Austin Journal of Nutrition and Food Sciences

Open Access

Austin Publishing Group

Research Article

Prevalence of Bovine Trypanosomosis in Gurage Zone Enemorena Ener Woreda, Ethiopia

Tamirat TG[1]* and Tsegaye L[2]

[1]Ethiopian Meat and Dairy Industry Development Institute, Ethiopia

[2]Enemorena Ener Woreda Agricultural Developemnt Office, Ethiopia

***Corresponding author:** Tamirat TG, Ethiopian Meat and Dairy Industry Development Institute, p.o.box -1537 Bishoftu, Ethiopia; Email: tamoplus@gmail.com

Received: March 16, 2018; **Accepted:** May 08, 2018; **Published:** May 15, 2018

Abstract

The study was conducted in Enemorena Ener woreda of Southern Nation Nationalities of Ethiopia to determine the prevalence of bovine trypanosomosis. First questioner survey was conducted from 100 farmers from different peasant association and 67(67%) of the asked people says it is predominant disease in the study area and then Blood samples were taken from a total of 384 indigenous cattle managed under small holder mixed crop livestock production, Blood Buffy coat dark ground phase appear contrast microscopic technique was used for detection of the trypanosomes in the blood samples, Packed Cell Volume (PCV) to degree of anemia caused by trypanosomosis, the overall prevalence of 20 (5.2%) bovine trypanosomosis was recorded in the study area. Predominant species of trypanosome encountered during the study period were Trypanosoma *congolonsce* with prevalence of 17(85%) followed by Trypanosoma *vivax* 3(15%) but there was no mixed infection observed. PCV evaluation showed that 90(23.4) were <24% and 294(76.6%) were >24% the mean PCV of parasetemic animals indicating the importance of bovine trypanosomosis in causing anemia. The result of the questioners and present study revealed that trypanosomosis is important problem for agricultural activity and animal production in the study area. There for a high commitment of the community is required to fully and willingly participate in the operation to effectively control and finally eradicate trypanosomosis and make the land free for agriculture and livestock production.

Keywords: Bovine; Enemorena Ener woreda; Gurage zone; Prevalence; Trypanosomosis

Introduction

Trypanosomosis is a disease caused by several species of protozoan parasite (trypanosomes) found in the blood and other tissue of vertebrates including livestock, wild life and people [1-3]. It is one of the most important disease of livestock, which makes the land difficult for agricultural production and human settlement in considerable part of the world especially in sub Saharan Africa including Ethiopia [4-7].

Trypanosomosis in livestock causes great losses in terms of mortality, abortion, reduced fertility, milk and meat production, and ability to work as traction animals [8].

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 of South West and North West part of the country following the greater river basin of Abay, Omo, Gibe and Baro with a high potential for agricultural development [9].

It can be transmitted between the host mainly by tsetse flies cyclically, by other biting flies mechanically and other means of transmission [4,5]. Trypanosomasis of cattle locally known as "sineche" or "Gendi" can be found in many province of Ethiopia were it has greatly hindered development.

The most important Trypanosome species affecting livestock in Ethiopia Trypanosome *Congolese*, T. *vivax* and T. *bruci* in cattle, sheep and goat, T. *evansi* in camels and T. *equiperdem* in horse [10]. Trypanosome *vivax*, Trypanosome *congolonse,* Trypanosome *bruci bruci* and Trypanosome *simae* are the four main species responsible for African Trypanosome cases affecting virtually all domestic mammals Trypanosome *vivax* and Trypanosome *Congolese* are the main pathogen of cattle. The four species are members of the salivarian group of Trypanosome are transmitted cyclically via the mouth part of tsetse flies, hence the name salivarian Trypanosome. Trypanosoma *vivax* usually numerous in bovine blood and can be identified by its very fast movement in wet films, in stained smears it is along slender with long free flagellum. Trypanosoma *Congolese* is smaller, sluggish in wet film and in stained smears it is short and no free flagellum [11]. The epidemiology of Trypanosome depends on the distributions of the vectors, the virulence of the parasite and the response of the host.

There is also a difference in host susceptibility to trypanosome which is best exemplified by the small east African breeds of cattle such as n`dama and West African short horn. These animals are less susceptible to the diseases that zebu or the European breeds and are commonly found in endemic areas of Trypanosomosis. They are referred to as Trypanotolerant breeds [12-14].

In the pathogenesis infected tsetse inoculates Meta cyclic trypanosomes in to the skins of animals were the trypanosomes grow for few days caused localized swelling (chancre). They enter the lymph nodes, then the blood stream, were they divide rapidly by binary fission in T. *congolonse* infection. The organism attaches to the

Citation: Tamirat TG and Tsegaye L. Prevalence of Bovine Trypanosomosis in Gurage Zone Enemorena Ener Woreda, Ethiopia. Austin J Nutri Food Sci. 2018; 6(2): 1104.

Table 1: Prevalence of trypanosome on the base of localities.

Peasant association	Number of examined animal	Test result		Trypanosome positive percentage
		positive	Negative	
Shumoro	128	8	120	6.3%
Jatu	128	7	121	5.5%
Agara	128	5	123	3.9%
Total number	384	20	364	5.2%

Table 2: Species of trypanosome involved in disease process in each peasant association rate of infection trypanosome spp.

Origin	Number of cattle examined	Test result			Prevalence (%)
		T.congelense	T.vivax	Negative	
Shumoro	128	7	1	120	6.3%
Jatu	128	6	1	121	5.5%
Agar	128	4	1	123	3.9%
Total number	384	17	3	364	5.2%

Table 3: Prevalence of trypanosome infection in both sex.

Sex	Number of cattle examined	Test result		Prevalence
		Number of cattle infected	Number of cattle non-infected	
female	193	11	180	5.69%
male	191	9	184	4.71%
Total number	384	20	364	5.2%

endothelial cells and localize in capillaries and small blood vessel, T. *bruci* species and T. *vivax* invade tissue and cause damage in several organs. The immune response is vigorous and immune complexes cause inflammation, which contributes to the signs and lesions of the disease anti bodies against the surface coat glycol proteins kill the trypanosome. However trypanosomes have multiple genes that code for different surface coat glycoprotein's that are not vulnerable to the immune response [15].

The diagnosis is important at both in clinical medicine and epidemiological investigation. The disease shows a variety of clinical manifestations, which are also common to other disease. The disease may run acute, chronic or sub clinical course and fever can be observed which can be intermittent due to the variation parasetemia and the animal survives, the disease become chronic there is development of anemia and emaciation. Anemia, fever and loss of condition are important parameters, which are routinely used for tentative diagnosis of trypanosomosis. In areas were the disease is endemic and laboratory service are not available. However, clinical sign of trypanosomosis are not pathogenic to the disease and diagnosis is safely attained by parasitological methods live dark ground phase contrast Buffy coat technique [16]. Which can be used under field condition to detect the presence or absence of trypanosomosis species are identified from thin or thick smears of positive samples [5].

Treatment against trypanosomosis in order to be effective should be given early in the initial phase of fluctuating parasetemia. As no new drugs have been withdrawal because of resistance, treatment is now essential limited to two compounds diminazine aceturate and homideuem salts (either chloride or bromide) [17,18]. control is aimed at interrupting the cycle of development of the protozoan, either with in the mammalian host or the insect vector control of trypanosomosis except for dourin can be based on; control of the parasite trypanosomes control of vectors tsetse or biting flies; use of trypanotolerant animals and integrated approach combing other methods [5]. Vector control is the most reliable means of disease control since it removes the treat of trypanosomosis on a permanent basis.

However studies have not yet been carried out on the epidemiology, prevalence and economic significance of bovine Trypanosomosis in the study site. Therefore the objectives of the study were to determine the prevalence of bovine pcv in relative to Trypanosomosis.

Thus the objectives of this study were

1. To study the prevalence of bovine trypanosomosis in Gurage Zone Enemorena ener woreda
2. To determine some associated risk factors
3. To compare pcv in relation to trypanosome

Materials and Methods

Study area

The present study on the prevalence of bovine trypanosomosis was conducted in three selected kebele and peasant association of Gurage zone enemore ener district. Enemorenaener one of the Gurage zone woreda situated about 470 km from Hawassa and 198 km from Addis Ababa. It is located on the equator at $8^0 2'11''$ N^0 latitude and $37^0 5'1''E^0$ longitude. The altitude of the study area ranges from 1200 to 2500 m.a.s.l and its total area is estimated to be 107,584 hectare of land. The distribution of the rain is bio medial with short rain from January to April and high rain from June to September. The average annual rain fall is 950 mm and Enemornaener woreda and

Table 4: Prevalence of trypanosome in different age group.

Age	Number of cattle examined	Test result		Trypanosome prevalence (%)
		Number of cattle infected	Number of non- cattle infected	
Calf(<1 year)	26	1	25	3.8%
Young(1-3year)	88	4	84	4.5%
Adult(>3 year)	270	15_a	255_a	5.6%
Total	384	20	364	5.2%

Table 5: Pcv evaluation result in infected and non-infected with trypanosome.

Pcv	Test Result			Over all prevalence
	Trypanosome positive	Trypanosome negative	Total	
Pcv < 24%	14	76	90	23.4%
% within pcv	15.6%	84.4%	100.0%	
Pcv >24%	6	288	294	76.6%
% within pcv	2.0%	98.0%	100.0%	
Total Count	20	364	384	100%
Total % within pcv	5.2%	94.8%	100.0%	

its surrounding is characterized by with minimum and maximum temperature ranging from 6 to 28 respectively. The vegetation is savanna type with scattered bush the livestock population that are found in Enemorenaener woreda include cattle 181,485, sheep 15,327, goats 15,327, horse 5,238, mule 3124, donkey 5845 and poultry 80875 among the animal cattle are the dominant species raised in the area. The cattle population in the district is estimated to be over 181,485 [19]. The body condition of the sampled animal was done according to [20] from 1 to 9 scales, their age, breed and sex was also documented during sampling. The local human population is principally engaged in livestock crop (mixed) farming system and the major crops growing in Enemorenaener woreda are maize, teff, sour gem and paean [19].

Study population

Cross sectional study was conducted on 384 indigenous cattle managed under small holder mixed crop livestock farming system local indigenous zebu cattle were considered in the study.

Study design

Sampling method and sampling size determination: The sampling method applied in the present study was a simple random sampling; from the study population of 128 animals from each three selected peasant association of Enemorenaener woreda. The sample size was calculated by using thrust field formula [21] using 95% cl and expected prevalence of 50%.

$$N = \frac{1.962 * p_{\exp}\left(1 - p_{\exp}\right)}{d^2}$$

$$N = \frac{1.96 * 0.5(1 - 0.5)}{(0.05)^2}$$

N=384.16

N=384

Were N= required sample size

$p_{exp=}$ expected prevalence 50%

D= desired absolute precision 5%

Cl= confidence interval 95%

Study Methodology and Procedure

Questioner survey

Questioner was ready all about the diseases and risk factors which they encountered and disseminated to farmers which are under the research area out of three peasant associations in each target group 33,33,34 in Shumoro, Jatu and Agare respectively farmers selected for questioner and they give answer as one problem in the study area.

Collection and examination of blood samples

Blood was collected using sterile procedures to avoid mechanical transmission of trypanosomes and other haemoparasite. Since many parasites are more concentrated in small blood vessels, blood collection will be made from ear veins (capillaries) to easily detect parasitemias.

Buffy coat technique parasitological survey

Blood sample were collected after properly restraining the animal and aseptically preparing the area around the veins. It was collected from the ear vein by using sterile blood lancet and heparinized micro hematocrit capillary tube.

Thin blood smear

A small drop of blood was taken and spread over the slide to examine trypanosomosis species and movement.

Pcv

Following the same steps the tubes the above centrifuged tubes were then placed in hematocrit and the reading were expressed as a percentage of packed red cells to the total volume of whole blood. Animal with pcv <24% were considered to be anemia.

Data management and analysis

Data collected from trypanosome infection survey entered in to ms-excel spread sheet program to create data base statistical analysis was employed with IBM spss statistic 23 soft ware for data management and analysis. The tested hypothesis were of prevalenceof trypanosomosis, prevalence of trypanosomosis the relation between pcv value and prevalence of trypanosomosis were tested kind of description statics which were used are confidence interval, mean and chi- square method.

Results

Questionnaire survey

Parasitic diseases like mange mites, ticks, gastrointestinal helminthiasis and blood parasitic diseases like trypanosomiasis, bacterial diseases including blackleg, anthrax, contagious bovine pleuropneumonia, caprine pleuropneumonia, mastitis were listed as most important livestock diseases in the area. From the questionnaire it was indicated that trypanosomiasis was the most important and the first cause of morbidity and mortality of cattle in Enemorena ener woreda, even after control program has been conducted for years by different stakeholders. Of these listed diseases, from 100 farmers 67(67%) of the interviewed farmers ranked trypanosomiasis as the priority disease affecting their cattle and the risk factor is lack of feed in dry season.

Parasitological survey

A cross sectional study was conducted on 384 randomly selected cattle to determine the prevalence of bovine trypanosomiasis and evaluate associated risk factors. The result of the survey showed that an overall prevalence of 5.2 % (95% cl=0.92-1.08). On peasant association basis shumoro was highest prevalence 6.3% followed by jatu 5.5%and agare 3.9% (Table 1).

Distribution of trypanosome species

The species of trypanosome identified by Buffy coat technique and thin smear showed that T.congolonse is the most prevalent with prevalence of 85% where as T.vivax 15% but there was no mixed infection ($_{p>}$0.05) (Table 2).

Prevalence of trypanosome infection in both sexes

During the present survey, from a total of 384 cattle examined 193 were female and 191 of them were male animals, from the female examined 5.69% were positive for trypanosome infection while 4.71% of the male animals were infected in (Table 3). The trypanosome in both sexes were almost similar and statically there is no significant difference in the infection rate between male and female animals (chi square= 0.234, p>0.05) (Table 3).

Prevalence of trypanosome infection in different age groups

The animals examined were categorized in different group age groups as calf (less than 1 year), the young (1-3 years) and adults (>3 years). The prevalence of trypanosomosis on different group age was 3.8%, 4.5% and 5.6% in calves, young and adult respectively. Different in infection rate among the different age groups (chi square=0.242, p>0.05) (Table 4).

Hematological findings

To assess the relationship between trypanosome infection and pcv value, pcv determination was done by using hematocrit method and the mean pcv of parasetemic and aparesemetic animals were calculated. The mean pcv of parastemic animal is 21.5% which fall on the range of anemia and for this aparesetemic animals mean pcv 30.5% which is normal pcv value. From a total of 384, 23.4% (90) of animal were found to be anemic and 76.6% (294) were fall in normal range. There is statically significant difference in the mean pcv value between in the infected and non infected animals (chi square 0.000, p<0.05) (Table 5).

Discussion

The questionnaire survey and clinical findings were revealed that trypanosomiasis was known in the area for more than 10 years and it was priority disease despite tsetse and trypanosomiasis control program conducted by southern tsetse eradication project. The result of the present study is relatively lower than previous report 8.55% by Tafes, W et al. [22], Habeteweled [23] 1993, 9.3% and 13.44% prevalence rate in Gawo Dale district by waktole [24].

According to the present parasitological survey a total of 384 local zebu cattle were collected by using simple random sampling method determine the prevalence of bovine trypanosomosis and associating factors in Gurage zone Enemorenaener woreda of SNNPRS during the present study an overall prevalence of 5.2% (95% cl=0.92-1.08) was resulted. The result of the present study (5.2%) was in close agreement with the finding of Miruk et al. [25] who reported prevalence of 4.8%. at Mirabe abaye and Tasew and Duguma Dale sadi District western oromia [26] (5.84%). This finding is also higher than the result of Ayana, Tesfaheywet and Getenet at Amhara region, NorthWest Ethiopia (2.1%) [27]. This might be due to the lack of recent study and application of effective controlling methods in the study area.

The present study trypanosome *congolonse* is predominant spp in the study area as compared to other spp of trypanosome. The predominance of T. *congolonse* infection on cattle may be due to the high number serdomes of T. *congolonse* as compared to T. *vivax* and the development of better immune response to T. *vivax* by the infected animal [28,29]. The dominancy of T. *congolonese* (85%) in the present study is an agreement with the pervious result of Tewelde [18] at kone (75%) and village 1 (93%) settlement area of Ethiopia woldeys and aboest 1997 [30] at Arbaminch zuria districts (85.2%) and Rowland et al. [31] in gibe valley, south west of Ethiopia (84%) had shown the same result of T.*congolonse* finding. These high ratio of T.*congolonse* suggest that the major cyclical vector or Glossina spp are more efficient tranismitors of T.*congolonse* than T.*vivax* in east Africa [9].

Prevalence of bovine trypanosomosis was suited between sex of animals and among 20 trypanosome positive animals 11 of them are female and 9 were male animal were as there was no statically significant difference observed during the present study (p>0.05) infection rates between male and female animals which considers with the result of Tefera and Adne [32,33], who that both male and female cattle were equally susceptible to the disease and equal to obtain no significant difference in susceptibility between the two

sexes. This show exposure to the vector of the parasite is equal in the grazing field.

The population studied based on their age in to less than one year old, 1-3 years and greater than three years old to observe whether they have any influence on the disease prevalence in the calf group the prevalence was less which happened to be as a result of low exposure to the vector challenge. Conversely in the adult and older age groups of animals the prevalence of trypanosome infection was higher due to the routine contact existing with the tsetse fly in the field. Statically no significant difference was observed ($p>0.05$) in the prevalence rate of the disease between age groups. This result supports the result of the previous work by Alekaw [34] who conclude that there is no significant difference rate between age groups.

In the present study the prevalence of trypanosomosis in different site of study have different status which may happened due to that some sites of the study area share the border which is favorable for tsetse distribution and has different types of wild animals which are important for the disease to act as a host. The prevalence of the disease in the study peasant association was in 6.3% Shumoro, 5.5% in Jatu and 3.9% in Agare. The difference was statically non significant ($p>0.05$).

During the study period cattle with pcv value less than 24% was considered anemic [18,35] which is the principal sign for trypanosomosis in the livestock. The overall anemia prevalence in the studied peasant association was 23.4% (90) of which 16.6% (14) was due to the presence of trypanosomes infection. However, large number of animals (83.4%) (76) were anemic (PCV<24%) without having trypanosomes infection. Some animals 2% (6) were positive to trypanosomosis but their PCV was normal (PCV ≥ 24%). This may suggest on the one hand the presence of other anemia causing factors and on the other hand individual variability in the maintenance of normal PCV in parasitemic animals or this may have occurred due to recent infection with trypanosomosis. The mean pcv value for anemic animals is 21.5% and 30.5% for non anemic there were significant difference observed between parasetemic and aparesetemic animals ($p <0.05$). This result agrees with the result of previous work of Alekaw [34] and Haile [36] who reported that the mean pcv value of aparesetemic animals. Trypanosomosisis also known to causes reduction in weight gain and productivity [29]. However, the difference in mean PCV value between parasitaemic and aparasitaemic animals indicates that trypanosomosis involves in reducing the PCV values in infected animals [21]. The damage of tissue due to trypanosomosis is probably multi factorial in etiology, but the underling feature is the progressive anemia throughout the cores of disease. The case of anemia is due to hemolysis caused by primarily by erythrophagocytosis due to simulation and expansionof mononuclearphagocytosis system [37]. The appearance of trypanosome negative animals which mean pcv value less than 24% may be due to inadequate of detection method used [16] or delayed recovery of anemic situation after resent treatment with trypanocidal drugs or may be due to compound effects of poor nutrition and hematophageoues heliment infection such as *Heimoncosis* and *Bunostosis* [17]. However, pcv value can be affected by many factors other than trypanosomosis. These factors are likely to affect both trypanosomosis positive and negative animals [38].

Conclusion and Recommendation

The study was conducted on the prevalence of bovine trypanosomosis in Gurage zone Enemorenaener woreda on SNNPRS, the result of the questioner and present study revaluated that trypanosomosis is important problem for agricultural activity and animal production in the study area. Among the species T.*congolonse* found to be the most prevalent trypanosome species in the area the lower pcv values in parasetimic animals indicated that the typical pathogenesis is observed in the study area of the examined animals positive of Trypanosomsis were typically their pcv is <24% are 14 in number and 6 are >24% of the diseased animals the greater number (%) are more likely anemic. In dry season decrease supply of feed to the animal due to drought in order to tolerate the drought the farmers move their animal for searching feed to the land which have not been settled by human this free lands are the home of tsetse flies then the animals bitten by tsetse flies then starts the disease development and this is also main source for mechanical transmitter of trypanosomosis following this animals which are moving long area become weak due to long journey and the disease development and then they easily attacked by other bacterial and parasitic diseases.

Based on the above conclusion the following recommendations are forwarded

1. Awareness creation about the disease and controls methods as well as the risk of trypanocidal drug resistance is required in the area.

2. Control strategies of trypanosomosis focusing on strong sustainable and community based designed and implemented

3. A high commitment of the community required fully and willingly participate in the operation to effectively control and finally eradicate tsetse flies and make the land free for agriculture and livestock production.

4. Keeping excessive feeds and grain residues and other potential feeds to the animal for dry season to overcome the feed shortage.

5. Finally, epidemiological studies should be carried out and appropriate, feasible control of trypanosomosis and/or vector should be implemented.

Acknowledgment

The authors are grateful to the Gunchire vet clinic staffs for their technical support and zerfiesh Abera and T/Giorgis Balcha for availing facilities. In addition i would like to appreciate all participants.

References

1. Stephen LE. Trypanosomosis: A veterinary perspective. Program press, oxford. 1986; 67.

2. Taylor KA. Immune responses of cattle to African trypanosomosis: protective of pathogenic?. Int J Parasitol. 1998; 28: 219-240.

3. WHO world health organization fact sheets no 259. 2006.

4. Awoke K Study of trypanosomosis and its vector in Humbo and Merab woredas. Eth vet Assc jour. 2000; 4: 61.

5. Uilneberg G. A field Guide for diagnosis, treatment and prevention of African animal trypanosomosis. Adapted from the original edition by Boyt. Wp food and agricultural organization of united nations (FAO). Reome. 1998: 43-135.

6. PATTEC. Pan african tsetse and trypanosomosis eradication commission (PATTEC) plan for action. 2001.

7. Abebe G. Trypanasomosis in Ethiopia, Ethiopian journal of biological science. 2005; 4: 75-121.

8. Maudlin IA, Holmer PH, Milor MA. The typanosomosis, Centre for Agricultural Bioscience International, Egham. 2004.

9. Langridge WP. Tsetse and trypanosomosis survey in Ethiopia. Ministry of overseas development, United Kingdom. 1976.

10. Getachew A. Trypanosomosis in Ethiopia, Addis Abeba University, faculty of veterinary medicine. Deber zeit. 2005: 18-20.

11. Radostitis O, Gay C, Hincne Iiff KW. Constable P. African trypanosomosis. A text book of the diseases of cattle, horse, sheep, pigs and goats 10th edn. Elsiver London. 2006; 1531-1535.

12. Dayo GK, Gautieg, Berthier D, Poivey JP, Sidebe`I, Bengayel Z, Eggen A, et al. Association studies in QTZ regions linked to bovine trypanotolerance in west African cross breed population Animal Genetics. 2012; 42: 123-132.

13. Mason IL. world dictionary of livestock breeds Thiged edition C.A.B international. 1988.

14. A filled guide for the diagnostic treatment and prevention of African Animal Trypanosomisis FAO G. Uueberg (adapted from the original edition by WP boyt).

15. Dubois ME, Demick KP, Mansfield JM. Trypanosomes expressing a mosaic variant surface glycoprotein coat escape early detection by the immune system. Infect Immun. 2005; 73: 2690-2697.

16. Murray M, Murray PK, Mcintyre WI. An improved parasitological technique for the diagnosis of African trypanosomosis. Trans R Soc Trop Med Hyg. 1977; 71: 325-326.

17. Afework Y, Clause PH, Abebe G, Tilahuen G, Mehliz D. Multiple drug resistance trypanosome congolonsce population in village cattle of metekel district, North west Ethiopia. Acta Trop. 2000; 76: 231-238.

18. Tewolde N, Abebe G, Eisler M, Dermot J, Afework Y, Kyule M, et al. Application of field methods to assess isometamediume resistance of trypanosomosis in cattel in western Ethiopia Act Tropica. 2004; 90: 163-170.

19. Enemorenaener woreda communication affaire light magazine. 2004.

20. Nicholson MJ, Butter MH Worth. Aguied condition scsoring of zebu cattle. International livestock center for Africa (ILCA), Addis Ababa, Ethiopia. 1986.

21. Thrustfield MV. Veterinary Epidemiology 3rd edition. Black well Science, Oxford distribution. 2005; 233.

22. Tafes W, Melaku A, Fentahun T. Prevalence of bovine trypanosomosis and its vector in two districts of East Wollega Zone, Ethiopia. Onderstepoort. J vet Res. 2012; 79: 3.

23. Habtewold T. Bovine trypanosomosis in wolayita: prevalence and assessment of drug efficacy AAU, Faculty of veterinary medicine, Deber zeit DVM Thesis. 1993.

24. Waktole T. Studies on bovine trypanosomosis and therapeutic efficacy of selected trypanocidal in Birbir valley of Gawo-Dalle district, west oromia, Msc Thesis Addis Ababa university faculty of veterinary medicine deber zeit, Ethiopia. 2008.

25. Miruk A, Hagos A, Yacob HT, Asnake F, Basu AK. Prevalence of bovine trypanosomosis and trypanocidal drug sensitivity studies on Trypanosoma congolense in Wolyta and Dawero zones of southern Ethiopia. Vet Parasitol. 2008; 152: 141–147.

26. Tasew S, Duguma R. Cattel anemia and trypanosomosis in western oromia state, Ethiopia. Revue Med. 2012.

27. Ayana M, Tesfaheywet, F Getenet. A cross-sectional study on the pervalence of bovine trypanosomosis in Amhara region. North West Ethiopia. Livestock Research for Rural Development. 2012.

28. Leak SGA. Tsetse Biology and Ecology; their role in the epidemiology and control of trypanosomosis.CAB international Walling ford (UK). 1999.

29. MacLennan KJR. Tsetse transmitted trypanosomosis in relation to the rural ecology. Wld Animal Rev. 1970; 36: 69-92.

30. Woldeyes G, Aboset G. Tsetse and Tryapanosomosis distribution, identification and assessment of soci-economic viabilities of the new vector control approaches in Arba Minch zuria wereda. Ethio vet asso proceeding of the 11th conference. 1997; 143-154.

31. Rowlands GJ, Woudyaalew M, Authie EJD, Dleteren GDM, Leak SGA, Nagada SM, et al. Mariega A method for distinguishing new and recurrent trypanosome infection in afield survey of east Africa zebu cattle in Ethiopia. 1993.

32. Tefera S. Prevalence of bovinetrypanosomosis in Arba Minch districts. DVM. 1994.

33. Adane M. Survey on the prevalence in and around Bahir Dar. DVM Thesis, Addis Ababa University, faculty of veterinary medicine, Deber Zeite, Ethiopia. 1995.

34. Alekaw Prevalence of trypanosomosis of cattle in three woreda of Amhara region (Unpublished). 2003.

35. Rowlands GJ, leak SG, Perigeren AS, Nagada SM, Mulatu W, Dleteren GD. The incidence of new and the prevalence of recurrent trypanosome infection in cattel in south west Ethiopia exposed to high challenge with drug resistance parasite. ActaTrop. 2001; 79:149-163.

36. Haile C. Bovine trypanosomosis in North omo; prevalence and assessment of drug efficacy DVM Thesis, Addis Ababa university, faculty of veterinary medicine Deber zeit, Ethiopia. 1996.

37. Walle R, Shearer D. Veterinary Entomology Arthropod Ectoparasites of Veterinary Importance. London. Champ man and Hallpp. 1997; 141-193.

38. Van den Bossche P, Rowlands GJ. The relationship between the parasitology prevalence of trypanosomosis infection in cattel and helped average packed cell volume. Acta Trop. 2001; 78: 168-170.

Austin J Nutri Food Sci - Volume 6 Issue 2 - 2018
ISSN : 2381-8980 | www.austinpublishinggroup.com

Citation: Tamirat TG and Tsegaye L. Prevalence of Bovine Trypanosomosis in Gurage Zone Enemorena Ener Woreda, Ethiopia. Austin J Nutri Food Sci. 2018; 6(2): 1104.