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Original Research

Prevalence of Cattle Trypanosomiasis in Selected Areas of Dugda Dawa District, Southern Oromia Regional State, Ethiopia

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Abstract

Trypanosomosis is the most serious disease of cattle, which causes great socio-economic losses in the country. Across –sectional study design was used with objectives determining the prevalence of bovine trypanosomiasis and associated risk factors in selected areas of Dugda Dawa district of Oromia Regional State, southern Ethiopia from September 2017 to January 2018. Buffy coat techniques for parasitological study were employed. A total of 384 cattle was randomly selected from the study population and examined for parasitological study. An overall prevalence of trypanosomosis in the study area was 13.8%. Out of positive cases, Trypanosoma congolense (7.5%) was the dominant trypanosome species followed by Trypanosoma vivax (6.2 %.). There was no a significant difference (P>0.05) in trypanosome infection between body condition, sex and peasant association. But there was a significant difference (p< 0.05) among age and PCV values. The prevalence of trypanosomosis on the bases of body condition was 4.9% for poor, 6.7% for medium and 2.2% for good body condition. The overall incidence of anemia was (36.8%) in current work and presence of anemia was higher in trypanosome positive animals (62.5%) than negative animals 34.3%. The overall mean PCV value for examined animals was 25.84 ± 0.252SE. The mean PCV value of parasitemic animals was found to be 23.22 ± 0.989SE which is significantly lower (P<0.05) than aparasitemic one which was 29.56 ± 0.252SE. Mean packed cell volume (PCV) of parasitaemic cattle (9.1%) was significantly (P<0.05) lower than that of aparasitemic cattle (90%). Generally, trypanosomosis is still causing constraint in the study area. Therefore, an integrated approach aiming at vector and parasite control should be implemented.

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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 primary 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 (Bekele *et al*., 2010).

Even though, livestock have often been described as sturdy animals, they succumb to a variety of diseases and a number of other unhealthy circumstances. Among these, Trypanosomosis is one of the major animal health constraints to livestock production in Sub-Saharan Africa (FAO, 2002). Bovine trypanosomosis is one of the major impediments to livestock development and agricultural production in Ethiopia contributing negatively to the overall development in general and to food self-reliance efforts of the nation in particular (Abebe, 2005).

Trypanosoma infects cattle, sheep, camels, goats, horses, many other domestic and wild mammals, but the species of trypanosomosis known to exist in Ethiopia, which are pathogenic to cattle are*, T. congolense*, *T. vivax* and *T. brucei*. They are distributed mainly in tsetse belt of the country, West, Southwest and Southern part of Ethiopia. T. *vivax* also found in areas outside of the tsetse belt, where it can possibly transmitted by mechanical vectors of biting flies (Abebe, 2005).The prevalence varies from locality to locality depending on agro-climatic conditions, seasons and as part of activities which were intended to control the impact of the disease(Tadesse & Tsegaye, 2010).

Trypanosomosis is a protozoan disease of both human and animals caused by different species of the genus Trypanosomes*.* It is the single most important livestock disease in Sub-Saharan Africa (SSA) and is present in 37 countries in that region. Trypanosomosis is a complex disease of protozoa that is caused by different species of unicellular parasites (Trypanosome) found in the blood and other tissues of vertebrates include livestock, wild life and people. Bovine trypanosome is one of the diseases that caused by this flagellated protozoon parasite belong to the genus trypanosome. Trypanosomosis limited the extension of natural herds particularly in Africa were the presence of the tsetse fly density access to woodland and savanna areas with good grazing potential (Getachew, 2005).

Hence, Trypanosomosis is the most serious disease of cattle, which causes great socio-economic losses in the country. Its socio-economic impact is reflected on direct losses due to mortality, morbidity and reduction in milk and meat production, abortion and stillbirth and also costs associated with combat of the disease are direct losses. And hence, studying the prevalence and magnitude of the vector is inevitably important to device appropriate control measures (Abebe, 2005).

Even though many studies indicating prevalence of trypanosomiasis and its vector densities were studies in many parts of Ethiopia, there is lack of information on its current prevalence and the vectors in Dugda Dawa district. And also, a study on the status of the disease and investigating the vectors and their relative abundance is crucial for a successful control in the area. The knowledge of the status of the disease prevalence, its health impact on animals affected, its vector distribution and the associated risks are very important for the understanding the epidemiology of the disease and to devise suitable control measures. Therefore, the objectives of the study were:

- To determine the prevalence of cattle trypanosomosis found at the selected areas of Dugda Dawa district
- To determine apparent densities, distribution and species of tsetse flies and other biting flies in selected areas.
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MATERIALS AND METHOD

Study Area

The study was conducted from September 2017 to January 2018 in Dugda Dawa district. The district found in West Guji Zone which located 505 KM South East of Finfine. The climate is semi –arid which receives annual average rainfall ranging from 500mm^3 to 700mm. Delivery of the rainfall is bimodal 56% of the annual rainfall occurs with long rains expected from March to May and 27% the short

rains from mid-September to mid-November (Coppock,1994). Annual mean daily temperature varies from 19°c to 24°c with moderate seasonal variation. The Dugda Dawa district pastoral system is dominated savannah vegetation containing mixtures of perennial and woody bush land. The major sources of water are ponds and deep wells during rainy and dry periods respectively (Holland *et al*., 1982). The Livestock population are approximately 1.7 million cattle 2 million sheep and goats, 700,000 camels and 64,000equins (Desta, 1999). The Guji/Borena pastoralists manage their cattle, the dominant animal species, in a traditional pastoral system .The cattle herd is split in two groups, "warra" herd comprising of small number of animals, especially, milking cows and calves, are kept around the olla's (encampments), whereas "forra" herd, that encompass the majority of animals, are driven long distance in search of good pasture and surface water, irrespective of national boundaries (Coppock, 1994).

Study animals and sample size

The study was conducted on indigenous cattle breed kept under extensive husbandry management system from six peasant associations (PAs). The sample size required for this study was determined using the formula given by Thrush field (2005).

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

where: n=required sample size, pexp=expected prevalence, d=required precision

Accordingly; by using 95% level of confidence interval, 50% expected prevalence and 0.05 desired absolute precision the required sample size was 384.

Study design

The cross-sectional study was used to estimate the current prevalence of bovine trypanosomiasis and vector in study area from November, 2016 to March, 2017. The PAs were selected based on their accessibility to transport and information from the district's administrative body. Two stage sampling was used to sample animals, where, herds were selected from each PAs by simple random sampling as primary sampling unit. From selected herds, individual animals to be sampled were selected by simple random sampling technique as secondary sampling unit. The age of sampled animals was determined based on owners' information and were grouped as young those ≤2years of age, adults for those >2 ≤5years and old for those >5years (Gatenby, 2017). The body condition of animals was recorded by classifying animals in to three groups as good, medium, and poor based on physical appearance and observation of body conformation.

Study methodology

Survey of trypanosomiasis

Blood samples were collected randomly from cattle of the settlement into capillary tube after piercing the ear vein by using a lancet. One end of the capillary tube was sealed and centrifuged at 12,000rpm for 5 minutes to separate the blood cells and to concentrate trypanosomes using centrifugal forces as Buffy coat. Then PCV was measured using haematocrit reader. The capillary tubes were broken just 1mm below Buffy coat and expressed on microscopic slide, mixed and covered with 22x 22mm cover slip. Then it was examined under 40x objective of a microscope using dark ground Buffy coat technique to detect the presence of the parasite.

Data Analysis

All the collected raw data entered into a Microsoft excel spread sheets program and then was transferred to SPSS Version 20 for analysis. The association between trypanosome infection and risk factors (age, body condition, sex and peasant Association) were determined by invariable logistic regression. Two sample student *t*-tests were used to compare mean PCV of study animals. A statistically significant difference between

variables exist when p<0.05 at 95% Confidence Level (CI).

RESULTS

Parasitological result

Out of 384 examined cattle, 53(13.8%) were found to be positive for trypanosome infection using Buffy coat technique. The predominant trypanosomes species were *T. congolense* 29 (7.5%) followed by *T. vivax*24 (6.2%) in study area. The prevalence of trypanosomosis within three peasant associations (PAs) during the study period was 6.2%, 3.9%, and 3.7 at Hema Kinsho, Jigesa Nanesa and Burkitu Magada respectively. Despite the occurrence of highest prevalence in Hema Kinsho 24/127(18.9%) and the lowest in Burkitu Magada PAs 14/127 (11%), However the difference in the prevalence rate of trypanosomosis in relation to PA was not statistically significant (p>0.05) (x^2=10.611, p=0.225) (Table 1).

Table 1: *Prevalence of cattle trypanosomiasis and identified trypanosome species in study area*

Sampling villages	No. Animal examined	No.+ve cattle	Trypanosome encountered		Prevalence (%)
			T. congolence	*T. vivax*	
Hema Kinsho	127	24(6.3%)	14	10	6.2
Jigesa Nanesa	130	15(3.9%)	9	6	3.9
Burkitu Magada	127	14(3.6%)	6	8	3.7
Total	384	53(13.8)	29	24	13.8

T =Trypanosome, +ve=positive, x^2=10.611, p=0.225

Concerning age categories, 0%, 5.2% and 8.6% trypanosome infection rate were recorded in young (≤ 2years), adult (>2years<5 years) and old (≥5 years) cattle, respectively (Table 2). The most striking result to emerge from the data was that as age increased the prevalence rate was also increased. Ironically, these differences were statistically highly significant (x^2=15.381, P=0.000). The prevalence of females was higher than males. However, statistically no significant difference (P>0.05) was observed between two sexes groups.

Of the total 384 sampled animals, 4.9%, 6.7%and 2.2% prevalence of bovine trypanosomosis was recorded in poor, medium and good body conditions of the animals respectively. There was no significant difference (P>0.05) on prevalence of trypanosomosis among animals of different body condition (Table 2).

Table 2: Invariable logistic regression analysis of risk factors with Buffy coat result

Risk factors	Risk factors	No of examined	No of positive	Prevalence %	X^2	P-value
PAs	Hema Kinsho	127	24	6.3%	10.611	0.225
	Jigesa Nanesa	130	15	3.9		
	Burkitu Magada	127	14	3.6		
	Total	**384**	**53**	**13.8**		
Sex	Female	3221	33	8.6	0.559	0.445
	Male	163	20	5.2	-	-
	Total	**384**	**53**	**13.8**		
Age	Young (≤2)	24	0	0		
	Adult (>2≤5)	160	20	5.2	15.381	0.00
	Old (>5)	200	33	8.6	-	-
	Total	**384**	**53**	**13.8**		
BCS	Poor	140	18	4.9		
	Medium	413	35	6.7	0.590	**0.345**
	Good	85	5	2.2	-	-
	Total	**384**	**53**	**13.8**		

BCS=Body condition score, CI=confidence interval

Hematological findings

The mean PCV of anemic (19.60 ±0.260SE) and normal (29.56 ± 0.228SE) cattle showed significant difference (p<0.05). The proportion of anemic animal infected with parasite were significant (p<0.05) as compared with non-anemic positive animals (Table 3). The risk of being anemic increased by 3.13(CI=1.794-5.471) folds when animals were infected with trypanosome (p<0.05).

The mean PCV value of parasitaemic 23.22 ± 0.989 SE and aparasitaemic 29.56 ± 0.228 SE respectively. There was a significant difference between mean PCV value of Parasitaemic and aparasitaemic cattle showed significant difference (P<0.05). The overall mean PCV of parasitemic and aparasitemic examined animals was 25.8±0. 252 SE. The mean PCV of parasitic animals were significantly lower than that of aparasitemic (P<0.05) (Table 4).

Table 3: invariable logistic regression analysis of anemic and non-anemic cattle

Category	No. examined (%)	Positive (%)	Over all prevalence (%)	Mean ± SE	OR (95%)	P-value
Anemic (<25)	140(36.8%)	33(15.3%)	8.2	19.60 ±0.260	3.13(1.794-5.471)	0.000
Normal (≥25)	244(63.2%)	20(5.4%)	5.6	29.56 ± 0.228	-	-
Total	**384**	**53**	**13.8**	25.84±0.252	-	-

Table 4: Mean PCV value of parasitemic and aparasitemic animals

Infection	No. examined	Mean ± SE	OR (95%)	P-value
Parasitemic	53	23.22±0.989	3.13(1.794 - 5.471)	0.000
Aparasitemic	331	29.56 ± 0.228	-	-
Total	**384**	25.84±0.252		

DISCUSSION

Trypanosomosis is a major constraint to the utilization of large land resources and also affect livestock, particularly cattle which play a major role in the agricultural economy of Ethiopia. In all the areas, animals were infected by trypanosomes. The overall prevalence of bovine trypanosomiasis in the study area was found to be 13.8%. The current result agreed with the previous report by Bitew *et al*. (2011) and Fayisas *et al*. (2011) who reported 11.7% at Jabi Teheran district and the result was lower than the report in Gamogofa 17.33% by Girma (2014) and in Wozeka grid southern Ethiopia 27.5% by Abraham and Tesfaheywet (2012). This lower prevalence of the present study may occur due to the difference in agro ecology of the study area, prophylactic measure and differences in veterinary services employed in the area which all contribute to the low prevalence of the disease (Cheren *et al*., 2006).

The overall prevalence of bovine trypanosomiasis recorded in current study area was found to be higher than the previous result of Ayana *et al*. (2012), Teka *et al*. (2012), Fayisa *et al*. (2015),) and Kumela *et al*.(2016) who reported a prevalence of 2.10%, 4.43%, 4.86%, and 4.25% from Didesa District, Arbaminch area, Amhara region, Northwest Ethiopian and Ilubabor Zone, South western

Ethiopia, receptively. The variation between reports might be due to the difference in management system, season of the study period, the development of drug resistance, and the increase of tsetse challenge due to higher vector density and lack awareness of the animal owners about the disease in the study area.

Three species of trypanosomes were observed in hematological examination namely *T. congolense* and *T. vivax*. This study shows that, *T. congolense* was the dominant species with a proportion of 29(54.7%) and followed by *T. vivax*24 (45.3%). This result was in agreement with Leak (1999) he stated that, the predominance of *T. congolense* infection in cattle may be also 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. In addition, Tewelde (2001) reported that, the dominant trypanosomes species in upper Didessa of tsetse infested regions was *T. congolense*. Moreover, Muturi (2001) stated that, the most prevalent trypanosome species in tsetse- infested areas of Ethiopia are *T. congolense* and *T. vivax*.

During the study period, the prevalence of cattle trypanosomosis was assessed between sexes of animals and among 53 trypanosome positive animals; 33 (8.6%) of them were female animals and 20(5.2%) of them were male animals. The trypanosome infection in female animals was similar with male animals no significant difference observed ($p>0.05$); this shows that both male and female cattle were equally susceptible to trypanosomosis infection. This result was coinciding with the results of Daya and Abebe (2008), and also Adane (1995) who also obtained no significant difference in susceptibility between the two sexes. This show equal exposure to the vector of the parasite (Quadeer *et al.,* 2008).

The occurrence of disease in three different body condition (poor, good and medium) of the total 384 sampled animals, the highest prevalence showed in medium body condition (6.7%) followed by poor (4.9%) and good body condition (2.2%). Due to poor body condition; animals are highly susceptible diseases. This in line with that emaciated animals are more infected than other which supports the previous study of Bizuayehu *et al.* (2012). There was no significant difference ($P>0.05$) on prevalence of trypanosomosis among animals of different body condition. This result was disagreement with Mussa (2002) he stated that, the prevalence of the disease is high in good body condition than poor body condition.

In the current study, highest prevalence of the diseases was 8.6% in old followed by 5.2% in adult and 0% in young. This could be associated to the fact that animals travel long distance for feed and draught as well as for harvesting crops to tsetse high challenge areas. Young animals are also naturally protected to some extent by maternal antibodies. There was statistically highly significant difference between age groups ($P>0.05$). This result was disagreement with the previous research reported by Sinshaw (2004) he states that, there is no statistically significant difference between age groups of the animals.

The overall mean PCV value for examined animals was 25.84 ± 0.252SE. The mean PCV value of parasitemic animals was found to be 23.22 ± 0.989SE which is significantly lower ($p<0.05$) than aparasitemic one which was 29.56 ± 0.252SE. This finding is aligned with previous work by Ali and Bitew (2011) and Rowlands *et al.* (2001). In the contrary the number of cattle aparasitemic but anemic was also considerable. The overall incidence of anaemia was 15.3% in the research area and the presence of anemia was higher in trypanosome positive animals (62.5%) than negative animals (34.3%) (Table 4). This is due to the contribution of trypanosomosis for causing anemia in infected animals. This finding agreed with previous reports by

Tewelde (2001) in western Ethiopia and Desta (2014) in upper Dedesa valley of Ethiopia. The difference in mean PCV value between parasitemic and aparasitemic animals indicates that trypanosomosis is involved in reducing the PCV values in the infected animals.

Among the anemic animals 31.2% of them were negative to trypanosome infection. This is because the observed anemia can be caused by other Concurrent diseases that can cause anemia such as blood sucking gastrointestinal parasites, hemiparasite and malnutrition could affect the PCV value of cattle (Van den Bossche *et al*., 2001). However, 3.5% of the cattle with normal PCV value were also found infected by trypanosome and this result is in line with Garoma (2009) report from East Wollega Zone. This might happen due to the ability of trypanosome positive animal to maintain their PCV value or delayed recovery of the anemic situation after current treatment with trypanocidal drugs. Furthermore, the occurrence of positive animals with normal PCV value might be thought of as recent infections of the animals (Vanden Bossche *et al*., 2001).

CONCLUSSION AND RECCOMMENDATIONS

The results of current study on cattle trypanosomosis in selected peasant association of Dugda Dawa districts indicated that an overall 13.8% prevalence of the disease. Among the two trypanosome species; *Trypanosome congolense* was found to be the most prevalent trypanosome species in the study area. The result of this study shows that trypanosomosis is a very important disease that brings about great economic losses of the livestock in the Dugda Dawa district of West Guji zone which was assumed to be imposed more by the presence of high density of vectors and the situation is getting worse as the prevention and control a of trypanosomosis is facing a challenge due to limitation of vector control activities and chemotherapy.

Based on above conclusions the following points are forwarded

- Comprehensive integrated control strategies approach (vector control and chemotherapy) should be undertaken in the studied areas.
- The government and concerned animal health professionals should monitor the use of trypanocidal drugs to avoid further drug resistances.
- Awareness creation among livestock owners about the disease and control methods as well as the risk of trypanocidal drug resistance in diseases prevalence.

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