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Epidemiological Study of Bovine Trypanosomosis in Selective Kebeles of South Omo Zone, Ethiopia

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Abstract
A cross-sectional study was carried out aimed at determining the Epidemiological study of bovine trypanosomosis, tsetse density and other biting flies during dry season in selected kebeles of South Omo zone, from November, 2011 to February, 2013. Blood samples were collected from 1056 randomly selected cattle to detect the prevalence of trypanosomes using buffy coat method. The overall infection rate 6.9% (N=73) was recorded; the highest prevalence was observed in Gondoroba(15,3%) and Kure(15,0%); no significant difference was observed within kebeles except Arbuj (P=0.03). The cattle are invariably infected with different species of trypanosome parasite and among these *Trypanosoma congolense* is the commonest (5.4%) followed by *Trypanosoma viviax* (0.8 %) and non-pathogenic *trypanosome theilerii(0.8%)* .The mean PCV value of parasitemic and aparasitaemic animals was recorded PCV values less than 26% were considered as anemic. The distribution of percentage of PCV(26.89% with standard Deviation 7.13). The highest distribution of trypanosomes species were detected at end of the rain (54.4 %) with (45.6%) dry season; not differ significant from each other at .05 level. In each study area, entomological surveys were conducted using biconical traps and it indicated that *G. pallidipes* were the only tsetse fly species caught in the study area along with other biting flies like *Tabanids* and *Muscids* in savanna woodland and Marginal River(Weyto) during dry season**.** The overall apparent density of tsetse flies in the study area was 1.95 flies/trap/day. Suggest that in endemic areas of trypanosomiasis should be practical control and reduce or eliminate tsetse fly populations with traps, insecticides and by treating infected animals with anti-parasitic drugs and continues follow up of drug sensitivity test.
Keywords: cattle, species, tsetses, Trypanosomosis, Trypanosomes

INTRODUCTION

Bovine trypanosomosis remains a major pathological constraint for livestock development in sub-Saharan Africa. The trypanosomosis have been and remain a serious constraint to economic development in sub Saharan Africa, impacting on the health of the people as well as their domestic livestock (Shaw, 2004) losses and control costs exceeds one billion U.S. dollars (ILRAD,1993). Trypanosomosis, which is covers one third of the content, which is estimated to be 10 million km^{2}and in the region at least 46 million cattle are exposed to the risk of contracting the tsetse borne trypanosomosis (Reid *et al*., 1998). Recent study estimated the direct annual cost of Trypanosomosis to be about 1.34 billion USA dollar (Kristjanson *et al*., 1999).

The distribution of trypanosomosis in Africa corresponds to the range of tsetse flies and comprises currently an area of 8 million km 2 between 14 degrees North and 20 degrees South latitude (Molyneux and Pentreath, 1996). Trypanosomes infect all domesticated animals; cattle are the main species affected, due to the feeding preferences of tsetse flies; in effect, they can shield other domesticated animals such as goats and pigs from the effects of trypanosomosis. In wild animals, these parasites cause relatively mild infections while in domestic animals they cause a severe, often fatal disease. All domestic animals can be affected by trypanosomosis and the symptoms are fever, listlessness, emaciation, hair loss, and discharge from the eyes, edema, anemia, and paralysis (Winkle, 2005)

Trypanosomes can be found wherever the tsetse fly vector exists. Tsetse flies are endemic in Africa between latitude 15° N and 29° S, from the southern edge of the Sahara desert. African animal trypanosomosis disease is caused by *T. congolense*, *T. vivax* and *T.brucei* spp. The host preferences of each trypanosome species may differ, but *Trypanosoma congolense*, *T. vivax* and *T brucei* have a wide host range among domesticated animals. *T. godfreyi* and *T. suis* occur in pigs. *T. simiae* appears to be most important in pigs, but it has also been reported by PCR in camels and horses. Trypanosomosis is often a chronic disease in susceptible animals. The morbidity rate is high, and many untreated animals infected with. *T.vivax*, *T. brucei* or *T. congolens*e eventually die. In cattle infected with some strains, the mortality rate can reach 50-100% within months after exposure, particularly when poor nutrition or other factors contribute to debilitation. Animal trypanosomosis occurs in most of the tropical regions, but only in equatorial Africa does it constitute a major obstacle to the development of animal production. The considerable economic and social repercussions make control of this disease a priority operation for the development of a large part of the African continent. Recent study estimated the direct annual cost of Trypanosomosis to be about 1.34 billion USA dollar (Krist Janson *et al*., 1999). Several reports made in Ethiopia revealed that tsetse fly occupy over 66,000 km^2 area (Ford *et al*., 1976) based on 1500 m.a.s.l. Breeding limit in the Southern and Southwestern parts of Ethiopia. The most prevalent trypanosome species in Ethiopia are

T.congolens and *T.vivax* (Rowland *et al*., 1993) reported that the prevalence rate of 37% for *T.congolense* in South west Ethiopia.

The control Program of the disease with effects on various aspects of the epidemiological cycle of the infection is essential and can achieved by taking action on the parasite, on the vector and on the host. In the absence of an effective vaccine and lacking a cohort strategy for controlling the insect vector, in many Africa countries the dependence on trypanocidal drugs for control of animal Trypanosomosis has become alarming (Jordan, 1986). Following the prolonged use of these trypanocidal emergences of strains of trypanosomes resistant to the drug has been reported from different parts of the continent (Ainanshe *et al*., 1992). Hence:

Specific Objective

- Identify main Tse-Tse and other flies found in the area
- To determine the prevalence of trypanosomosis diseases in selected Peasants Associations of South Omo zone
- To design appropriate prevention and control strategies

2. MATERIALS AND METHODS

2.1. Study area

The study was conducted in thirteen kebeles (PAs) namely, Maki,Gerfa, Gura,arbuja and Hayloha; kure, Maytol, Geza and Alga; Godoroba and Chelkaka; Alize and Beneta selected from Salamago, Debub Ari, Hamer and Malle districts, respectively of South Omo zone. The zone is located between 40 43' North to 6^0 46’ North latitude & 35^0 79’ East to 36^0 06’ East longitude, and found from 376 m to 3,500 m. a. s. l. with mean annual rainfall from 400 mm to 1,600 mm. It has a diverse agro-ecological zones ranging from hot arid to the tropical humid with average temperature minimum 10.1^0C and maximum 27.5^0C (SOFED,2004 E.C).

2.2. Study population and sample size

The population unit is indigenous cattle encountered in the areas. They are kept under traditional extensive husbandry system. Sample size of animals 1058 were considered (dry and end of rainy season)

2.3. Study period and design

The study was conducted between, November, 2011 to February, 2013.. With multi stage random sampling; in order to increase the representativeness of the study animal and a cross-sectional survey was carried out. The study site is selected presumably based on the level of disease prevalence with medium to high tsetse fly challenge areas. It elegant two disciplines (parasitology and entomology). The investigation was focused on parameters such as-parasite prevalence and abundance of trypanosome species.

Entomological survey

Tsetse and other biting population flies were sampled using biconical traps(Challier and Laveissor, 1973) baited with oetenol, acetone and cattle urine traps were deployed for 24 hours at two different sites (savanna woodland and marginal river) through grazing areas, routes and watering points for animal during dray season. Caught tsetse flies and other biting flies were counted and identified using the methods of Lloyd and Jonson (1924).

Parasitology survey

Dark ground/phase contrast buffy coat method (Murray *et al*., 1977) was employed to study the prevalence rate of trypanosome infection. Blood to be examined was added to the capillary tubes by capillary attraction until the tube was filled ¾ ways. Each capillary tube was sealed at one end using plastic; using a generator as a power source, and centrifuge at 12,000 rpm for 4-5 minutes, the capillary tube was cut to include 1 mm of erythrocytes and 1cm of the plasma and the buffy coat was expressed on microscope slide and examined using a microscope with x 40 objectives. The prevalence of trypanosomosis trypanosome species encountered and hematocrit (PCV) of the animals examined were recorded.

Data analysis

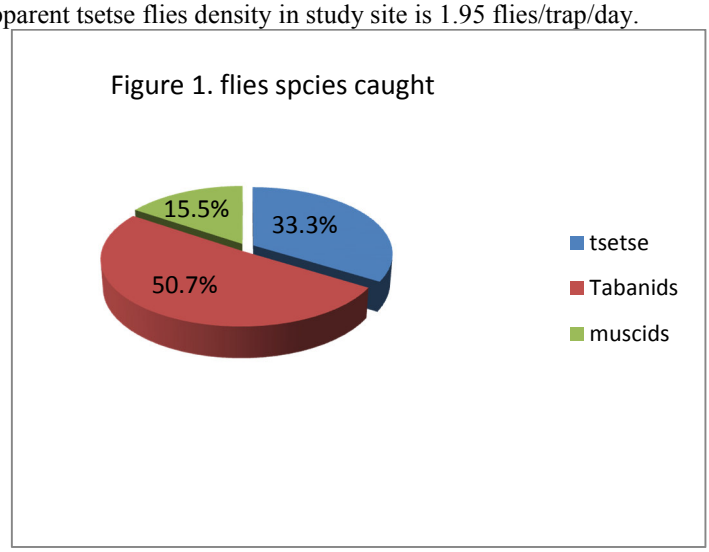
The trypanosomes infection survey entered into MS Excel spreadsheet program to create database; transferred to statistical software programme SPSS version 20. For analysis the categories of trypanosomes species used one sample chi square test. The distribution and prevalence of trypanosomes specie defined by season employed one sample binominal test.The distribution of percentage of PCV using one sample Kolmogorov Smirnov test.

3. RESULTS

Entomological survey

Tsetse flies were collected from two different sites savanna woodland and Marginal River(Weyto) during dry season, in each sites ten traps were planted. A total 1394 flies were couched; tsestse fly was *Glossina.pallidipe*s and biting flies like Tabanids and Muscids group were also caught. *Glossina pallidipes* flies accounted for 470(33.7%) of the total flies catch while Tabanids accounted for 707(50.7%) and Muscids accounted for 217(15.5%). Tsetse fly was abundant traps were planted in savanna woodland area in comparison other area.

Figure 1. An overall apparent tsetse flies density in study site is 1.95 flies/trap/day.



Parasitology survey and Hematochrite

Among thirteen kebeles 1056 cattle blood sample was collected to know the prevalence of trypanosomes species. The overall prevalence was 73(6.9%) observed. The highest prevalence was recorded in Gondoroba 9(15.3 %), Kure 34(15.0%), Maki 2 (8.3 %), Alize 3 (8.1%), Gerfa 6 (7.4%), Maytol 5 (5.0 %), Gura 2(3.8 %), Beneta 4(3.5 %), Geza 4(3.3 %) and Arbuja 2 (2.8%) Show Table 1. No significant difference was observed; except Arbuj (P=0.03) kebele was significant difference perceived. The major trypanosome species was identified *T.congolense,(*5.4%) *T.vivax and T. theilerii,* with similar prevalence (0.8%) and (0.8%) respectively.

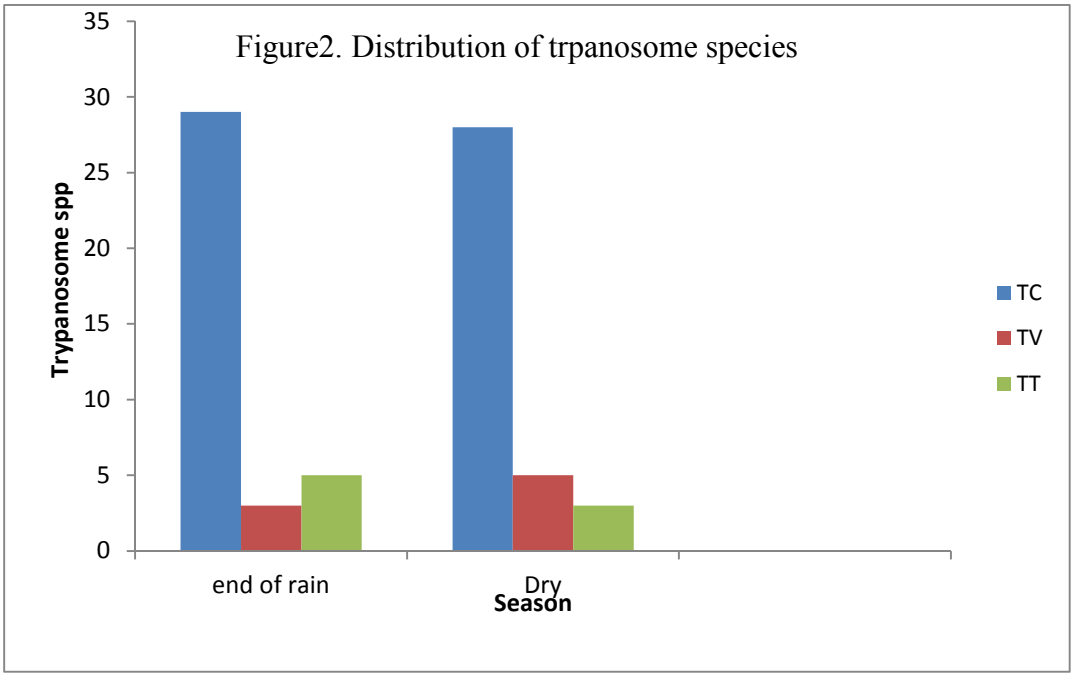
The mean PCV (%) values of parasitaemic and unparasiteamic animals during study period based on kebeles level in Maki 22.2%(95% CI=20.33-24.00) follow by Hayloja 22.8 %(95 % CI=21.26-24.16), Gura 23.4%(95% CI=21.74-24.77) and Arbuja 24.19%(95% CI=22.20-29.97) was observed. There was significantly difference between kebeles (P<0.05). The overall mean values were also significantly difference between parasitaemic and aparasiteamic animals 26.49 %(95% CI=26.07=26.89)(P=0.000).

Table 1. Prevalence of trypanosome species found in South Ome zone Kebeles

Name of woreda	Name of kebele	No. of animal tested	Prevalence % of Trypanosome SPP			Overall prevalence of trypanosome SPP%	Mean Hematocrit
			TC	TV	TT		
Salamago	Arbuja	72	2(2.8)	-	-	2.8	24.19
	Maki	24	2(8.3)	-	-	8.3	22.17
	Gura	51	1(1.9)	1(1.9)	-	3.9	23.35
	Gerfa	81	5(6.2)	1(1.2)	-	7.4	28.67
	Hayloha	52	-	-	-	-	22.77
Debub Ari	Alga	88	2(2.3)	-	-	2.3	26.96
	Geza	120	3(2.5)	-	1(0.8)	3.3	27.28
	Kure	226	29(12.8)	4(1.8)	1(0.4)	15.0	27.62
	Maytol	100	3(3)	2(2)	-	5.0	26.04
Hamer	Gondoroba	59	9(15.3)	-	-	15.3	24.49
	Cherkaka	60	-	-	-	-	28.03
Malle	Aliaze	37	-	-	3(8.1)	8.1	29.76
	Beneta	86	1(1.1)	-	3(3.5)	4.7	26.51
Total		1056	57(5.4)	8(0.8)	8(0.8)	73(6. 9)	26.49

Note: TC= *Trypanosome Congolense* TV- *Trypanosome Vivax* TT= *T.Theilirii*

During the study period similarly considered the distribution of trypanosome species through season (end of rain and dry). The prevalence the end of rain was *T. congolense* (5.1 %) , *T.vivax* (0.5 %) and *T. theilerii* (0.9%) observed; as well as throughout dry time sharing *T.congolense, T. vivax and T.theilerii* (5.8 %),(1.0 %) and (0.6 %) respectively. Show figure 2. The highest distribution was observed at end of the rain period (54.4 %) in comparison with dry (45.6%)season; not differ significant from each other at .05 level.



4. DISCUSSION

One species of tsetse *G. pallidipes* was detected in marginal river (Woyto) and savanna wood land (Kure PA) in the study area. Similar reports were indicated by (Terzu 2004; Takele 2006) in Gadala PA, Woiayta Zone. The same results were reported by (Habtewoled, 1993 and 1995) in Wolayta zone and Konso woreda, respectively. MacKichan (1944) stated that this specie living in forest galleries or in the marginal areas of forests.Whereas; during the previous surveys both *G.pallidipes* and *G.fuscipes* were reported by (Birhanu, 1995; SRVL, 1996). On the other hand, Amenu *et al (*2008) report showed that they cached only *G. morisitans* in marginal area of Woito river, South Omo this finding disagreed with the present study. During dry season (December) 1.95 flies/trap/day was registered. Whereas the earlier survey observed 0.06 flies/trap/day/ SRVL,(1996) 0.2 flies / trap / day Bocoum., (2012) in Foulalaba which was lower than the present survey. The lower apparent density may be due to high temperature and low relative density of the dry period.

In this study, biting flies such as tabanids and mucids were caught from savanna woodland and marginal river however the most frequently observed biting fly was tabanids. Similar observations were seen in different countries like Burkina Faso and Mauritania (Dia *et al.,* 1998; Acapovi *et al.,* 2001). In another study (Bright well *et al.,* 1992) and Leak *et al*.,(1993) reported that the spread of flies from riversides and thickets, where they usually inhabit during the dry season and during the rainy season they increases relative density to more an open areas.

The overall prevalence of bovine trypanosomiasis in study area was (6.9%) which virtually similar with the result (6.7%) at Mali and (4.43%) at selected village of Arbamich, reported by (Bocoum *et al*.,2012) and (Teka *et al*., 2012) respectively. The same with the finding(6.1%) in Mursi district, South Omo discovery by (Terefe *et al*., 2015).The present result is lower than the finding of Habtewold (1993 and 1995) at Humbo Larena of Wolayta zone (9.3%) and Konso district (11.5%) respectively. In the present study where compared within kebeles(PAs) the highest prevalence was noted in Gondoroba(15.3%)and Kure(15.0%). This finding agreement with (Tewelde,2001) at Keta south western part of the country which is(15%) amd,(Feyissa *et al*.,2011) with the prevalence (14.2%) at Humbo district.

Lower prevalence was recorded (3.8 %) in Gura (3.5 %) in Beneta (3.3 %) in Geza and (2.8%) in Arbuja. Virtual result was observed in N'Dama (2.28%) and in Madina Diassa (1.16%) discovered by (Bocoum *et al*.,2012). This might be due to implementation of control and prevention program by different organization of governments (STEP) and non-governments, and increasing awareness by communities how to manage trypanosomiasis disease. Understanding of farmers' knowledge and perceptions on the impacts of trypanosomiasis and tsetse fly and their participation in developing intervention strategies are prerequisites for effective implementation (Machila *et al*,2003).This result is in disagreement with previous result obtained by (Daud and Molalegne,2011) prevalence was (24.7%) in Mao-komo special district Benshangul Gumz regional state,(Feyissa *et al*.,2011) with the prevalence (14.2%) at Humbo district; (Tewelde,2001) at Keta south western part of the country which is(15%).

Among the different spp. of trypanosomes detected in study period, *T.congolense* 57*(*5.4%) was the most prevalent trypanosome species followed by *T. viviax* 8(0.8 %) and 8(0.8 %) prevalence of *T.Theilirii* .

Similarly Getachew Abebe and Yilma Jobre (1996) reported an infection rate of 58% for *T. congolense* and 31.20% for *T. vivax* in Southwest Ethiopia. In the same report it was also reported that 8.71% prevalence was recorded in the high lands of tsetse free area of which 99% was due to *T.vivax.* In Metekel district, different workers (Yohannes Afework, 1998; Muturi, 1999; Nega Tewelde, 2001) reported prevalence of 17.2% and 17.5% in the upper Didessa valley and southern rift valley areas of tsetse infested regions, respectively, where the dominant specieswas *T. congolense.*

In the present finding there was significantly difference between kebeles (P<0.05). The mean PCV of Maki and Hayloha is equal to 22.17 % and 22.77%. It is equal to 23.35% in Gura, 24.19 % in Arbuja and Gondoroba, 26.04 % in Maytol, Beneta and Alga, 27.62 % and 27.28 % in Kure and Geza, 28.67 % and 28.03 % in Gerfa and Cherkaka and 29.76 % in Aliaze to Malle district with average mean PCV(26.49%.) Similar trends of mean PCV values were reported by other researches (Feyisa Regassa,2004; Takele Sori ,2006; Tilahun Tekle , 2007). Rowlands*., et al* (2001) indicated that in an increased PCV value, the proportion of positive cases will decrease and hence mean PCV was a good indicator for the health status of the herd in an endemic area and cattle with mean PCV values less than 26% were considered as anaemic which is said to be the principal sign of trypanosomosis. The resulting low PCV value may not solely be due to trypanosomosis; however, the difference in mean PCV between parasitaemic and aparasitaemic animals indicates that trypanosomosis reduces the PCV values infected animals. These might be exacerbated by other diseases that are considered to reduce the PCV values in the study area such as helminthiasis tick borne diseases and nutritional imbalances.

The dominant species in this study was 5.1 % and 5.8 % for *T. congolense* and 0.5 % and 1.0 % for *T.vivax* during the end of rain and in the dry season respectively . In Ghibe prevalence 84% and 14% was recorded for *T. congolense* and *T. vivax*, respectively (Muturi, 1999., Rowlands *et al.,* 1995). In Northwestern and Southwestern Ethiopia the dominant species was *T. congolense* (Getachew Abebe and Yilma Jobre,1996; Yonannes Afework, 1998; Nega Tewelde, 2001). The predominance of *T.congolense* infection in cattle may be due to the high number of serodems of *T. congolense* as compared to *T. vivax* and the development of better immune response to *T. vivax* by the infected animal (Leak *et al.,* 1999). In the present study, there was higher prevalence of trypanosomosis in both at end of the rain (54.4 %) and dry (45.6%)season; however not differ significant from each other at .05 level. Similar results were reported by Muturi (1999) in North Omo Zone. This might be attributed to the difference in tsetse apparent density and infection rates in both seasons. It is known that the risk of trypanosomosis is influenced by tsetse apparent density and infection rate in flies. Riordan (1977) demonstrated that a high tsetse apparent density and infection rate of 50% in tsetse results 42% trypanosome prevalence in cattle exposed to tsetse flies.

CONCULSIONS AND RECOMANDATIONS

- The results of bovine trypansomosis and apparent tsetse density survey in selected kebeles of South omo zone indicated that an overall 6.9 % prevalence of the disease and presence of high density of tsetse flies with an overall apparent density of 1.95 flies/trap/day. During entomological survey, only one species of tsetse fly was identified. This was *G. pallidipes.* Biting flies like Tabanids and Muscids group were also caught.
- Among kebeles the highest prevalence was observed in Gondoroba and Kure with similar prevalence was recorded in Maki and Alize followed by Gerfa and Maytol kebeles.
- During study period the predominate trypanosome species was *T. congolense* followed by *T.vivix*.

Based on the conclusion, the following prevention and control strategy recommendations are forwarded:

In endemic areas of trypanosomiasis: should be control and reducer or eliminate tsetse fly populations with traps, insecticides and by treating infected animals with anti-parasitic drugs. Control arthropod vectors could be prevent new infections by using biconical traps, Sputon and deltamethrin or other external uses.

Strict follow-up of drugs sensitivity test

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