterinary services infrastructure and supply of effective trypanocidal drugs are necessary to reduce trypanosomosis. Further study on the occurrence of tsetse and trypanosomosis at different seasons of the year.

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