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Study on Bovine Trypanomosis in Hurumu Woreda Ilu Ababoor Zone Oromia, Ethiopia

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Abstract: A cross sectional study was conducted from March 2018 to August 2018 to determines the prevalence of bovine trypanosomosis in the study area. A total of 384 blood samples were collected from cattle. The selected cattle were categorized according to their body condition (good, medium and poor), sex (female and male) and age (adult and young). Study district and peasant association was randomly selected animal in both sexes either male or female which was found in five kebeles including Gaba, Wangenye, Hurumu, Haro and Goljo. Blood sample were obtained by puncturing the marginal ear vein with lancet and collect directly into capillary tube. The specimen was allowed to centrifuge at 12,000 revolutions per minute for 5 minute.*Trypanosoma vivax* and *Trypanosoma congolense* were identified by microscopic examination by its movement. Out of the total 384 cattle examined 38 (9.89%) cattle were positive for trypanonosomesis infected giving the overall prevalence 30(78.95%) was due to *T. congolense* and 8 (21.05%) was due to *T. vivax.* There was no statistically significant difference (P>0.05) between all peasant associations; however, the highest results were Gaba 9 (11.25%). There was also no statistically significant difference (P>0.05) between age and sex.The trypanosome infection prevalence was found to be 8% in the young and 10.56% in adult and prevalence of bovine trypanosomosis was assessed between sexes 16(8.69) of them were female animals and 22(11%) of them were male animals. Even though between sexes of animals there is no significant difference slightly higher than in the female animals. There was statistically significant difference (P>0.05) between PCV and body condition score which was the highest prevalence in poor body condition (26.08) followed by in medium (7.08) and good body condition (2.13) and low PCV value of individual animals is a good indicator of trypanosome infection cattle with PCV <24% were considered anemic which is said to be the principal sign of trypanosomosis in livestock.

Key words: Bovine · Trypanosomosis · Prevalence · Packed Cell Volume · Buffy Coat

INTRODUCTION

Trypanosomesis disease caused by unicellular parasite (trypanosome) found in blood and other tissue of vertebrate; including livestock, wild life and people [1]. It is a serious disease in domestic livestock causing a significant negative impact or food production and economic growth in many parts of the world, particularly in sub-SaharanAfrica [1, 2, 3]. Its epidemiology and impact on live stock production are largely determined by the prevalence and distribution of the disease and its vectors in the affected area [4]. This disease is transmitted mainly by tsetse flies (cyclically), biting flies (mechanically) and by other means of transmission [3]. The most important species that infect cattle include *Trypanosome congolese*, *Trypanosome brucei* and *Trypanosome vivax*. Mechanically transmission is particularly important in relation to *T. vivax* and *T. evansi* particularly on the fringe of tsetse areas. It can occur in the presence of biting flies of genus *Tabanus*, *Haematopta*, *Chrysopsa* and *Stomoxys* [5].

Tsetse flies ingest trypanosome in blood or lymph node while feeding on the host. The trypanosome undergoes cycle of development and multiplication in digestive tract of the fly until the infective metacyclic trypanosome (Meta trypanosome) are produced [3].

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They undergo transformation losing their typical trypanosome or trypomastogote metacyclic trypanosome which infective forms of the [6].

African trypanosomes lose infectivity for mammals when they enter the tsetse fly gut and must complete their development cycle with differentiation to the metacyclic stage before infective parasites can be transmitted in the tsetse saliva [7]. Approximately 30% of the total cattle population in Africa continent and about 50 million are exposed to animal trypanosomosis and human sleeping sickness respectively [8].

Tsetse flies (*Glossina*) inhabit wide range of habitats covering over 10 km representing 37% of the African continent and affecting 37 countries including Ethiopia [9]. In Ethiopia,tsetse flies are confined to the southern and western regions between the longitude 33° and 38° E and latitude 5° and 12°N. Tsetse fly infested areas lies in the low land and also in the river valley of Abay (Blue Nile), BaroAkobo,Ghibe, Didesa and Omo) [10].

Currently about 220,000km^2 area is infested by tsetse flies normally *Glossina fuscipes*,*Glossinatachnoides*, *Glossina pallidipes*, *Glossina morsitans*, *Glossina*long pennies, MOA [11]. About 15-20%of the low land believed to be suitable for livestock production by one or two species of the tsetse flies [11]. Bovine trypanosomosis is serious to agricultural productions in extensive tsetse infested areas of Ethiopia low land i.e. the North West and south west regions [5]. In Ethiopia trypanosomosis is one of the most important disease limiting livestock productivity and agricultural development due to its high prevalence in the most arable and fertile land south west part of the country following the greater basins of Abay, Omo, Ghibe, Didesa and Baro with high potential for agriculture [11].

The most important trypanosome species affecting livestock in Ethiopia are *T. congolense, T. vivax, T.brucei*in cattle, sheep and goat, *T. evance* in camel and *T.equiperdum* in horse [5]. In Giemsa stained blood smears the species distinguished by their size, shape, location, the size kinetoplast, position of nuclease and the attachment and length of flagellum. Trypanosomes move actively and progress by movement of the undulating membrane and the free flagellum when present [3].

Trypanosomes are characteristically leaves like in shape. They are a single flagellum and attached to the organism by undulating membrane [13]. Animal infected with trypanosomes is manifested anemia, generalized enlargement of superficial glands,loss of body condition, fever and loss of appetite [6].

In recent years a number of drugs effective against cattle trypanosomosis have been introduced for curative and prophylactic use [6]. Curative treatment is the most effective in herds that are inspected at regular intervals [3]. Control and strategies in the trypanosomosis concentrate on vector control and parasites control with chemotherapy and chemoprophylaxis use of inherent trypano-tolerant in some breed of animal [5]. The economic burden of trypanosomosis is not only due to the direct losses resulting from mortality, morbidity and infertility of the infected animals but also it is due to the indirect losses like exclusion of life stock and animal power based crop production from the huge fertile tsetse infested areas [14]. In Ethiopia, about 5.5 millions heads of cattle are exposed to the risk of trypanosomosis. This disease reduces meat and milk productions of animals recovering from it. In addition to this some drugs are costly to treat animals that are diseased. Despites of the importance of this disease, very few studies have been conducted about the species of bovine, trypanosomes, its impact on cattle production and prevalence of the disease in the study area [15]. Therefore, the objectives of this study are to determine the prevalence of bovine Trypanosomosis at the Hurumu District and to assess the prevalent species of bovine trypanosome at the Hurumu District.

MATERIALS AND METHODS

Study Area: The study was conducted from March 2018 to August 2018 in selected district. The study area was located in Oromia regional governmant, Ilu babor zone at Hurrumu woreda. Hurumu was the administrative center of the district. This district was bordered byYayo woreda in east, Mettu woreda in west,Becho woreda in south and Dorani woreda north. This study area was found in west of Ethiopia at the distance of 600km from Addis Ababa, 18 km from zone town which is Mettu. It was characterized by crop live stock mixed farming system. Hurumu was the smallest district located in Ilubabor zone which separated from Yayo woreda in 1999 Ethiopian calendar which contains 48615.14 Hectare of land**.** The elevation in this area varies from 1350-2450 meter above sea level. The annual mean temperature for most part of the district is 23°C and annual rain fall is about 2200mm. The climatic conditions of the area include 86% woina dega 9% dega and 5% kola. The lands used for cultivation are cultivated land 18999.4 hectare, grazing land 2789 hectare,

forest 20780 hectare and the other is 5902.54 hectare. The animals that found in the woreda are 48395 bovine, 17359 ovine, 3579 caprine 50559 poultry, donkey 695, 1159 mule and 2832 horse [16].

Study Design: A cross sectional types of study were conducted to determines the prevalence of bovine trypanosomosis in the study area. The selected cattle were categorized according to their body condition (good, medium and poor), sex (female and male) and age (adult and young). The study district and peasant association was purposively selected.

Sample Size and Sampling Method: The simple random sampling technique was applied to collect blood from ear vein. The sample size were determined based on 95% confidence interval, 5% desire absolute precision and 50% prevalence according to the formula indicated by Thrusfield [17].

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

where:

n = The required sample size

P_{exp} = Expected prevalence

d = Desired absolute precision.

Accordingly, the estimated sample sizes were **384** animals.

Study Methodology

Buffy Coat Technique: A small blood was collected from the ear vein using heparanized micro-haematocritcapillary tube. A haematocrit tube with a whole blood sample and one end were seal with haematocrit clay. The tube was centrifuged at 12000 revolutions per minute for five minutes. After centrifugation trypanosome was in and above the Buffycoat layer. The capillary were cut using a diamond tipped pen the plasma. The content of capillary tube was expressed on the slides, homogenized on to clean slide and cover with slip. Then, slide are examined under 40x objective and 10x eye piece for the movement of the parasite [18].

Measuring Packed Cell Volume: Blood sample were obtained by puncturing the marginal ear vein withlancet and collect directly into capillary tube. The capillary tubes are placed in micro haematocritcentrifuge with seal and outer most. The tubes were loaded systematically to ensuring goal balance after screwing the rotators over closing the centrifuge lid.The specimen was allowed to centrifuge at 12,000 revolutions per minute for 5 minute. Tubes are then placed in haematocrit and read expressed as percentage packed cells to be total volume of whole blood. Animals with PCV <24% were considered to be anaemic.

Body Condition Scoring: The body condition was done according to the Nicholson and Butter Worth classification, then classified into; good, medium and poor [19].

Study Population: The study subjects were consists of randomly selected animals in both sexes either males or females which were found in five kebeles including Gaba, Wangenye, Hurumu, Haro and Goljo. There is total number of about 384 of livestock selected.

Data Management and Analysis: Raw data on individual animals and parasitological examination were inserted into micro soft excel spread sheets to create a data base and transfer to SPSS version 20 software program for data analysis. Chi-squere were used to compare the prevalence of trypanosome infection with different variable, PA, age, sex,body condition and also to compare the mean PCV of infected animals with that of non infected.

RESULTS

In the present study, outof the total 384 cattle examined 38 (9.89%) cattle were positive for trypanonosomesis infected giving the overall prevalence was due 30 (78.95%) to *T. congolense* and 8 (21.05%) was due to *T. vivax.*

Prevalence of Bovine Trypanomosis in Relative to Peasant Association: The slightly highest prevalence of trypanosome infection was found in Gaba when compared with other peasant association prevalence related were varying from 9 (11.25%) in Gaba peasant association, 8(10.95%) in Wangegne peasant association, 7(9.09%) in Goljo peasant association, (9.21%) in Haro peasant association and 7 (9.59%) in Hurumu peasant association with no statistically significant different between all peasant association (Table 1).

Table 1: Prevalence of bovine trypanosomosis with in 5 peasant association in Hurumu District with (p>0.05).

No	Name of PAS	No of examined	No. of infected
1	Gaba	80	9(11.25%)
2	Wangegne	78	8(10.95%)
3	Goljo	77	7(9.09%)
4	Haro	76	7(9.21%)
5	Hurumu	73	7 (9.59%)
	Total	384	38(9.89%)

Table 2: Prevalence of bovine trypanosomosis with age in Hurumu woreda.

No	Age	No. of examined	No. positive	Prevalence
1	Young	100	8	8(8%)
2	Adult	284	30	30(10.56%)
	Total	384	38	38(9.89%)

Table 3: Prevalence of trypanosome species in Hurumu woreda

No	Type of parasite	No of positive	Prevalence rate
1	*Trypanosoma congolense*	30	30(78.95%)
2	*Trypanosoma vivax*	8	8(21.05%)
	Total	384	100

Table 4: Prevalence of bovine trypanosome with sex in Hurumu woreda

No	Sex	No of examined	No of positive	Prevalence rate
1	Male	200	22	22(11%)
2	Female	184	16	16(8.69%)
	Total	384	38	38(9.89%)

Table 5: Mean packed cell volume and standard deviation of infected and non infected animals in Hurumu woreda

Measurement	No of parasite examined	Parasitic	No parasitic	Prevalence
<25(anemic)	201	37	164	164(18.4%)
> 25 (normal)	183	1	182	182(0.55%)
Total		384	38	38(9.89%)

Table 6: Show based on body condition during study period

No	Body condition	No of examined	No of positive	Prevalence rate
1	Poor	69	18	18(26.08%)
2	Medium	268	19	19(7.08%)
3	Good	47	1	1(2.13%)
	Total	384	38	38(9.89%)

Prevalence of Bovine Trypanosomosis in Relative to Age: The animals examined were categorized in two age groups; young and adult. The trypanosome infection prevalence was found to be 8% in the young and 10.56% in adult.

Prevalence of Bovine Trypanosome Related with Sex: During the study period, the prevalence of bovine trypanosomosis was assessed between sexes 16(8.69) of them were female animals and 22(11%) of them were male animals. Even though between sexes of animals there is no significant difference. Among 38 trypanosomes positive animals the trypanosome infection in males are slightly higher than in the females. On sex categories during study period animal sex determined in five peasant association and also the overall result is not significantly different P>0.05, however relatively higher prevalence of trypanosomes in male than female.

PCV Results: This factor may be related to the debilitating nature of the disease [20]. In the absence of other disease causing anemia, low PCV value of individual animals is a good indicator of trypanosome infection [5, 21]. During the study period, cattle with PCV <24% were considered anemic [22] which is said to be the principal sign of trypanosomosis in livestock [23].

Prevalence in Relation to Body Condition Score: The occurrence of disease in three different body condition (poor, good and medium) animals shows the highest

prevalence in poor body condition (26.08) followed by in medium (7.08) and good body condition (2.13). This finding is consistent with observations of Tadese and Tsagaye and Bitew *et al*. [24, 25].

DISCUSSION

The result of the present study revealed that from a total of 384 randomly selected cattle's in the study area 38(9.89) of animals were positive for trypanosomes. This finding is greatly higher than the previously reported from Didesa woreda which was 4.86% [26]. The relatively low prevalence of trypanomosis in Didesa woreda could be due to tsetse distribution and low fly-animal contact and parasite and vector control programs practiced in the area by Bedelle NTTICC annually but, these were not practiced in the present study and lack of these control programs were increase the chance of prevalence of trypanosomosis and other vector disease in this study area and also lower than the previously reported from Arbaminch district of SNNPR, southern Ethiopia which was 27.5% [27]. The higher prevalence in Arbaminch district could be due to less and infrequent use of trypanocidal drugs as well as the increase of tsetse challenge because of higher density of vectors in these area. The reason of low prevalence of trypanosomosis in the present study, when we compeers with Arbaminch was due to low density of vector and at this study period there is sufficient amount of feed or grass is present, means due to good condition of the season, which is very necessary for animal and immunity of the animal were not under risk during this time and also agriculture are expanded both by farmers and private investment which influence the density of tsetse flies.

This study result is also lower than the previously reports;12.41% in Metekel and Awi zones of North West [28]. The lower prevalence in the current study might be due to the low sensitivity of the parasitological diagnostic methods, the uncontrolled use of trypanocidal drug, application of relatively well designed method of tsetse control and treatment, explanation of cultivation in the area which in directly affects flies distribution and awareness of the people towards the control and treatment of the disease. In this study the prevalence of bovine trypanosomosis between peasant associations was not significant; even though it is highest in Gaba.This may be the result of uncontrolled animal movements PAS and due to marsh area which favorable for tsetse flies.

The animals examined were categorized into two groups; young and adult. The trypanosome infection prevalence was found to be 8% in the young and 10.56% adult was also assessed on significance difference was observed with related age. The result agreed with report of in Lalokile district of KelemWollaga similar findings were also reported by Cherinet *et al*. [29] but, somewhat less prevalence greater in adult animals. This can be associated to the fact that adult animals travel long distance for feed and water as well as for drought to tsetse high challenge areas. There is also evidence that *T. congolense* infection was chronic disease that increase rate with age, tsetse flies are attracted significantly more by odor of large animals.

Morphological identification of the species of trypanosome involved in the study area was *T. vivax* and *T. congolense*. In the present study prevalence *T. congolense* was (78.95%) higher than the prevalence of *T. vivax* (21.05%). The high proportion of *T. congolense* detected in this study agreed with the report of [5] which is 58% due to*T. congolense*. This prevalence of *T. congolense* infection in cattle may be due to high number of serodemes(serological variation)of *T. congolense* as compared with *T. vivax* and the development of better immune response to *T. vivax* by infected animal [30]. More over Muturi[31] who reported 66.86% *T. congolense* and 20.75% *T. vivax* infection, respectively. Such high proportion of *T. congolense* may be caused by the presence of biological vector (*Glossina*), whereas, *T. vivax* is more readily transmitted mechanically by biting flies than tsetse flies [10]) and *T. congolense*is mainly confirmed in the blood while *T. vivax* and *T.brucei* also invade the tissue [32]. Other studies by Leak *et al.* [33] have indicated that *T. vivax* is highly susceptible to treatment while the problems of drug resistance are higher in *T. congolense.*

The sex wise prevalence trypanosome infection was 22(11%) in male and 16(8.69%) in female. Though prevalence slightly higher among the male, statistically there was no significant difference [1, 34] reported. Similar result where they observed no significant difference in trypanosome infection between male and females [35]. Inseparate studies added that no statistically significant deference in the prevalence bovine trypanosomes between sex group cattle [36].

The absence of trypanosoma infection in the poor body condition animals may be due to malnutrition, internal parasites and other body loss diseases [37]. In this therefore, they have equal chance of coming in contact with the flies and allowed in the same ecology

having comparable degree to acquire information. Parasitemic animals with poor body condition were also there and this indicate that other factors such as disease nutritional factors as well as management system may have contributed for the poor body condition of study there was a significant difference between mean PCVvalues of infected and non infected animals. This factor may be related to the debilitating nature of the disease [20]. In the absence of other disease causinganemia, low PCV value of individual animals is a good indicator of trypanosome infection [5, 21]. During the study period, cattle with PCV<24% were considered anemic [22] which is said to be the principal sign of trypanosomosis in live stock [23].

In this study the occurrence of the disease in three different body condition (poor, good and medium) animals shows the highest prevalence in poor body condition (26.08) followed by in medium (7.08) and good body condition (2.13). This finding is consistent with observations of Tadesse and Tsegaye and Bitew *et al.* [24, 25]. There was significant difference in the prevalence of trypanomiosis between animals with good and poor body condition, which is in agreement with Mussa [38]. This may be related to the debilitating nature of the disease.

The disease itself result in progressive emaciation of the infected animal never the less non infected animal under good body condition have well developed immune status that can respond for any foreign protein better than those non infected cattle with poor body condition which can immune compromised due to other disease or mal nutrition since malnutrition and concurrent infection depress the immune responsiveness in some cases [20].

CONCLUSION

Our study results revealed that bovine trypanosomes in five village of Hurumu woreda indicated that an overall 9.89% prevalence of the disease. In this study *T. vivax* (21.05%) and *T. congolense* (78.95%) are trypanosome species identified. Higher prevalence of trypanosomosis infection was observed in animals with poor body condition and low PCV animals. It conclude that trypanosomsis is the most wide spread and prevalent protozoan disease affecting the health and productivity of animals with proceeding to economic losses. This is due to the fact that the area is suitable for the habitats of tsetse fly. Strategic control of bovine trypanosomosis is including vector control should be strengthened to improve live stock production and agricultural in development in the area.

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