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PREVALENCE OF BOVINE TRYPANOSOMIASIS IN NUNU KUMBA DISTRICT, OROMIA ETHIOPIA

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ABSTRACT

A cross sectional study was conducted in five selected peasant Associations of Nunu Kumbaa Woreda of western Ethiopia from October, 2020 to May, 2021 to estimate the prevalence of bovine trypanosomiasis and to identify the prevalent trypanosome species. Blood samples were collected from the ear vein of randomly selected 384 cattle. Thin blood smear and buffy coat techniques are employed to detect the presence of the parasite and the PCV was measured to evaluate the anemic condition of the animals. Out of the total number of cattle examined, 33 were found to be positive for Trpanosomiasis giving the overall prevalence of 8.6%, which 60.6%, 39.4% were Trypanosoma vivax and Trypanosoma congolense identified respectively. The maximum prevalence 10.4% was observed in Wama Gudetu followed by Hora Bacha and Wama Adare, with the prevalence of, 8.9 and, 6.8% respectively. Animals were grouped into three age categories, young <3 years, Adult ≥3 years with the prevalence of 4.9 % and 9.6% respectively. Based on the body condition score, the prevalence of 0, 11.3% and 5.1 % were recorded in good, medium and poor conditioned animals, and it was higher in males 15.8% than females 5.6%. The statistical analysis showed a significant association in the variation of age categories, body condition and among kebeles ($p<0.05$). The result also showed a significant difference in packed cell volume (PCV) values between infected and non-infected cattle. In conclusion, the study showed that disease was higher in the area and had significant effect on the body condition and development of anemia. Therefore, the responsible organizations and the community should work on the control and prevention activities of the disease in environmental friendly manner.

INTRODUCTION

Ethiopia has the largest livestock population in Africa, with 65 million cattle, 40 million sheep, 51 million goats, 8 million camels and 49 million chickens in 2020 [1**]**, but fails to optimally exploit resources due to a number of factors such as diseases, poor nutrition, poor husbandry practices and lack of government policies for disease prevention and control [2]. Among the animal diseases trypanosomiasis is one of parasitic disease that hampering the livestock development in Ethiopia [3].

Trypanosomosis has long been recognized as a massive constraint on animal husbandry, livestock production and mixed farming in vast areas of rural sub-Saharan Africa [4]. About 85% of the Ethiopian populations are engaged in the agricultural sector [5]. Livestock is primarily kept on small holdings where it provide drought power for crop production, manure for soil fertility and fuels, serves as a sources family diet and sources of cash income (from livestock and livestock products). Despite large livestock population, Ethiopia fails to optimally utilize this resource due to different constrains facing the livestock subsector [6].

Since more than 90% of crop production in Ethiopia are dependent on animal draught power mainly on ploughing oxen, many large fields lie fallow due to lack of these animals in trypanosomiasis infested area [7], which worsen the food supply and living conditions in affected areas. Trypanosomes are flagellated protozoan parasites that live in the blood and other body fluids of vertebrate hosts [8].

Bovine trypanosome is one of the diseases that are caused by this flagellated protozoal parasite belonging to the genus trypanosome [9]. Trypanosomosis is an important disease of livestock in Ethiopia [10]. There are six pathogenic T. equiperdum and T. rhodesiense but the most species of trypanosomes are discovered in Ethiopia, which are namely T.vivax, T. congolense, T. brucei, T. evansi, and important trypanosomes which are found in country are T. vivax and T. congelense [11].

In Ethiopia, trypanosomosis is widespread in domestic livestock in the Western, South and South-western lowland regions and the associated river systems (Abay, Ghibe, Omo and Baro/Akobo). The tsetse flies in Ethiopia are confined to the southern and western regions between longitude 33° and 38°E and latitude 5° and 12° N [12].

However, studies have not yet been carried out on the epidemiology, prevalence and economic significance of bovine trypanosomiasis in this study site. Therefore, the objective of this study was to estimate the overall prevalence of bovine trypanosomosis in Nunu Kumba Wereda based on data from a number of scientific studies.

MATERIALS AND METHODS

Study Area

The study was conducted in three purposively selected kebeles, namely Hora Baca, Wama Gudetu, and Wama Adare Woreda which is situated at 394 km from Addis Abeba and 66 km from Nekemte. The woreda is found in 36°N and 8°E and covers 61,277.82 hectare total area, which is sub-divided into 21 kebeles. The altitude of the woreda ranges from 1400 to 2400 m.a.s.l and mean rain fall is 800 to 1000 mm. The temperature of the woreda ranges from 25°C to 35°C. In the area mixed farming system is practiced and the grazing land is covered by different vegetation types mainly savanna grassland forest, and bush lands. Livestock population of the woreda is 131,665 bovine, 21,018 caprine, 20,328 ovine, 9,032 equine and 58,304 poultry.

Study Animal

The study was carried out on 384 indigenous Zebu cattle of both sexes; age groups and body condition of the animal were also considered. The animals in area mainly depend upon communal grazing fields and crop residues as feed source and watering paint is the Wama river which is infested with tsetse flies.

Sampling Methods and Sample Size Determination

A cross-sectional study using simple random sampling technique was employed to determine the prevalence of bovine trypanosomiasis in the study area. The 3 kebeles were selected purposively based on the availability of transportation and logistics as well as their agro ecological representativeness of 21 kebeles of the district. From each selected kebeles, the farmers as well as the study animals were selected randomly in each household. During sampling, kebeles, age, sex and body condition score (BCS) of the animal were recorded. The body condition score was grouped in to good, medium and poor conditioned animals based on the appearance of ribs and dorsal spines applied for zebu cattle [13]. Age of the animal was estimated by dentition [14] and owner's information. The sample size (n) was calculated according to the formula given by Thrusfield (2005), considering 50% expected prevalence (p), 95% confidence level and 5% desired absolute precision (d).

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

Where, N = required sample size

P_{exp} = expected prevalence

d= desired absolute precision

$3.8416 \text{ X} 0.5 (1-0.5)/(0.05)^2 = 3.8416 \text{X} 0.5(0.5)/0.0025$

0.9604/0.0025= **384**

Study Design

The study was conducted by using simple random sampling techniques in order to determine the prevalence of trypanosomiasis in bovine species at study area. It was performed by parasitological survey and hematological procedures. Blood samples were obtained by puncturing the marginal ear vein with lancet.

Thin Blood Smear

A small drop of blood from a micro-haematocrit capillary tube was applied to a clean slide and spread by using another clean slide at an angle of 45 degree. The smear was dried by air and then fixed for 2 min in methyl alcohol. The thin smear was flooded with Giemsa stain 1:10 solution for 30 min. Then it was allowed to dry standing up right on the rack and examined under microscope oil immersion (100) objective lens [15].

Packed Cell Volume (PCV)

Blood was directly collected into heparinized capillary tubes, and the tubes were then sealed at one end with crystal seal. The capillary tubes were placed in micro- hematocrit centrifuge and allowed to centrifuge at 1500 revolution per minute (rpm) for 5 min. The centrifuged capillary tubes were placed on hematocrit reader, and measured for PCV. Animals with PCV less than 24% were considered to be anemic [15].

Buffy Coat Techniques

The capillary tubes were cut at 1 mm below the buffy coat to include the upper layer of red blood cell and expressed onto a slide and then covered with cover slip, the slide was examined under 40× objective lenses. Trypanosome species were identified according to their morphological descriptions of Giemsa stained blood film as well as movement in wet film preparations provided by Radostits et al. (2007).

DATA ANALYSIS

The collected raw data and the results of parasitological and hematological examination were entered into a Microsoft excel spread sheet. Then the raw data was summarized using statistical package for the social sciences

(SPSS) version 20. The presence of association between the prevalence of the diseases and the risk factors such as kebeles, age, sex and body condition score were assessed by using chi-square test (×2). Mean PCV values of parasitaemic and non- parasitaemic animals were compared by independent t test. P-values less than 0.05 were considered as significant.

RESULT AND DISCUSSION

Out of the total of 384 cattle examined, 33 were positive for Trypanosomosis hence the overall prevalence of the study area was 8.6%. This finding was in agreement with the previous reports conducted in Ethiopia by Tafese et al. [2012] who studied the prevalence of bovine trypanosomosis in East Wollega zone of Digga and Sasiga using buffy coat technique and found prevalence rate of 8.55%; which is lower than previous reports: 12.41% in the Metekel and Awi zones of northwest Ethiopia [16]. The maximum prevalence was observed at Wama Gudetu 10.4% (n=11) followed by Hora Bacha 8.9% (n=13) and Wama Adare 6.8% (n=9). This might be due to their location around Wama river belt, where there is high tsetse flies distribution.

Table 1. prevalence of trypanosomiasis and identified trypanosome species in the study area

Kebeles	No of ex-amined	T.congole nce	T.vivax	T.bruci	T.congolence and T.vivax	Total Positive	Prevalence %	X^2 (P value)
Hora Bacha	146	5	8	0	0	13	8.9	0
Wama Gude-tu	106	4	7	0	0	11	10.4	0
Wama Adare	132	4	5	0	0	9	6.8	0
Total	384	13	20	0	0	33	8.6	

The prevalence of T. vivax infection 60.6% (n=20) in this study is comparatively higher than that of T. congolense 39.4% (n=13). According to this result T. vivax was the dominant species in the study area (Table 1). This is due to the prevalence of T. vivax was connected with its molecular biology which may have played a role in conferring it with resistance against both drugs and host defence and also as distance from the known tsetse infestation increases, T. vivax becomes more frequent and eventually predominates [17].

The present study revealed that the prevalence of young animals (<3 years) was lower than that of adult (≥3) animals but the difference was significant ($p<0.05$). This study was agreed with the previous reports showing higher prevalence in adult animals as compared to young animals which is believed to be due to high preference

of tsetse for adult animals and less exposure of young animals to tsetse challenge as they are usually kept at homestead [18]. This could be associated to the fact that adult animals travel long distance for grazing and draught as well as harvesting crops in areas of high tsetse challenge than calves which is indicated that suckling calves don't go out with their dams but graze at homesteads until they are weaned off. [19]

Higher prevalence 15.8% (n=18) were observed in male than in female animals 5.6% (n=15), but the difference was significant ($p<0.05$). Similar result reported by different researchers [20]. The possible suggestion to the present finding might be associated with the hardworking of male animals and might be due to physiological differences [21].

Table 2 prevance of trypanosomiasis based on animals age, sex and body condition

Variable	No. of examination	No. of positives (%)	Prevalence (95% CI)	X^2(P-Value)
Age				
<3 years	82	4	4.9	0.000
≥3years	302	29	9.6	
Sex				0.000
Female	270	15	5.6	
Male	114	18	15.8	
BCS				0.000
Good	26	0	0	
Medium	240	27	11.3	
Poor	118	6	5.1	

In this study, out of the total 33 parasitaemic animals, 33.3% were anemic (PCV<24) and only 66.7% were not; whereas from 351 aparasitaemic animals only 10.54% were anemic (PCV<24) but 89.5% were not anemic. There was significant difference between the mean PCV values of parasitaemic and aparasitaemic animals (t=0, P<0) (Table 3).

Table 3 comparison of mean parasitaemic and aparasitaemic cattle

Condition	No. examined	PCV<24%	PCV>24%	Mean PCV (95% CI)	t-test (p-value)
Parasitaemic	33	11	22	50	0.00
Aparasitaemic	351	37	314	11.8	0.00
Total	384	48	336	14.3	

This lower PCV might be due to trypanosome infection which produces erythrophagocytosis anemia (destruction of red blood cells) carried out by enzymatic and immunological mechanism during infection in parasitaemic animals [22].

CONCLUSION AND RECOMMENDATIONS

The presences of tsetse in many areas of Ethiopia and the diseases, which they transmit, have been responsible for the country being left poor. With 8.6% the highest prevalence in the present study revealed that trypanosomiasis causes significant loss of economy due to reduced production and milk yield, loss of body condition, stunted growth in young animals, low output of draught power, cost of treatment and death of the animals is supposed to be signification. The result revealed that T. vivax was the most prevalent species in the study area and the infections significantly affect the PCV values and body condition. Having the above conclusions, the following recommendations are forwarded: Economical and environment friendly community based trypanosomiasis and its vector control and prevention strategies should be implemented in the area. Further investigation should be done on the rest of kebeles for the determination and identification of trpanosomiasis. Governmental and nongovernmental organizations should involve for the control and prevention of tsetse flies in the study area. Awareness should be given for the community about the impact of the disease on the livestock and economy of the country and Community mobilization should be taken for the control of tsetse fly.

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