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Prevalence and host related risk factors of bovine trypanosomosis in selected villages surrounding Nekemte town, east Wollega, western Ethiopia

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Abstract
A cross sectional study was conducted from November 2017 to April 2018 in selected villages surrounding Nekemte town, Oromia Regional State, Ethiopia to determine prevalence of bovine trypanosomiasis, to assess its host risk factors and also identify species of trypanosomes affecting cattle in the study area. A total of 384 indigenous and cross breed cattle were randomly selected for blood sample collection and examined for the parasitological survey by buffy coat examination and hematological study by use of PCV. Out of total sampled cattle, 23 animal infected with trypanosome with an overall prevalence of 6% (23/384). The trypanosome species identified were *T. congolense* which account 47.82% of total infection followed *T. vivax* 34.78% and mixed infection of both species 17.4%. This study showed statistically significant difference ($P < 0.05$) was observed in trypanosomosis infection among sexes, body condition, age, anemic status of animal and among selected villages of study area. The Overall mean PCV of sampled animal was 26.22 ± 3.16SD. The mean PCV values of affected (parasitemic) and non-infected (aparasitaemic) animals were 20 ± 2.30SD and 26 ± 2.88SD respectively. This study confirmed that bovine trypanosomosis is among the most important health constraints causing loss of cattle production in selected villages surrounding Nekemte town. Therefore implementing strategic vector control and intervention with chemotherapeutics and prophylactics should be applied to reduce effect of bovine trypanosomosis on livestock production.

Keywords: Buffy coat, bovine, trypanosomosis, nekemte, prevalence, village, PCV

Introduction

African animal trypanosomosis is a chronic debilitating disease caused by blood borne unicellular protozoan parasites dwelling in various body and tissue fluids of the genus *Trypanosoma*, including *T. brucei, T. congolense*, and *T. vivax*. These trypanosomes are transmitted by tsetse flies of the genus *Glossina.* (Jing *et al.,* 2008) [14] (Muhanguzi *et al.,* 2015) [22]. It causes a serious disease in domestic livestock that causes a significant negative impact in food production and economic growth in many parts of the world, particularly in sub-Saharan Africa (Cecchi *et al.,* 2008) [7].

Agriculture and particularly livestock production are the main drivers of most of the sub-Saharan African economies. Indeed, the agricultural sector contributes significantly to the gross domestic products and employs the largest part of the populations in the region (Swallow, 1999) [36].

Ethiopia has an enormous and diverse livestock population that plays an important role in the economy and livelihoods of farmers and pastoralists with a total contribution of 15% of Gross Domestic Product and 33% of the agricultural output. In Ethiopia the estimates of livestock population show that there are 53.99 million heads of cattle, 25.5 million sheep, 24.06 million goats, 9.01 million equines, 0.92 million camels in Ethiopia (CSA, 2013). Trypanosomosi*s* had impact on livestock, especially cattle production, and its epidemiology was determined largely by the prevalence and distribution of the disease and its vector in the affected area (PATTEC, 2004) [30].

Tsetse flies that are found in Africa belong to the genus Glossina within which three groups are recognized on the basis of their preference for habitat including the riverine (palpalis) group, the forest (fusca) group and the savannah (morsitans) group (Manful *et al.* 2010) [19].

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Tsetse flies (Glosina) inhabit wide range of habitats covering over 10 million km² representing 37% of the African continent and affecting 37 countries including Ethiopia (Shimelis and Sisay, 2011) [34]

Tsetse flies in Ethiopia are confined to southwestern and northwestern regions between longitude 33° and 38°E and latitude 5° and 12°N covers an area of 220,000 km². Tsetse infested areas lie in the lowlands and also in the river valleys of Abay (Blue Nile), Baro, Akobo, Didessa, Ghibe, and Omo (NTTICC, 2004) [29]. However, new areas have been invaded and settled communities are being evicted continually by the advancing infections (Tafese et al., 2012) [37].

The most important trypanosome species affecting livestock in Ethiopia includes *T. congolense*, *T. vivax*, *T. bruci* in cattle, sheep and goat; *T. evansi* in camel; *T. equiperdum* in horse (Getachew, 2005; Alemu and Alemneh, 2017) [13, 3].

Trypanosomosis can be transmitted through cyclical or mechanical transmissions. In cyclical transmission there is always development and replication of parasite in intermediate hosts (Teka et al., 2012) [38]. The life cycle of trypanosomes in tsetse involves cyclical development for a varying length of time, depending on species and ambient temperatures. *Trypanosome vivax* completes its developmental cycle in the proboscis and pharynx and can be transmitted within a week of the initial infective feed. The cycle of *T. congolense* involves the midgut and proboscis and is completed in about 2 weeks. That of *T. brucei* is more complex it takes 3 or more weeks and involves the midgut and salivary glands. Once infected, flies remain so for life 1-2 months (Radostits et al., 2007) [31]. Mechanical transmission is a potential threat to livestock productivity even in the absence of *Glossina. Trypanasoma vivax* infection can be transmitted mechanically by several *Tabanide, Stomoxyinae* and *Hippoboscidae* are capable of mechanically transmitting trypanosomes in their mouth parts if they feed on more than one host within a short interval (Cherinet et al., 2006; Sinshaw, 2006) [8, 35].

Bovine Trypanosomosis is generally chronic evolving disease. Clinical signs of tsetse-transmitted trypanosomosis includes intermittent fever, lethargy, oedema, abortion, and emaciation. Anaemia usually develops in affected animals and this is followed by loss of body condition, reduced productivity and often mortality. *Trypanosome congolense* is more pathogenic to cattle in eastern and southern Africa (Radostits et al., 2007) [31]. The course of the infection may be acute, particularly when animals have just been introduced to a tsetse-infested area and subacute or chronic mainly in endemic areas, with possible fatal consequences in the absence of intervention (Namangala and Odongo, 2014) [26].

The diagnosis of trypanosome infection is based on clinical signs but the clinical signs of the animal trypanosome are indicative but are not sufficiently pathognomonic (Sekoni et al., 2004) [32]. Therefore, standard methods have been developed and applied practically to diagnose the disease in animals. The methods includes direct microscopic examination of blood, either by the wet film method but it is insensitive. Stained thin and thick smear techniques permit detailed morphological studies and identification of different *Trypanosoma* species by light microscopy (Borden, 2005) [6]. The buffy coat technique is more sensitive than direct examination techniques. The sensitivity of the buffy coat method can be improved by using the buffy coat double-centrifugation technique. The microhaematocrit centrifugation technique is particularly useful in that the status of anemia in the test animals can be assessed at the same time (Kratzer and Ondiek, 1989) [16].

Due to the lack of an effective vaccine against *Trypanosome*, current control measure against the disease is achieved by targeting either the parasite or the tsetse vector. Elimination of the tsetse vector in the transmission cycle is critical and more sustainable in the reduction of the prevalence of tsetse-transmitted trypanosome (Torr et al., 2006) [40]. The main drugs used for treatment animal trypanosomosis are Diminazene aceturate and Isometamidium (Chitanga et al., 2011) [9].

Therefore the objective of the study was
- ✓ To determine the prevalence and associated host risk factors of bovine trypanosomosis in selected villages surrounding Nekemte town.
- ✓ To identify species of trypanosome in the study area.

Materials and Methods
Study Area
The study was conducted from November 2017 to April 2018 at villages surrounding Nekemte town and kebelles of Nekemte town, which is located in East Wollega Oromia regional states. Nekemte town found, 331 kilometers west of Addis Ababa, which lies at latitude of 9^0 5' N and longitude of 36^0 33' E at an elevation of 2124 m above sea level. The area receives bimodal rainfalls that were long rain season and short rain season. The climatic condition alternates with long summer rainfall from June to September, short rainfall during the months of March, April and May. The climatic condition of the area is dega and woyendega with the minimum and maximum annual rainfall is between 1800-2200 mm and daily temperature ranges from 15 ^{0}C to 27 ^{0}C. The total land coverage of the region is about 769,725 hectares of which 336,220 hectares is used for crop production, 184,412 hectares for animal grazing, 256,901 hectares covered with forest and 20,492 hectares for other activities (EWARDO, 2007).

Study population
The study was conducted on 384 randomly selected local and cross breed of cattle related to peasant association found in the study areas. Out of this cattle 334 local cattle (indigenous) and 50 for cross breed of cattle was randomly selected for the examination of blood sample.

Sample size
Sample size determination
The number of cattle required for the study was determined using the formula given by (Thrusfield, 2005) for simple random sampling.

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

Where n = required sample size
P exp= expected prevalence
d = desired absolute precision (usually 0.05)

The size of the sample is determined using 95% level of confidence, 50% expected prevalence and 0.05-desired absolute precision. Therefore, by substituting these with the above formula, the total Sample size (n) becomes 384 for the study.

Sampling methods
Simple random sampling was employed from those animal presented to Nekemte veterinary clinic admitted from different villages surrounding Nekemte town and kebelles of Nekemte town. During sampling age, sex, breed, coat color and body condition of each animal was recorded properly. Age was determined using owner's information and dentition parameters according to the description of De-Lahunta and Habel (1986) [10], Sex (male, female), breed (local and cross), coat color (black, red, white, gray and broken or mixed) and body condition score (poor, medium, good) was selected according to (Nicholson and Butterworth, 1986) [28].

Study design
A cross-sectional study was conducted to determine the prevalence and host related risk factors of bovine trypanosomosis on the study animals, from November 2017 to April 2018. The animals was selected randomly for sampling.

Study Methodology
Sample collection and transportation
The blood sample was collected from selected cattle for examination. Cattle was properly restrained by then following using aseptic procedures the marginal ear vein was pricked with tip of sterile disposable lancet to let blood in to capillary tube. The capillary tube was sealed at one end with sealant and transported to laboratory. The blood was collected in to two capillary tube from each animal selected for examination (Murry *et al.,* 1978). Each sample was clearly labeled with animal identification, date and place of collection
Parasitological examination and Survey on trypanosomosis
Buffy coat technique (hematocrit centrifugation technique) was used. Blood samples was collected into capillary tube after piercing the ear vein using sterile disposal lancet. Filling occurs by capillary attraction until 3/4th of volume is filled. The other end of the tube is then sealed by sealant and centrifuged with 12,000rpm for 5 minutes to separate the blood cells and to concentrate trypanosomes using centrifugal forces at buffy coat. Centrifuged blood filled capillary tubes was broken using diamond tipped pencil 1 mm below the Buffy coat to include the red blood cells layer and 3mm above the Buffy coat to include the plasma. The content was expelled on the microscopic slides and smeared, then the

slides is covered with 22x22 mm cover slip and then examined under 40x objectives and ×10 eye piece, to see the movement of the parasite (Woo, 1996) [42]. After centrifugation, the tubes was removed, care was taken that it remains known to which animal each of the tubes corresponds. When the centrifugation process gets an end, the PCV value was recorded by using hematocrit reader. Animals with a PCV≤24% were considered to be anemic.
Buffy coat thin smear preparation was done for anemic animal and for those positive cases by using Giemsa staining technique. For positive cases to identify the species of trypanosomes morphologically Giemsa stained thin buffy coat smears was done and the morphology of the species was distinguished by presence and absence of free flagellum, size, position, location of the kinetoplast with position of nucleus and also shape of its posterior part (Aksoy, 2003) [2].

Data management and analysis
The data recorded was entered into Microsoft Excel 2013 spreadsheet and coded. Statistical analysis was done using SPSS version 20. The mean PCV of infected (parasitemic) and non-infected (aparasitemic) was compared using the student t test. The total prevalence was calculated by dividing the number of positive animals by the total number of animals tested (Thrusfield, 2005). The chi-square test was used to determine the association between the prevalence of trypanosome infection and considered factors such as sites, sex, age, breed, BCS, coat color and anemic status of animal. A statically significant association between variables said to exist the calculated $p<0.05$ and 95% confidence level for all association.

Results
Parasitological results
A total of 384 cattle were sampled during survey period. 23 animals were found to be infected with trypanosomes. The overall parasitological prevalence of the study area was 6% (23/384). The highest prevalence was observed at Ganda Jiregna village 12.08% of examined animal, then followed by Ganda Negasa 8.4%. The lowest prevalence was recorded in kebelle 03 of Nekemte town (0.0%) with respect to examined animal in selected study site. The result was statically significant ($P<0.05$) (Table 1).

Table 1: Prevalence of trypanosome infection in different villages and kebelles of Nekemte town

Villages and kebelles	No of animal examined	No of positive animal	Species of trypanosome			Prevalence within study area	X^2(p-value)
			T.congolense	*T. vivax*	Mixed infection of both		
Ganda Gari	90	4	2(2.2%)	2(2.2%)	0(0.0%)	4.44%	16.74 (0.044)
Ganda Negasa	83	7	2(2.4%)	4(4.8%)	1(1.2%)	8.43%	
Ganda Jiregna	91	10	5(5.5%)	2(2.2%)	3(3.3%)	12.08%	
Kebelle 03	56	0	0(0.0%)	0(0.0%)	0(0.0%)	0.0%	
Kebelle 07	64	2	0(0.0%)	0(0.0%)	0(0.0%)	3.22%	
Total	384	23	11(2.9%)	8(2.1%)	4(1.0%)	6.0%	

X^2: chi square.

Concerning to the sex of animal from a total of 261 female animals examined, 17 animal (6.5%) were positive to Trypanasomosis whereas from a total of 123 male animals examined 6 animals (4.9%) were positive to trypanosome. In this study male cattle were infected with trypanasomosis with

an overall prevalence of 1.6%, whereas in female a higher overall prevalence of (4.4%) was registered when compared to the males; however, the difference was not statistically significant (p>0.05) (table 3).

Table 2: Trypanosome infection and its association based on sex of animal

Sex	Number of animal examined	Number of positive animal	X^2	p- value
Female	261	17(6.5%)	0.397	0.529
Male	123	6(4.9%)		
Total	384	23(6%)		

In the present study, the highest prevalence was recorded on old animal (>6 year) in which out of 76 animal 13(17%) animal found positive followed by Adult animal(2-6 year) from which 286 animal 10(3.5%) animal were found positive. Young animal (<2 year) where not affected by trypanasome. The difference between the age group of animal was statistically significant ($p<0.05$) (Table 3).

Table 3: Trypanosome infection and its association with age categories

Age of animal	Number of animal examined	Number of positive animal	X^2	p-value
<2 year	22	0(0%)		
2-6 year	286	10(3.5%)	21.235	0.00
>6 year	76	13(17%)		
Total	384	23(6%)		

This study revealed that prevalence of bovine trypanosomosis is higher in poor body condition animals (17.2%) than medium body condition animal (3.9%). However, no positive animal were found from good body conditioned animal. The difference in the prevalence between different groups of body condition was statistically significant ($P<0.05$) (table 4).

Table 4: The Prevalence of Trypanosomosis on the basis of body condition of animal

Body condition score	Number of animal examined	Number of positive animal	X^2	P-value
Poor	87	15(17.2%)		
Medium	203	8(3.9%)	27.063	0.00
Good	94	0(0%)		
Total	384	23(6%)		

Prevalence of trypanosome infection was higher in local breed of cattle, whereas no infection was recorded on cross breed animal. However, the observed association was not statically significant (P>0.05) (Table 5).

Table 5: Prevalence of trypanosome and association with breed of animal

Breed of animal	Number of animal examined	Number of positive animal	X^2	P-value
Local	334	23(6.9%)		
Cross	50	0(0.00%)	3.66	0.056
Overall total	384	23(6.00%		

There was no statically significant difference was observed on prevalence of trypanosomosis related to coat color (p>0.05). Out of examined animal prevalence of trypanosomosis was, 7.2%, 6.8%, 2.3%, 0% and 4% trypanosome infection rate were recorded in red, black, grey, white, and broken (mixed) coat color of animal respectively with respect to their sampled animal.

Table 6: Prevalence of trypanosome and its association on bases of coat color

Coat color	Number of animal examined	Number of positive animal	X^2	P-value
Red	181	13(7.2%)		
Black	73	5(6.8%)		
Grey	44	1(2.3%)		
White	28	0(0%)	3.501	0.478
Broken(mixed color)	58	4(6.9%)		
Total	384	23(6%)		

Prevalence of bovine trypanosome based on anemic status of animal was statistically significant difference was observed ($P<0.05$). Out of 384 examined animal 26.04% was anemic. From 100 anemic animal 20% were infected with trypanosome infection (Table 7).

Table 7: Prevalence of bovine trypanosome on bases of anemic status of animal

Anemic status	Number of animal examined	Number of infected animal Positive	Prevalence	X^2	P-value
Anemic (PCV≤24)	100	20	20%		
Non anemic (PCV>24)	284	3	1.1%	47.135	0.00
Total	384	23	6%		

Hematological Findings
The mean PCV of positive animal (parasitemic) was (20.83± 2.38SD) and those negative animal (aparasitaemic) was (26.56± 2.88SD). The overall mean of sampled animal was 26.22. Statistical analysis made to compare mean PCV value of affected and normal animals revealed those positive for trypanosome (parasitaemic) animals had lower mean PCV than non-affected animal with trypanosome (Table 8).

Table 8: Mean PCV of the examined cattle over non-infected (aparasitaemic) and infected (parasitaemic) animals

Sample result	No of animal	Mean PCV	Std. Deviation	Std. Error
Infected animal(parasitaemic)	23	20.83	2.387	0.498
Non-infected animal(aparasitaemic)	361	26.56	2.880	0.152
Total	384	26.22	3.160	0.161

This study reveal that *T. congolense* cause 50% of anemia from species of trypanosome, followed by *T. vivax* by 35% and mixed infection of both species by 35% causing anemia on cattle infected by trypanosome. The result shows presence of statistically significant between anemic status of animal ($p<0.05$) (Table 9).

Table 9: Association between species of trypanosome with anemic status of animal

Anemic status of animal	Number of animal examined	Species of trpanasome			Prevalence	X^2	P-value
		T. congolense	*T.vivax*	Mixed infection of both species			
Anemic(PCV>24)	100	10(10%)	7(7%)	3(3%)	20%	47.55	0.00
Non-anemic(PCV≤24	284	1(0.4%)	1(0.4%)	1(0.4%)	1.2%		
Total	384	11(2.9%)	8(2.1%)	4(1%)	6%		

Discussion
The overall prevalence of trypanosomosis recorded in the present study was 6%. This finding is comparable with the reported prevalence of 6.1% in Bure district (Mezene *et al.,* 2014) [20], 7.4% in Yayo district (Kitila, *et al.,* 2017) [15], 7.8% in Woliso woreda (Gebreyohannes and Legesse, 2014) [12], 5.47% in Chilga district (Zewdu and Dessie, 2016) [45] and 5.47% in Didessa district (Netsa *et al.,* 2018) [27]. This might

be associated with the absence of significant variation in vector density and similarity among agro-climatic difference.

This result was higher than previous observation made elsewhere in the country on cattle, 4.43% in Arbaminch (Teka *et al.,* 2012) [38], 2.1% in Andracha woreda sheka zone (Yigzaw *et al.,* 2017) [44] and in Dale Wabera district of Kellem Wollega zone lower prevalence 2.86% (Biyazen *et al.,* 2014) [5] have been reported. These differences were due to ecological differences and seasonal variations of study areas (Cherenet, *et al.,* 2006; Kitila, *et al.,* 2017) [15].

This finding was lower than the previously reported prevalence of 22.77% in and around Asosa district of Benishangul Gumuz (Mulaw *et al.,* 2011) [24] and 23% in Daramallo district (Ayale, *et al.,* 2012). The observed lower prevalence might be expansion of cultivation, due to regular use of trypanosome chemoprophylaxis by most farmers, due to expansion of veterinary clinic in the study area. However, increased in urbanization and sensitivity of diagnostic tools in this study creates low prevalence of the infection.

The parasitological examination revealed that *T. congolense* which accounts 47.82% of the infection and *T.vivax* (34.78%) were the species detected from infected animals, with (17.41%) of mixed infection of both species. The finding that the higher infection rate of *T. congolense* was the most prevalent followed by *T. vivax* trypanosome species is in agreement with previous reports (Abraham and Tesfaheywet, 2012; Mezene, *et al.,* 2014; Yigzaw *et al.,* 2017) [1, 20, 44]. However, in areas Wemberma district of West Gojjam zone the respective ratios between *T.vivax* (80%) and *T.congolense* (20%) infections were reported by Yehunie *et al.* (2012) [43] which disagrees the present result in the study areas. This might be due to presence of large number of biting insects that responsible for mechanically transmission of *T.vivax.*

The predominance of *T. congolense* infection in cattle might be due to it mainly confined in the blood, while *T. vivax* and *T. brucei* invade the tissues so the possibility of *T. vivax* in blood was lower than *T. congolense*. According to Langridge *et al.* (1976) [17] reported, *G. pallidipes* and *G.m. Submorsitans* are efficient in the transmission of *T. congolense* than *T. vivax* in East Africa and development of better immune response to species of *T vivax* by infected animal (leak *et al.,* 1999) [18] that support the present study.

In this study, low prevalence of trypanosome infection was recorded in Kebelle 07(3.22%) and the highest prevalence were recorded in Ganda Jiregna (12.08%). However, cattle in Kebelle 03 was not infected with this disease. This might be due to fact that most animal in Kebelle 07 they doesn't go out for grazing rather they kept homestead that makes them less susceptible toward tsetse insect.

In present study, the prevalence of bovine trypanosomosis was assessed between sexes of animals. Out of 23 trypanosome positive animals; 17 (6.5%) of them were female animals and 6 (4.9%) of them were male animals. There was no statistically significant difference (P > 0.05) between sexes groups. This finding is consistence with previous report research that showed no statistical significant difference between sex groups by Zewdu, and Dessie (2016) [45] those who did similar investigation in Chilga District of Northwest Ethiopia, in Sheka zone of Anderacha Woreda (Yigzaw *et al.,* 2017) [44] and in Dara district Sidama zone (Migbaru *et al.,* 2017) [21].

The prevalence of bovine trypanosomosis from 286 adult (2-6 year) cattle, 10(3.5%) animal was infected with this disease and from 76 old cattle (>6 year), 13(17%) animal was infected. However, young animal (<2 year) were not infected.

The infection rates of trypanosome in different age groups showed that statistically significant (*p*<0.05) difference was recorded. This might be due to immunosuppression of old animal and longtime exposure to the vector as they travel long distance for grazing. Less exposure of young animals to tsetse challenge as they are usually kept around home. Young animal (<2 year) in the study area, doesn't travel long distance to access grazing lands where the vector usually prevail. According to Fimmen *et al.* (1999) [11] reports low prevalence in calves is due to natural protection to some extent by maternal antibodies.

This result concords with the reported of Shimelis *et al.* (2011) [34], Migbaru *et al.* (2017) [21] and Alemu and Alemneh (2017) [3] in the district of Asosa, Dara district Sidama zone and Quara district respectively.

The infection rate of trypanosomosis in poor body conditioned animals were significantly higher than of medium body condition animals and good body condition animal (*P* < 0.05). From a total of 87, 203, 94 poor, medium and good body condition of animals examined, the prevalence were 15(17.2%), 8(3.9%), 0(0%) respectively and it is in agreement with the study done in Woliso district (Gebreyohannes and Legesse, 2014) [12], Quara district (Alemu and Alemneh, 2017) [3], Chilga district of Northwest Ethiopia (Zewdu and Dessie 2016) [45], those who report significant difference among different body condition. The higher prevalence in poor body condition animals might be due to higher susceptibility to diseases and absence of trypanosomosis infection in good body condition animals might be related to that well-nourished animals have good level of immunity and better position to resist infection.

In the current study animal having Red coat color was highly affected followed by broken color, black, grey and white color with 7.2%, 6.9%, 6.8%, 2.3% and 0% respectively. However, there was no statistically significant difference was observed on coat color of animal. This result was in agreement with the previous research report in selected village of Arbaminch (Teka *et al.,* 2012) [38] and in Benatsemay district, South Omo zone (Muktar *et al.,*2016) [23]. On the basic of the PCV readings, an assumption was made on the anemic status of animals. From 384 examined animals, 100 (26.04%) animals were anaemic (PCV≤24) and 281 animal where non-anemic (PCV>24) out of this 20% of anemic animal infected with trypanosome infection and 1.1% of non-anemic animal was infected with this diseases. The analyzed data also shows that there is statistically significance variation between anemic and non-anemic. Declining in PCV might be due to nutritional status of animal and presence of other disease that cause anemia in cattle. This result is in agreement with previous finding that reports presence of significant declining in PCV is caused by trypanosomosis results anemia on cattle (Mihret, *et al.,* 2007; Kitila, *et al.,* 2017; Migbaru, *et al.,* 2017) [21, 15].

The present study also revealed that Mean PCV for affected animal was 20.82±2.38SD and non-affected animal was 26.56±2.88SD that was statistically significant difference was observed. 1.1% of the cattle have a PCV value in the normal range (non-anemic) (PCV>24%) but they are affected by trypanosomosis infection. This might be due to recovering from infection and due to recent infection with trypanosome or current treatment with trypanocidal drugs. This result is in agreement with the previous result of Teka, *et al*, (2012) [38] who report having normal range of PCV value were shown to be infected with trypanosome parasite.

According to report of Tafese *et al.* (2012) [37] the mean PCV

value of infected animals (21.45%) was significantly lower (P < 0.05) than that of non-infected animals (26.6%) that was in agreement with present study. In the present survey, 50% anemia from positives (parasitemic) animals was caused by *T. congolense*. This could be due to pathogenic mechanism of *T. congolense* causing infection. Valli *et al*. (1978) [41] reported that Anemia is thought to be the principal injury caused by *Trypanosoma congolense* infection in cattle.

Conclusion and recommendations
The present finding indicated that bovine trypanosomosis were important disease lowering productivity, causes serious economic losses and detrimental to livestock rearing in the selected villages of Nekemte town. The predominant species of *Trypanosoma* identified in the study area were *T. congolense* followed by *T.vivax* and mixed infection of both species was revealed by the study. The highest prevalence of bovine trypanososmosis was recorded in Ganda Jiregna 12.08% followed by Ganda Negassa (8.43%), Ganda Gari (4.44%), and Kebelle 07(3.22%). Higher prevalence of trypanosomosis infection was observed in animal with poor body condition, female, old and anemic animal was highly affected. The mean PCV value of affected animals was lower than mean PCV value of non-affected animals. Based on the above conclusion the following recommendations were forwarded:

- Vector control techniques like insecticide (pyrethroid) pour on animal and sterile insect technique should be applied to reduce the density of tsetse fly.
- Government should give emphasis for health of animal and livestock productivity.
- Strategic chemotherapeutics and prophylactics drugs should be undertaken.
- Further epidemiological investigations that consider the agro-ecology and other non-host related risk factors should be carried out for appropriate control of vector and trypanosome infection by stakeholders.

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