Prevalence of Bovine Trypanosomosis and Its Vector Density in Dale Wabera District, Kellem Wollega Zone, Oromia Regional State, Western Ethiopia

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Abstract: Trypanosomosis is a widely spread protozoan disease in domestic livestock that causes a significant negative impact on economic growth in many parts of the world particularly in sub-Saharan Africa. Bovine trypanosomosis is one of the most prevalent and important disease in Ethiopia limiting livestock productivity and agricultural development. Therefore, a cross sectional study was conducted in Dale Wabera district of Oromia Regional State from November 2015 to June 2016 to determine the prevalence of trypanosomosis and its vector density. Blood sample was collected in capillary tubes from 620 randomly selected animals through puncturing their ear vein by lancet. Buffy coat technique was used to determine prevalence of bovine trypanosomosis in the study area. From a total 620 examined blood sample, 44(7.1%) animals were found positive. The prevalence of bovine trypanosomosis in female was 11 (4.6%) and in male 33 (8.6%) with a statistical significant difference of (P=0.020, X^2=3.670, CI= 0.9736—3.698), similarly, the prevalence in young animals were 7 (3.95%), middle 29 (9.63%), and adult 8 (5.65%) without a statistical significant difference (P=0.107, X^2 =6.10, CI= 0.769—1.812). The prevalence of the disease that was recorded in poor 29(61.39%), medium 10(3.61%) and good 5(6.67%) body condition score with statically significant variation (P=0.005, X^2 =10.766, CI = 0.732326—0.90477). However, the mean PCV value recorded between parasitaemic and aparasitemic animals were 19.51 and 27.78 respectively, with highly statically significant difference (P=0.000, X^2 =30.718, CI=0.316—0.2533). In this study the most frequently identified trypanosome species were *T. congolense* 32 (72.72%) followed by *T. vivax* 8 (18.18%) and mixed infection (*T. vivax* and *T. congolense*) 4 (9.09%). The entomological surveys were conducted using 60 traps, 12, 12, 36 ENGU, Biconical and Monopryamidal traps respectively on each PAs. AS a result, *Glossina pallidipes, G. m. submorsitans, G. tachynoides* and *G. fuscipes fuscipes* were the tsetse fly species identified in the study area along with other biting flies like *Stomoxys* and *Tabanus*. The mean apparent density of tsetse fly was higher (19.7) than biting fly (0.6) in the study area. In conclusion, the current study revealed that the livestock in study area was found still with the challenge of this disease. Therefore, emphasis should be given for the control and prevention of trypanosomosis infection and its vectors.

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1. Introduction

African animal trypanosomosis (AAT) is a very important disease in sub-Saharan Africa that affects the health and productivity of livestock (Tewodros *et al*., 2012). Among the factors that limit the expected out come from animal production in tropical Africa is an animal disease (Radostits *et al*., 2007). 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 (Ayele *et al.,* 2012).

The risk of trypanosomosis in much of these areas precludes farmers from keeping cattle and small ruminants. The disease mainly transmitted cyclically by the genus Glossina (tsetse flies), but also mechanically by biting flies, among which *Tabanus* and *Stomoxys* are presumed to be the most important. The disease infects various species of mammals but, from an economic point of view, tsetse-transmitted trypanosomosis is particularly important in cattle. It is mainly caused by *Trypanosoma congolense, Trypanosoma vivax* and *Trypanosoma brucei, Trypanosoma uniforme,* and *Trypanosoma simiaeare* other, less common tsetse-transmitted species. Biting flies such as *Stomoxys* and *Tabanus* also transmit *T. vivax* mechanically (Taye *et al.,* 2012; Tafese, 2012). Tsetse infests 10 million square kilometers (Km^2)

between latitudes 14° N and 29° S and 38 African countries affected by the disease known as nagana (Radostits *et al*., 2007; Ayana *et al*., 2012; Vanden-Bosche and Vale, 2000).

In Ethiopia, about 240,000km^2 (about 21.7% of the territory), located in the Southern, Southwestern, Western and North Western is infested with tsetse flies and preclude farmers from rearing livestock (STEP, 2012; PATTEC, 2001). The most important trypanosome species affecting livestock in Ethiopia are *T. congolense, T. vivax* and *T. brucei,* in cattle, sheep and goat, *T. evansi* in camel and *T. equiperdum* in horse (Abebe, 2005; Khan, 2010). While tsetse-borne trypanosomosis is excluding some agriculturally suitable land in the West and Southwest of the country, 14 million head of cattle, nearly 7 million equines, 1.8 million camels, and an equivalent number of small ruminants are at the risk of contracting trypanosomosis (MoARD, 2004; Shimelis *et al.,* 2011).

African animal trypanosomosis has both direct and indirect effects on the economic development of the tropical countries. Direct effect is that the infected livestock may have high mortality rate if not treated. Direct losses due to the disease are estimated to amount to between US$ 1-1.2 billion each year whereas the indirect impact of AAT on agriculture in sub-Saharan Africa exceeds this amount (FAO, 2005). Indirect effect is due to that nagana is a wasting disease and the affected animals are chronically unproductive in terms of milk, meat, manure and traction (Vanden-Bosche *et al*., 2001). According to FAO, 2002, trypanosomosis caused a reduced crop production due to insufficient animal traction power, reduced rates of calving, and increased mortality. Another indirect effect on the economic development of the country is the costs of drug to treat the disease and control of the tsetse flies. The added risk of human infections due to sleeping sickness, the most fatal trypanosome disease transmitted by tsetse fly has also greatly affected social, economic and agricultural of the rural communities (WHO, 2000; OIE, 2008).

Trypanosomes are unicellular, flagellated, elongated and usually slightly curved protozoan parasites. Within the host, the parasites are extracellular and are mostly found within the blood circulation. In some species, for example, *T. brucei*, the parasites can also colonize the spinal fluid or can be found in host tissues (Smyth, 2004). By the help of the flagellum, they swim in body fluids, boring their way between cells. They generally possess kinetoplast and undergo cyclical development in tsetse flies. Tsetse-transmitted trypanosomes of cattle (*T. brucei*, *T. congolense* and *T. vivax*) are transmitted during feeding on an infected host and their life cycle includes vertebrate and invertebrate hosts (Khan, 2010; Ford and Katanondo, 2011). In the vertebrate host, the infective metatrypanosomes undergo development and multiplication at the site of infection causing a swelling (for *T. brucei*) and, eventually, trypomastigotes are released into blood circulation via the lymphatic system. In the tsetse fly, trypanosomes undergo cycles of development and multiplication, involving different parts of the alimentary tract depending on the trypanosome species (Abebe, 2005; Taylor *et al*., 2007).

Tsetse flies are blood-sucking flies of the genus *Glossina* that belongs to the family muscidae (Radostitis *et al*., 2007). They are narrow bodied, yellow to dark brown and 6-13.5 mm long. The thorax has a dull greenish color with inconspicuous spots or stripes. The abdomen is light to dark brown with six segments that are visible from the dorsal aspects (Taylor *et al*., 2007). When resting, their wings are held over the back in a scissor like configuration with a characteristics hatched shaped cell in the center of the wings (Leak, 1999; Dwight and Bowman, 2003). Their honeybee like appearance can identify them and the long proboscis with its onion shaped bulb at the base, which helps the flies to easily pierce the skin to suck blood. It is held horizontally between long pulps, which are of an even thickness throughout. The proboscis is composed of a lower U-shaped labium with rasp like labella terminally and an upper narrow labrum, which together creates a food channel. Within this food channel sits the slender hypophrynx that carries saliva and anticoagulant down into the wound formed during feeding. Each antenna of *Glossina* has a long arista that is feathered along one edge (Jordan, 1996; Smyth, 2004).

Tsetse flies are found exclusively on the African continent, (Hippenheit *et al*., 2013) and are closely related to the vegetation, which protects them from solar radiation and wind. The eco-climates generally corresponds to that of wood land areas situated in regions receiving more than 1000mm of rain fall, but may also occur in areas with slightly lower rain fall (Meberate *et al*., 2000). Their range does not extend into areas with very high or low temperatures. Based on climates, vegetation and fauna characteristics of ecology, tsetse flies are classified into three groups. They are savanna, riverine and forest type (Radostits *et al*., 2007).

The savanna tsetse flies known as *G. morsitans submorsitans* concentrate in the dry season, near the source of water courses, while during the rainy season they spread out in the wooden savanna. The riverine tsetse flies (*G. palpalis*), are widely distributed near the edge of river, where the vegetation is dense. They occupy the forest areas of West and Central Africa, the riverine forest penetrating into the savanna regions (Hippenheit *et al*., 2013; Smyth, 2004). The forest

tsetse flies (fusca group) are densely populated where vegetations are found in transition zones between true forest and wooden lands, preferring dense shade and riverine thickets. *G. longipennis* is species of the fusca group that restricted to Kenya, Ethiopia, South-Eastern Sudan, Southern Somali, North-Western Uganda and Northern Tanzania (Aksoy *et al.*, 2003; Maudlin, 2006). In Ethiopia, there are five species of *Glossina* and all are important vectors for African animal trypanosomosis (nagana). They are *G. pallidipes, G. Morsitanssubmorsitans, G. fuscipes, G. tachynoides and G. longipennis* (Getachaw, 2005*)*. The distribution of *G. pallidipes* and *G.morsitans submorsitans* is along with the savanna grassland, *G. fuscipes* and *G. tachynoides* is along the river, and that of *G. longipennis* is in dense vegetation (STEP, 2012).

According to (NTTICC, 2012), tsetse transmitted animal trypanosomosis is still remain as one of the largest causes of livestock production losses in Ethiopia. Dale wabera District has a high livestock population, which plays a substantial role in the livelihood of the farmers, for the agricultural community in both the market and the households' level. Animal productivity is very low in the area; there are many reasons for this, among which is the major obstacle of animal trypanosomosis. The disease commonly occurs in areas associated with tsetse flies, where the disease is rapidly transmitted by *Glossina* species as an intermediate host (DWBAO, 2015). In the current study area, there was no enough research carried out on both trypanosomosis and its vectors. Therefore, the aim of this study was to determine the prevalence of bovine trypanosomosis, to identify the species of parasite and vectors in the study area.

2. Materials and Methods

2.1. Description of Study Area: The study was carried out from November 2015 to June 2016 on the prevalence of bovine trypanosomosis and tsetse apparent density in Dale Wabera district which is located in Kellem Wollega zone, Oromia Regional state, Western Ethiopia. Dembi-Dollo is a capital (town) of Kellem Wollega zone and situated about 588 km West of Addis Ababa. Geographically, Dale Wabera falls between latitude 08° 41' 92''- 08° 55'92'' N and longitude of 035° 00' 38''- 035° 07' 65'' With an elevation between 1776 and 1928 meters above sea level. The study area was situated in Birbir watershed which is one the tsetse infested area in Baro Akobo river system, Keto, Bosona and Kuni rivers which are tributaries of Birbir river boarder, PA's and the vegetation type of the area is characterized by Common river in vegetation and occupied by wood-grass land especially along the sides of grazing. The areas were rich with wild game animals in main river system and savanna. Some of these wild animals are monkey, African Buffalo, Lion, Bushbuck, pig, Hyena, Snakes. The temperature ranged from 12°C to 28°C while the mean annual rainfall was approximately ranging from 1300 to 1600 mm. It has a tropical climate and remains mostly hot and humid throughout the year. The livelihood of the society largely depends on mixed livestock and crop production. Livestock population occupies a significant place in the farm ecology. The most important crops that grow in the area are maize, sorghum, sesame and tiger millet and teff. Crop and livestock sales are important source of income for all wealth groups; the poorer groups also do agricultural labor such as weeding and harvesting and sell firewood (DWBAO, 2015). The total land cover of the district is about 1132.02km^2 of which 424.77 km^2 are infested by tsetse flies (NTTICC, 2009). The zone is bordered by West Wollega zone to the north, Gambella regional state to the south, Illubabor zone to the east and Benishangul Gumuz Regional state to the west (DWBAO, 2015).

2.2 Study Population: The Study populations are indigenous cattle breed kept under traditionally (extensive management) system. Animals used in this study were local zebu cattle (*Bos indicus*) were allowed to graze freely during the day and housed in poorly constructed barns at night. Blood sample was taken from the randomly selected cattle. During sampling PAs, age, sex and body condition score of animals were recorded. The age was categorized into three young (<3 years old), medium (3-6 years cattle) and adult (≥6 year) (Kumela *et al.,* 2014). Body condition score was grouped in to poor, medium and good conditioned animals based on the appearance of ribs and dorsal spines applied for Zebu cattle (Nicholson and Butterworth, 1986). Livestock those found in Dale Wabera district include cattle (128068), sheep (49795), goat (32813), horses (59), mule (1442), donkey (4786) and poultry (99435). Among these animals, cattle are the dominant species raised in the area (DWBOA, 2015).

2.3 Study Design and sample size determination: A cross-sectional study design was used to determine the current prevalence of bovine trypanosomosis in the study area from November 2015 to June 2016 in Dale Wabera district Kellem Wollega zone. The study district and peasant association was purposively selected based on high abundant of animal population and peripheries of river basin. The Study animals were selected with a simple random sampling. Desired sampling size was calculated according to the formula given by (Thrusfield, 2005).

$$n = \frac{1.96^2 \, Pexp \, (1-Pexp)}{d^2}$$

Where: n = required sample size
Pexp = expected prevalence
d = desired absolute precision

The size of the sample was determined using 95% level of confidence interval, 2.86% expected prevalence from previous study (Habtamu *et al.,* 2012) and 0.05-desired absolute precision. Therefore, according to the Thrusfield formula 43 cattle were needed for the study. However, to increase the precision, the sample was increased to 620.

2.4. Study Methodology

2.4.1 Parasitological Study: Blood sample were obtained from 620 cattle by puncturing of the marginal ear vein of each animal with a lancet and drawn directly into heparinized capillary tube at least its ¾th of volume and was sealed at one end with crystal seal and centrifuged with capillary haematocrit centrifuge at 12,000 rpm (revolution per minute) for 5 minutes. At the ends centrifugation process the Packed Cell Volume was calculated 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. The length of the packed red blood cells column is expressed as a percentage of the total volume of blood according to (Woo, 1970; Murray *et al*., 1984). Animals with PCV less than 24% were considered to be anemic (OIE, 2008). The trypanosome positive buffy coat samples were analyzed and trypanosome species were identified based on their motility. A sample was considered positive for trypanosomiasis when trypanosome was detected in the buffy coat techniques.

2.4.2 Entomological Survey: For the entomological study tsetse flies and other biting flies were collected from selected sites of the study area. The altitude levels, kebeles, numbers of traps, tsetse species caught and other biting flies' days were recorded during the sampling period. The flies were caught with Monopryamidal, Biconical and Engu traps baited with acetone, octenol and cow urine (Bright well *et al.,* 2003). In the selected sites of the study area, about 60 traps were deployed in the morning and kept in position for 48 hours. During trapping, acetone and octenol was dispensed from open vials through an approximately, 'O'- sized hole while cow urine from open bottles into which a quarter of tissue paper was used. All odours were placed on the ground about 30cm upwind of the trap. The altitudes, latitude and longitudes of each trap position were recorded with a Global Positioning System (GPS) and found in the range between 1776 to 1928 meters above sea level. The different fly caught in each trap were counted and identified by hand lens; the species of tsetse flies and other biting flies were identified based on their morphological characteristics such as size, color and wing venation structure. Sexing was done for tsetse fly just by observing the posterior end of the ventral aspect of abdomen by hand lens as a result male flies easily identified by enlarged hypogeum (Walle,1997).

2.4.3 Data management and Analysis: Microsoft Excel was used to store all the data and STATA 2003 version and SPSS 20 software were used to analyze the data. Parasitological data on trypanosome prevalence were analyze by applying chi-square test to evaluate the association with different variables like age, sex and BCS. The mean PCV values of parasitaemic and aparasitemic animals were analyzed. In all cases 95% CI and $p< 0.05$ was used for the significance differences.

3. Result

3.1 Parasitological Results: Out of a total of 620 cattle examined from six PAs, 44 (7.1%) were positive. From six PAs the lowest prevalence (5%) was recorded in mender-6 while the highest (10%) in mender 7. There was no statistically significant difference (P=0.848) in prevalence of trypanosomosis between the PAs. The prevalence of bovine trypanosomosis among six PAs in the study area was summarized in table 1. The prevalence of trypanosomosis between sexes was 11(4.6%) in female and3 3(8.66%) in male. However, there was statically significant difference (p=0.020). The prevalence of trypanosomosis according to the ages, in young (<3 years old) 7 (3.95%), in middle (3-6 years cattle) 29(9.63 %) and in adult (≥6 year) 8(5.67%) were recorded. There was no statically significant difference between age (p=0.107). The prevalence trypanosomosis between body conditions were 5(6.6%) of animals with good, medium 10 (3.61%) and 29(61.39%) with poor body conditions were positive for trypanosomosis strongly significant difference (p=0.000). The trypanosome species were identified as, 5.16% (32/620) were *T. Congolence*, 1.29% (8/620) were *T. vivax* and 0.65 % (4/620) were mixed (*T. Congolence* and *T. vivax*) and there was strongly statistical significant variation among trypanosome species (p=000).

Table 1: The prevalence of bovine trypanosomosis based on PAs

Origin of animals	No of examined	No of positive	Prevalence	x^2(p-value)	95% CI
Midega Birbir	100	7	7%		
Mender 11 & 12	104	7	6.73%		
Mender 8	100	5	5%	2.007(0.858)	0.8539_1.2154
Mender 7	100	10	10%		
Mender 6	96	7	7.3		
Mender 5 & 4	120	8	6.67		
Total	**620**	**44**	**7.1%**		

Table 2: The prevalence of bovine trypanosomosis based on: sex, age and body condition

Risk factors	No of examined	No of positive	Prevalence	x^2(p-value)	95% CI
Sex					
Female	239	11	4.6%		
Male	381	33	8.6%	3.670(0.020)	0.9736 __3.968
Total	**620**	**44**	**7.1%**		
Age					
<3	177	7	3.95%	6.10(0.107)	0.76945__1.81273
3-6	301	29	9.63%		
≥ 6	141	8	5.67%		
Total	**620**	**44**	**7.1%**		
Body condition					
Poor	268	29	61.39%		
Medium	277	10	3.61%	10.766(0.005)	0.732326 __0.90477
Good	75	5	6.67%		
Total	**620**	**44**	**7.1%**		

Table 3: The prevalence of single and mixed trypanosome infection

Species of parasite	No Examined	No. positive	X^2 (*P*-value)	Prevalence
T.congolence		32		5.16%
Mixed (*T.congolence* and *T.vivax*)	620	4	257.338(0.000)	1.29%
T.vivax		8		0.65%
Total	**620**	**44**		

The relationship between infection rate and PCV is shown in table-4 below. The mean PCV of parasitaemic and aparasitemic cattle was 19.51% and 27.78%, respectively and is statistically highly significant (p=000).

Table 4: Mean PCV values of parasitaemic and aparasitemic animals

PCV category	No Examined	positive	prevalence%	mean PCV	X^2(P-value)	95% CI
≥24	306	4	49.4%	27.78%	30.718 (0.000)	0.316__0.2533
< 24	314	40	50.6%	19.51%		
Total	**620**	**44**	**7.1%**	**23.717%**		

3.2 Entomological Results: A total of 60 Trap was deployed; 36 mono-pyramidal, 12 bi-conical, and 12 ENGU traps were deployed. The overall Glossina species caught per 48 hours was 2359 (19.7fly/trap/day). In six PAs the already caught tsetse flies were analyzed and the higher apparent density of tsetse flies were obtained from Midega Birbir (9.94), followed by Mender 8(4.416), Mender 11 and 12 (3.6), Mender 7(0.95), Mender6 (0.642), Mender 5 and 4(0.17). As indicate in table -5 below. A total of 2359 tsetse flies caught during the study period were subjected for sexing. Accordingly, 42% (991/2359) males and 58% (1368/2359) were females. The apparent density of female flies was higher in six PAs which was summarized in Table 7 follows. Four species of Glossina (*G. morsitans submorsitans, G. pallidipes, G. tachynoides* and *G. fuscipes fuscipes*) and 0.6 fly/trap/day two genera of biting flies (*Stomoxys* and *Tabanus*) were caught during the entomological survey.

Table 5: The relative apparent density of Glossina species and other biting flies

PAs	Altitude (m)	Trap	Species of tsetse fly								Total	FTD	Biting flies		Total	FTD
			GP		GMSM		GF		GT				Stom	Tab		
			M	F	M	F	M	F	M	F						
M.bir	1240	T1B	23	78	19	80	-	-	-	-	200	100	1	3	4	2
Midega	1230	T2E	5	20	11	37	-	-	2	1	76	38		1	1	0.5
Midega Birbir	1207	T3M	45	66	42	55	-	-	-	-	208	104	2	-	2	1
Midega Birbir	1198	T4E	6	20	-	-	--	-	2	2	30	15	2	1	3	1.5
Midega Birbir	1192	T5M	38	80	40	78	-	-	-	-	236	118	2		2	1
Midega Birbir	1187	T6M	54	90	45	98	-	-	3	2	292	146	-	-	-	-
Midega Birbir	1177	T7B	4	8	10	13	6	10	-	-	51	25.5	3	2	5	2.5
Midega Birbir	1168	T8M	4	5	3	6	2	1	1	-	22	11	-	-	-	-
Mender 11 & 12	1166	T9M	9	12	6	7	4	4	1	2	47	23.5	1	-	1	0.5
M 11 & 12	1181	T10M	4	3	3	4	5	5	2	1	24	12	1	2	3	1.5
M 11 & 12	1184	T11M	21	22	8	7	6	8	-	-	72	36	2	1	3	1.5
M 11 & 12	1186	T12B	-	-	-	-	-	-	-	3	3	1.5	-	-	-	-
M 11 & 12	1187	T13M	-	-	10	14	16	20	-	1	61	30.5	-	3	3	1.5
M 11 & 12	1188	T14E	12	16	-	-	6	7	-	-	41	20.5	-	1	1	0.5
M 11 & 12	1186	T15M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M 11 & 12	1192	T16B	-	1	-	-	-	-	4		5	2.5	-	-	-	-
M 11 & 12	1190	T17E	-	1	-	-	--	-	2	3	6	3	4		4	2
M 8	1193	T18M	-	-	5	4	3	10	-	2	24	12	2	3	5	2.5
M 8	1156	T19M	6	10	4	11	13	10	-	-	54	27	-	2	2	1
M 8	1166	T20E	27	40	19	28	30	25	-	-	169	84.5	-	-	-	-
M 8	1168	T21B	2	3	2	1	1		4	-	13	6.5	-	-	-	-
M 8	1171	T22M	4	8	1	4	6	5	-	1	29	14.5	4		4	2
M 8	1168	T23E	-	-	-	-	2	1	-	-	3	1.5	-	1	1	0.5
M 8	1173	T24B	-	-	-	-	4	2	3	3	14	7	-	-	-	-
M 8	1176	T25M	33	46	22	43	29	28	-	-	201	100.5	3	3	6	3
M 8	1178	T26M	-	-	-	-	2	1	-	-	3	1.5	-	-	-	-
M 8	1181	T27M	-	-	-	-	1	-	1	-	2	1	-	-	--	-
M 8	1193	T28M	-	-	-	-	-	3	-	-	3	1.5	1		1	0.5
M 7	1187	T29M	-	2	-	-	2	-	2		6	3	-	-	-	-
M 7	1214	T30M	-	-	2	3	1	1	-	-	7	3.5	2		2	1
M 7	1227	T31M	-	-	1	-	2	3	-	2	8	4	-	-	-	-
M 7	1214	T32B	3	6	2	3	4	2	-	1	21	20.5	-	2	2	1
M 7	1208	T33E	2	2	1	-	1	1	-	-	7	3.5	-	1	1	0.5
M7	1216	T34M	1	-	-	-	1	-	1	-	3	1.5	-	-	-	-
M 7	1217	T35M	2	4	2	-	1	1	1	-	11	5.5	1		1	0.5
M 7	1215	T36M	1	1	4	2	2	1	-	-	11	5.5	1		1	0.5
M 7	1211	T37B	1	-	4	1	-	-	-	-	6	3	-	-	-	-
M 7	1210	T38M	-	1	2	3	-	-	-	1	7	3.5	-	-	-	-
M 7	1223	T39E	-	1	3	1	1	2	1	3	12	6	-	1	1	0.5
M 6	1198	T40M	2	5	4	2	3	4	-	-	20	10	1	3	4	2
M 6	1257	T41M	2	3	-	-	2	1	-	-	8	4	-	-	-	-
M 6	1272	T42E	-	-	-	-	5	2	-	-	7	3.5	-	-	-	-
M 6	1258	T43B	1	3	2	2	3	2	-	-	13	6.5	-	-	-	-
M 6	1268	T44M	1	-	2	3		4	-	-	14	7	-	-	-	-
M 6	1258	T45E	-	-	-	-	1		-	-	1	0.5	-	-	-	-
M 6	1253	T46M	1	-	-	2	-	1	-	-	4	2	-	-	-	-
M 6	1250	T47B	-	-	-	-	3	2	-	2	7	3.5	-	-	-	-
M 6	1246	T48M	-	5	-	-	1	1	-	-	7	3.5	-	2	2	1
M 6	1239	T49M	-	-	-	-	3	-	--	-	3	1.5	-	1	1	0.5
M 5 & 4	1246	50M	2	-	1	1	-	-	-	-	4	2	-	2	2	1
M 5 & 4	1267	51M	-	-	1	-	-	-	-	-	1	0.5	2	-	2	1
M 5 & 4	1270	52M	-	1	3	1	-	-	-	--	4	2		1	1	0.5
M 5 & 4	1266	53B	-	1	-	-	1	1	-	-	3	1.5	1	-	1	0.5
M 5 & 4	1265	54M	1	1	-	-	-	-	-	-	2	1	-	-	-	-
M 5 & 4	1280	55E	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M 5 & 4	1283	56B	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M 5 & 4	1276	57M	-	-	-	-	-	-	-	-	-	-	-	-	-	--
M5 & 4	1277	58E	-	-	1	1	-	-	-	-	2	1	1		1	0.5
M 5 & 4	1279	59M	-	1	-	-	-	-	-	-	1	0.5	-	-	-	-
M 4 & 5	1280	60M	-	-	1	-	-	-	-	-	1	0.5	-	-	-	-
Total		**60**	**310**	**561**	**278**	**500**	**170**	**160**	**210**	**170**	**2359**	**19.7**	**37**	**35**	**72**	**0.6**

Gmsm = *Glossina morsitans submorsitans*, Gp=*Glossina pallidipes,* Gt=*Glossina tachynoides,* TM=trap monopyramidal, Gf= *Glossina fuscipes fuscipes*, M= Male, F= Female, T=Total, Stom =*Stomoxys* and Tab = *Tabanus* TB=trap Biconical, TE=trap Engu, M=mender, MB= Midega Birbir

Table 6: The male and female proportions of Glossina species in study area

Peasant association	Total no of Glossina	Male	Female
Midega Birbir	1209	408(33.75%)	738(66.25%)
Mender 11 & 12	451	197(43.68%)	235(56.32%)
Mender8	604	276(45.7%)	305(54.3%)
Mender7	128	60(46.875%)	54(53.125%)
Mender 6	80	39(48.75%)	38(51.25%)
Mender 5 & 4	19	11(57.9%)	9(42.1%)
Total	**2359**	**991(42%)**	**1368(58%)**

4. Discussion

The present study revealed that a total of 620 randomly selected cattle, 44/620(7.1%) of animals were positive for trypanosomes. The overall prevalence of bovine trypanosomosis in the study area was 7.1%. This result was consistent with the work of (Fedasa *et al*., 2015), 7.1% in Darimu woreda, (NTTICC, 2009), 13.44% in Gawo Dale district, (Fentahun *et al*., 2012), 15.1% in Mada Talila and Gudina Wacho Kebeles of Hewa Gelan, Western Ethiopia. However, the finding of the current study is higher than the result reported by Girma *et al.,* 2014, 1.3% in Zeyse and Mirab Abaya). This may be due to the difference in control strategy and vector distribution. However, the present study showed that lower prevalence rate while compared to the finding of (Shimelis *et al.,* 2010), 28.1% in Asosa, (Ayele *et al*., 2012), 23.0% in Daremello district. This variation in prevalence rate might be due to the control activities that carried out in the current study area by (NTTICC).

There were two trypanosome species recovered in the current study (*T.congolence* and *T. vivax*). Hence; *T.congolence* was higher in prevalence rate (72.72%) compared to *T. vivax* (18.2%) in the present study. The mixed infection 9.09% (*T.congolence* and *T. vivax*) was also identified. This was agree with the finding of (Fayisa *et al*., 2011) who reported 65.71% prevalence of *T.congolence* in Humbo district, (Waktole, 2008) who reported 71.8% in the Gawo Dale district. This is may be the major cyclical vectors or Glossina species are more efficient transmitters of *T. congolense* than *T. vivax*. The 18.18% prevalence for *T. vivax* in this study was slightly similar with 10.7% in Gawo Dale (Waktole, 2008), 14% in Gibe (Muturi, 1999) and 20.8% in Southern Rift Valley of Ethiopia (Rowlands *et al*., 1995). According to (Getachaw, 2005) *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of the Ethiopia respectively. Similarly, in the present study *G m. submorsitans* and *Pallidipes* caught might be increase the infection due to *T. congolense*. The density of tsetse population in the area and the level of their contact with the host, will determine the level of infection (Radostits, 2007).

During the study period, the prevalence of bovine trypanosomosis was assessed between sexes of animals and among 44 trypanosome positive animals; 33 (8.6%) of them were male animals and 11 (4.6%) of them were of female animals; this shows that it was higher in male animal than female animal. This result is agree with Efrem *et al*., 2012, 9.44% in male and 3.4286 in female in Lalo Kile.

In this study age was considered as one of the risk factor with regards to the disease distribution, therefore, prevalence was observed in middle age 9.63%, young 3.95% and adult 5.67%. There was not statistically significant variation among age difference (p=0.107). This finding was in line with that of (Fedasa *et al*., 2015) who reported4.15%in young, 8.1% in middle 6.5% in adult at Darimu district.

The mean PCV value of 19.51% of the parasitaemic and 27.78% aparasitemic animals have registered. PCV values 27.78% aparasitemic animals have registered PCV values more than 24. Trypanosome infection and mean PCV obtained between parasitaemic and aparasitemic animals had strongly significant difference (p=000). Which was confirms the result with obtained by (Fayisa *et al*., 2011) 20.2% in parasitaemic and 26.5% in aparasitemic Humbo district Southern Ethiopia, (Siyum *et al.,* 2014*)* 24.12% in parasitaemic and 26.14% aparasitemic in Sayo district. Regarding PCV determination (even though other diseases such as helminthosis, thick borne disease and nutritional imbalances contribute to the low PCV values however the present study showed that the parasitaemic animals (50.6%) were found to be anemic (PCV≤24%) compared with aparasitemic (PCV >24%) animals (49.4%). Likewise (OIE, 2008) stated that average PCV of parasitologically negative animals was significantly higher than those of parasitologically positive animals. Therefore, trypanosomosis may adversely lowering PCV value of infected animals.

In this study, the entomological findings revealed that four species of *Glossina* (*G. Pallidipes,G. morsitans submorsitans*, *G. tachynoides* and *G. fuscipes*) were identified out of five reported in Ethiopia (Abebe, 2005) and other two biting flies (*Stomoxys* and *Tabanus* species) were detected in

selected PAs of the Dale Wabera district. The four species of Glossina were reported in the Western and South Western parts of the country (Lelisa, *et al*., 2014). The overall mean apparent density of Glossina species was 19.7Fly/trap/day (2359) and other two biting fly 0.6Fly/trap/day (72). In the study area, tsetse flies were recovered with high apparent density compared to biting flies. This may suggest an absolute increase in the number of tsetse flies due to favorable environment such as enough moisture, presences of wild animals, vegetation growth and suitable habitat or spread of flies from the rivers, thereby increasing relative density. *Glossina Pallidipes* is more efficient in the transmission of trypanosomosis and the potential occupation of the savannah wood land than other Morsitans groups (Jordan, 1986). However, this finding was agree with the report by (NTTICC, 2009) who reported G pallidipes, G. m. sub-morsitans, G. fuscipes and G.tachynoides species were reported in Gawo Dale District.

Regarding the sex composition of the flies, female flies constitute 58% and male 42% this was in agreement with (NTTICC, 1998) who reported female flies to comprise 70-80% of the mean population in the Western part of the country. Various reports indicate that the apparent density of Glossina species ranges from 0.3 to 24.4 flies per trap per day (Lelisa *et al.,* 2014; Rundassa *et al.,* 2013; Yibrah and Semeamlak, 2013). While the current finding showed that the mean population Glossina species were recorded 19.7fly per trap per day. The relatively increase in the number of tsetse flies might be due to differences in climatic, agro ecological condition and level of intervention applied in control of these vectors.

5. Conclusion and Recommendations

This study indicated that trypanosomosis is an important disease and a potential threat that affects the health and productivity of cattle in Dale Wabera district. The overall prevalence of Bovine trypanosomosis in the study area was 7.1%. However; the animal in the study area is still in challenge to contract this disease. Statistically significant difference was observed in the prevalence of trypanosomosis between age, sex and body condition score. The major species of trypanosomes in the study area were *T. congolense* followed by *T. vivax*. Similarly, bovine trypanosomosis was recorded higher in males than in females. With regard to age, the highest prevalence of the parasite was recovered in middle age category than in young and it was the highest in those animals with poor body condition. The mean PCV value of positive animals was significantly lower than mean PCV value of negative animals. During entomological survey, Glossina species (*G. pallidipes*. *morsitans submorsitans, G. tachynoides* and *Glossina fuscipes fuscipes*) of tsetse fly and other biting flies (*Stomoxys* and *Tabanus*) were identified. An overall mean apparent density of tsetse fly at study site was 19.7.

Based on the above conclusions, the following recommendations are forwarded:

- ❖ Appropriate and feasible control (especially vector control) measures should be instituted through strategic tsetse control and prophylactic treatment.
- ❖ To generate complete data set on epidemiology of trypanosome infections, their economic loss and ecology of tsetse flies, further detailed studies need to be conducted in different seasons with the possibly larger sample size at study area.
- ❖ The burdens of both tsetse and biting fly should be further investigated at the area.
- ❖ The survey of tsetse flies and trypanosomosis done by NTTICC should be continued to implement an appropriate intervention of time.
- ❖ Educating the public in the tsetse belt or affected areas of trypanosome to participate in control strategies.

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