Prevalence of Bovine Trypanosomosis in Bako Tibe District of West Shoa and Gobu Seyo Districts of West Wollega Zone, Ethiopia

Zelalem Abera, Merga Fekadu, Tadele Kabeta, Girma Kebede and Tesfaye Mersha

Abstract: A cross-sectional study was conducted in selected areas of Bako Tibe and Gobu Seyo districts, Western Ethiopia from October 2013 to April 2014 with the aim of determining the prevalence rate of the bovine trypanosomosis, the species of trypanosomes affecting bovine in the study area and the mean PCV values in anaemic and non-anaemic animals in both districts. Blood samples collected from 384 randomly selected cattle of different age groups and both sexes were screened for Trypanosomosis using the buffy coat method. The PCV value of each animal was also measured using a haematocrit reader. Three species of Trypanosomes were identified and T. congolense (58.3%) was the predominant species in the area followed by T. vivax (37.5%) and T. brucei (4.2%) and the overall prevalence of bovine trypanosomosis in the study area was 6.25% which is not very high. Statistically significant difference was observed in the prevalence of trypanosomosis between districts, age, breeds and among body conditions of the animals. The prevalence rate was significantly higher (P<0.05) in animals from Gobu Seyo as compared to animals from Bako Tibe district. There was no statistical difference (P>0.05) between the two sexes but there was statistical difference between breeds (P<0.05) in which local breeds were attacked by the disease almost about 3 times more frequent than crossbreed animals. Also there was a significant variation (P<0.05) among body condition in which poor body condition animals were infected almost twice than the other body conditions. The analysis showed insignificant variation (P>0.05) in prevalence among different PAs. The trypanosome infection significantly influences the PCV and the mean PCV for anaemic and non-anaemic animals were 20.66%±0.5 and 26.68%±0.5 respectively. Finally, this study generated valuable information on the epidemiology of bovine trypanosomosis in the study area and revealed that trypanosomosis is an important disease that significantly affects the health and productivity of cattle in the area. Hence, appropriate trypanosomosis control measure should be undertaken to mitigate the set back.

Key words: Bovine · Buffy Coat · Bako Tibe Gobu Seyo · PCV · Prevalence · Trypanosomiosis

INTRODUCTION

Livestock are the mainstay of the vast majority of African people. They contribute a large proportion of the continent’s gross domestic product (GDP) and constitute a major source of foreign currency earning for a number of countries. Livestock production, indeed, contributes to improve food security and poverty alleviation in developing world. However, animal diseases, lack of improved stock, poor food resources and other improved stock, poor food resources and other multifaceted problems limit the potential of livestock [1].

Ethiopia is chiefly an agricultural country whose economy is largely dependent on crop and livestock production. Besides its direct contribution in terms of Gross Domestic Product and foreign earning, livestock provides virtually all the draught power for cultivation and transportation of agricultural crops and people in rural of the country [2, 3].

Animal Trypanosomosis is an important livestock disease in Africa which is considered as a threat to the ongoing effort on poverty alleviation in the continent [4]. It is a serious disease in domestic livestock that causes a significant negative impact in
food production and economic growth in many parts of the world [5], particularly in sub-Saharan Africa [6].

In Ethiopia, animal Trypanosomiasis is among of the most important diseases limiting livestock productivity and agricultural development due to its high prevalence in the most arable and fertile land of South West and North West part of the country following the greater river basins of Abay, Omo, Ghibe and Baro, which has a high potential for agricultural development [7, 8]. The most important Trypanosoma species affecting cattle in Ethiopia are Trypanosoma congoense, Trypanosoma vivax and Trypanosoma brucei in cattle, sheep and goats.

The tsetse flies are widely distributed in the western southern and south western low lands and river valleys and 15% of the land believed to be suitable for livestock production is affected by one or more of the following species of tsetse flies; Glossina morsitans sub morsitans, G. paulidipes, G. tachinoides, G. fuscipes fuscipes and G. longipennis [9]. Apart from cyclical transmission of Trypanosomiasis by Glossina species, mechanical transmission is a potential threat to livestock productivity in some parts of Ethiopia [10]. Trypanosoma vivax infection can be transmitted mechanically by several tabanide and large number of biting flies [11]. Biting flies have been reported as the major cause of T. vivax infection in three highland districts bordering Lake Tana [12].

It causes great losses in terms of mortality, abortion, reduced fertility, milk and meat production and ability to work as traction animals [13]. Over 6 million heads of cattle and equivalent number of other livestock species are at risk of contracting the diseases. More than 20,000 heads die per annum and annual loss attributed to the diseases is estimated to be over US$ 236 million, whereas loss due to reduce meat, milk and draft power is not applicable to this figure [14]. In addition to these, the disease is also responsible for an annual loss of millions of dollars in livestock production as a result of the cost related to treatment, prevention and vector control efforts [15].

In Ethiopia, trypanosomosis is one of the major impediments to livestock development and agricultural production contributing negatively to the overall development in agriculture in general and to food self-reliance efforts of the nation in particular. While tsetse-borne trypanosomosis is excluding some 180,000 to 200,000 km2 of agriculturally suitable landing the west and south west of the country, 14 million heads of cattle, an equivalent number of small ruminants, nearly 7 million equines and 1.8 million camels are at risk of contracting trypanosomosis at any one time [16].

In Ethiopia, the disease is more prevalent in the southern and western regions where the primary vector exists. Recently, however, new areas are being invaded and settled communities are being evicted continually by the advancing infections. Several attempts have been made to control trypanosomosis in the country, with chemotherapy and chemoprophylaxis being the most widely applied methods. Vector-targeted control practices have been implemented mainly through specifically designed joint projects of the Ministry of Agriculture and other non-government. Knowing the current status of trypanosomosis and its vectors are crucial to integrate all efforts towards combating the disease and reducing economic losses.

However, bovine trypanosomosis is tremendously affecting the productivity and health of livestock in the area, no previous work has been carried out, except few studies which had been undertaken by Bako Agricultural Research Center. So, it is important to clearly understand epidemiology of this economically importance diseases to launch appropriate controls measures. Therefore, the objectives of the study were to determine the prevalence rate of the bovine trypanosomosis in both districts, to identify the species of trypanosomes affecting bovine in the study area and to determine PCV values in anaemic and non-anaemic animals.

MATERIALS AND METHODS

Geographical Description of the Study Area: This study was conducted from October 2013 to May 2014 in West of Ethiopia, Oromia Regional State, in BakoTibe and Gobu Seyo districts. Bako Tibe District is located at 251 kms to west of Addis Ababa in West Shoa Zone, West Oromia. Gobu Seyo District is situated in East Wollega Zone 265 kms west of Addis Ababa by bounding Bako Tibe at the Western side. The capital town of Gobu Seyo (Ano) is located 65 K.M to East from Nekemte, the capital town of East Wollega Zone. The two districts were separated each other by the big river Gibe which forms a conducive environment for the reproduction of the tsetse flies.

Area of Land and Livestock Production: The total area of the Bako Tibe District is about 64,469 hectares of land with animal population of 137,343 cattle, 12,502 sheep, 24,212 goats, 3685 horses, 8415 donkeys, 1023 mules,
The total area of the Gobu Seyo district is about 33,153 hectares of land with animal population of 226,791 cattle, 9,533 sheep, 9283 goats, 72 horses, 3300 donkeys, 601 mules, 24954 poultry 4251 feline, 4,991 canine, 382 porcine [17,18].

The Agro-Climatic Condition: According the information gained from Agricultural Office of the woreda, the agro-climate condition of the area is falls within tropical sub humid climate as the area has 3 to 4 humid months. The altitude range of the Bako Tibe and Gobu Seyo districts are 1650 meters above sea level and their longitude and latitude are 37°09 E and latitude of 09°060’ N respectively. Bako Tibe district have an average rain fall of 886.5mm, average temperature of 21.2 °C. The area was generally concluded as “Woina Dega” eventhough some of it was kola [19]. The annual rainfall of Gobu Seyo districts ranges from maximum 1658 mm to minimum 830 mm and it have a temperature that ranges from 30°C to 10 °C. The main rainfall season for the two districts where from June to September and the dry season being from December to April and their humidity was 57.83% [18, 19].

Climate: Referring to the climate of the districts, they are under the factors of suitable temperature and humidity for the tsetse survival and for biting flies since they are near Gibe River and its tributary which provides adequate humidity and ambient temperature.

Vegetation: The vegetation type of the area is characterized by common savannah vegetation like mango tree, stetterspermum kunthiamum (botoro), Dokma (locally), pilio stigma thonningii (wanza) acashia absinica (grat), carissa Idylis (agamsa) and others [19].

Wild Game: The area is reach with wild game animals in main river systems and in savannah. Some of these wild animals are Apes, pigs, antelopes, Columbus monkey, baboons and others. According to the settlers and people, there are bushbucks, hyenas and others [19].

Study Population: In this study, a total of 384 cattle from eight peasants Association were sampled and examined for the presence of trypanosomosis. The study animals were cattle kept under extensive management system. The sampling includes all cattle without considering their ages and sexes.

Study Design: A cross-sectional study was conducted to establish the prevalence of bovine Trypanosomosis in Bako Tibe and Gobu Seyo districts. Bako Tibe has twenty eight peasant Associations and Gobu Seyo have nine peasant Associations under the nowdays government system. The districts were purposively selected based on the accessibility, lack of information on prevalence of the disease, presence of livestock markets activity, production and management system. These districts share similar farming system and bordered by Gibe River.

To take equal sample from the two districts, the ratio of one peasant association to the other were used as a frame reference to select the PAs. So, the ratio of the number of peasant association from the Bako Tibe to Gobu Seyo was twenty eight to nine which becomes three to one. To fulfill the required sample size the ratio was multiplied by two. So, the study was conducted in six peasant Associations of the Bako Tibe district and two peasants Association of the Gobu Seyo district in total of eight peasant Associations of the both districts. These eight peasant Associations were randomly selected. Since there was no previous survey conducted in the study area the sample size was determined based on the expected prevalence rate of 50% and absolute desired precision of 5% at confidence level of 95% and the sample size was determined to be 384 based on formula given above by [20].

During sampling age, sex, name of the Peasant Associations and body condition of the animals were recorded. Body condition for each cattle was estimated from 1 to 5 (emaciated) to score 5 (obese), but I had been encountered only the three scores. The samples collected randomly from the field were the source of the data. The age of the animals was grouped as young (between 1 and 3 years) and adults (>=3 years) according to the classification used by [22].

Sampling Method and Sample Size Determination: Simple random sampling method was used for sampling from the selected eight PAs and using 95% confidence interval, the sample size was determined by the formula given by [20].

\[ n = \frac{Z^2 \cdot \pi \cdot (1-\pi)}{d^2} \]
Where

\[ n = \text{sample size required} \]
\[ Z = \text{Constant value (1.96)} \]
\[ P_{\text{exp}} = \text{Expected prevalence (50\%)} \]
\[ d = \text{Desired absolute precision (5\%)} \]

Based on this formula, the total sample size was calculated to be 384 after replacing the variables and substituting into the formula mentioned above.

**Study Methodology (Diagnostic Method):** The blood samples from 48 animals for each peasant Association were collected. Of all current trypanosomes survey (diagnostic technique) used in the field, buffy coat technique (haematocrit centrifugation technique) is the most sensitive one having all the necessary equipments at hand and the marginal vein of cattle is pierced with a sterile lancet and blood from the ear vein drawn by a heparinized capillary tube at least its 3/4th of volume and sealed at one end with crystal seal. The lancet must be cleaned with cotton after bleeding each animal so as to prevent cross contamination of the sample. Then, the sealed one end was stand on rack and placed in the container. Then, it was shipped to the laboratory. The sealed capillary tubes were placed in a microhaematocrit centrifuge with the sealed ends pointing towards the outside. To ensure good balance, the tubes are loaded symmetrically or all 24 samples were placed in the machine. The rotary cover was screwed on and the centrifuged lid is closed. Then, the revolution rates and the time were adjusted (i.e. 12,000 revolutions for 5 minutes). Then, it was centrifuged at 12000 rpm for five minutes [23].

The spinning process that separate the RBC from that of WBC or WBC +parasite and plasma according to the specific gravities takes 60,000 rotations (12,000 rpm x 5min.). When the centrifugation process gets an end, the PCV is determined and recorded on the survey format or notebook. Animals with PCV reading below 24 were considered as anemic [24].

The trypanosomes infection was detected by the method of blood examination at the study site using Buffy-coat dark ground microscopic technique. To identify the species of trypanosomes morphologically, staining technique was used. For positive cases, by Giemsa stained thin blood smears [23], the morphology of the species can be distinguished by their size, shape, location and size of kinetoplast, position of nucleus and the attachment and length of flagellum [25]. The slide was examined under 40x objective and 10x eye piece for movement of parasite [24, 26]. Total sample taken, total PCV and the results were recorded for each particular site or PAs of the woreda and finally the overall prevalence rate of the area was calculated as proportion of positives among sampled animals.

**Data Analysis:** Data entry and management was made using Microsoft Excel sheets and later exported to Statistical Package for Social Science (SPSS) software version 20 for analysis. Logistic regression was used to analyze the result and in all the analyses, confidence levels at 95\% were calculated and a \(P<0.05\) was used for statistical significance level. The risk of association such as Odd Ratio (OR) was also analyzed to determine the association of the explanatory variables (sex, age, body condition and PAs) with the prevalence of trypanosome infection.

Descriptive statistics like prevalence was used to calculate by dividing the number of positive slide animals as examined (buffy coat method) divided by the total number of animals examined at that particular time [20] after followed by Giemsa stain of thin blood film for positive cases. The total prevalence rate was calculated based on the examination positive results by dividing the number of positive results of animals by the total number of animals tested in the area. The pattern of mean packed cell volume (PCV) values were calculated by using t-test formula, the prevalence rates of bovine trypanosomosis between different ages and sexes of animals and distribution of species of trypanosomes in the areas was compared.

**RESULTS**

**Prevalence of Bovine Trypanosomosis:** The overall prevalence of bovine trypanosomosis in the study area was 6.25 % (24/384). Comparison was made between the two districts (Gobu Seyo and Bako Tibe) included in the study and the result of analysis indicated that prevalence was significantly higher (OR = 3.72, CI = 1.9 - 16.1, \(P = 0.047\)) in animals from Gobu Seyo as compared to animals from Bako Tibe district as indicated in Table 1 below.

**Parasitological Findings:** Out of the total 384 cattle examined, 24 (6.25\%) cattle were positive for trypanosomosis. The prevalence rates of the disease were varying from 0\% (in Sombo Kejo PA where no animal was affected) to 12.5 \% (in Terkanfeta Gibe PA where 7 animals were positive. Terkanfeta Gibe is the highest prevalent as
Table 1: Comparisons of prevalence of bovine trypanosomosis in Gobu Seyo and Bako Tibe districts.

<table>
<thead>
<tr>
<th>Districts</th>
<th>N° of examined animals</th>
<th>N° of positive</th>
<th>Prevalence Rates (%)</th>
<th>P-value</th>
<th>Odd Ratio</th>
<th>95% CI (Lower Upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gobu Seyo</td>
<td>96</td>
<td>2</td>
<td>2.01</td>
<td>0.047</td>
<td>3.721</td>
<td>1.9 -16.1</td>
</tr>
<tr>
<td>Bako Tibe</td>
<td>288</td>
<td>22</td>
<td>7.64</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>24</td>
<td>6.25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2: Comparison of Prevalence of Bovine Trypanosomosis in Bako Tibe and Gobu Seyo Peasant Associations.

<table>
<thead>
<tr>
<th>Kebeles (PAs) in both districts</th>
<th>N° of examined animals</th>
<th>N° of positive</th>
<th>Prevalence Rates (%)</th>
<th>P-value</th>
<th>Odd Ratio</th>
<th>95% CI (Lower Upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gobu Seyo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sombo kejo</td>
<td>48</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>1.86 - 6.48</td>
</tr>
<tr>
<td>Ongobo Bekenisa</td>
<td>48</td>
<td>2</td>
<td>4.2</td>
<td>0.16</td>
<td>3.3</td>
<td>6.22 - 17.18</td>
</tr>
<tr>
<td>Sub Total</td>
<td>96</td>
<td>2</td>
<td>2.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bako Tibe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dembi Dima</td>
<td>48</td>
<td>5</td>
<td>10.4</td>
<td>0.75</td>
<td>1.3</td>
<td>3.02 - 4.32</td>
</tr>
<tr>
<td>Bako 01</td>
<td>48</td>
<td>2</td>
<td>4.17</td>
<td>0.16</td>
<td>3.3</td>
<td>1.15 - 17.12</td>
</tr>
<tr>
<td>Bako 02</td>
<td>48</td>
<td>2</td>
<td>4.17</td>
<td>0.16</td>
<td>3.3</td>
<td>1.52 - 17.12</td>
</tr>
<tr>
<td>Dembi Gobu</td>
<td>48</td>
<td>3</td>
<td>6.25</td>
<td>0.30</td>
<td>2.1</td>
<td>1.08 - 9.12</td>
</tr>
<tr>
<td>Seden Kite</td>
<td>48</td>
<td>4</td>
<td>8.33</td>
<td>0.51</td>
<td>1.6</td>
<td>1.36 - 5.97</td>
</tr>
<tr>
<td>Terkanfeta Gibe</td>
<td>48</td>
<td>6</td>
<td>12.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sub total</td>
<td>288</td>
<td>22</td>
<td>7.64</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ground Total</td>
<td>384</td>
<td>24</td>
<td>6.25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 3: Comparison of Prevalence of bovine trypanosomosis between pcv.

<table>
<thead>
<tr>
<th>Categories</th>
<th>N° of examined animals</th>
<th>N° of positive</th>
<th>PCV(%)±STD deviation</th>
<th>P-value</th>
<th>OR (95% CI)</th>
<th>95% CI (Lower Upper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemic</td>
<td>192</td>
<td>24</td>
<td>20.66±0.5</td>
<td>0.001</td>
<td>6.41</td>
<td>6.41 - 16.01</td>
</tr>
<tr>
<td>Normal</td>
<td>192</td>
<td>0</td>
<td>26.68±0.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>384</td>
<td>24</td>
<td>23.67±0.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Comparison was made on the prevalence of bovine trypanosomosis between females and males. Out of animals sampled, the majority or 60.2% were females while about 39.8% of them were males. The prevalence rates were 4.8% and 8.5% in females and males respectively. However, there was no statistical difference (OR =1.86, CI, 0.8 - 4.3, P = 0.14) between the two sexes as indicated in the Table (4) below.

Hematological Findings: Prevalence of Bovine Trypanosomosis According Packed Cell Volume (PCV): Out of the 384 examined animals, 12.5% of animals were anaemic in the range of 6.41% to 16.01% and the mean PCV for anaemic animal was 20.66±0.5 and 26.68±0.5 for non-anaemic (normal) animals. The analysis of the data also showed that there is statistically significant variation between anemic and non-anemic (normal) animals as summarized in the Table (3) below as follows compared to another PAs. As indicated in the Table (2) below, even though the all PAs showed insignificant variation (p > 0.05), the prevalence rates recorded in Bako 01, Bako 02 and Ongobo Bekenisa were greater than 3 times more frequent than the other PAs.

Prevalence of Bovine Trypanosomosis According to Sexes and Age Groups, Breeds and Body Conditions: Comparison was made on the prevalence of bovine trypanosomosis between females and males. Out of animals sampled, the majority or 60.2% were females while about 39.8% of them were males. The prevalence rates were 4.8% and 8.5% in females and males respectively. From a total of 384 cattle randomly selected and examined in eight PAs, 13.5% of animals were positives of trypanosomes and showed significant variation, where the higher prevalence rate of trypanosomosis was recorded in young than adult age group of animals [OR = 2.71, (95%) CI = 3.94 - 7.70, P = 0.044 (Table 4). Out of the total examined animals, 91.9% of them were local (Horro and Borana) breeds and 8.1% of them were crossbreed animals (Horro Fresian and Horro Jersey) and the recorded prevalence rates were 0% and 6.8% in crossbreed and local breeds respectively. The result showed that there is a significant variation, in which local breeds were attacked by the disease almost about 3 times more frequent than crossbreed animals [OR (95%) = 2.89, CI = 1.30 - 4.6, P = 0.000] (Table 4).

Based on body condition, the comparison was made on the prevalence of the disease in which 11.24%, 2.03 and 0% of poor, medium and good body condition animals were positive for trypanosomosis respectively. The result revealed that higher prevalence rate of
trypanosomosis was recorded in poor than the medium and good body condition animals. As analysis showed, there was a significant variation among body condition in which poor body condition animals were infected almost twice than the other body conditions [OR = 1.968, 95% CI=5.88-6.59, P =0.000] (Table 4).

Prevalence of Species of Parasite Identified: During the study period, three species of trypanosomes were detected. These species were *T.congolense*, *T.vivax* and *T.brucei*. Out of 24 infected animals 14 (3.64 %) cattle were found to be infected by *T. congolense*, 9 (2.34 %) cattle by *T. vivax*. and 1 (0.26 %) cattle by *T. brucei*. This shows that, *T. congolense* was highly detected in PAs followed by *T. vivax* and the last prevalent parasite was *T. brucei* and there is no statistically significant difference (P>0.05) in prevalence of species of trypanosomes. The prevalence of the species of the parasite identified was presented in the Table (5).

**DISCUSSION**

In the present study, the prevalence of bovine trypanosomosis exposure was investigated in the administrative districts of West-Shoa Zone (Bako Tibe) and East Wollega Zone (Gobu Seyo) by applying field study. The overall prevalence rate of the present investigation in the study area was 6.25%, which is virtually similar with the result of Efrem et al. [27] in Lalo Kile District, Kelem Wollega Zone, Western Ethiopia (6.86%) and Bizuayehu et al. 2012 in Chena district, South West Ethiopia (6.9%).

It is also worth to mention that, other studies on the disease were made in different areas and comparatively the present finding was lower than the results of Habtewold [28] at Humbo Larena of Wolayta zone and Habtewold [29] at Konso district, 9.3% and 11.5% respectively. The 13.44% prevalence rate in Gawo Dale district by Waktole [30], 17.2% in Metekel, by Afewerk...
The result of present study revealed that, the prevalence rate of bovine trypanosomosis in Bako Tibe (7.6%) was comparatively larger than that of Gobu Soy (2.01%) district and also it was larger than the results of Addisalem et al. [36] in Addisamba and Amarit, district of West Gojjam administrative zone, 0.9% and 1.2% respectively. Even though both districts exposed to the risk, this is highly due to the extensive management of zebu cattle and re-infestation of tsetse flies along the Gibe River Basin. But, this result was smaller as compared with work of Tafese [37] in which 8.55% prevalence rate was reported from two districts (Diga and Sasiga) of East Wollega zone and Yibrah [38] which was 15.57%, reported from (Guto Wayu and Sibu Sire districts) of East Wollega Zone. This might be due to agro ecological condition of the area and a season at which the activity of biting flies is high to play the major role in the disease transmission.

The result also showed that, the prevalence rate was higher in Terkanfeta Gibe PA (12.5%) and agrees with the prevalence rates of the disease in different villages like Faricho village (12%) and Bissare village (12.2%) and higher than the rate in Mareka village (8%). But, comparatively, it is lower than the prevalence rate in Ajaja village (16%) and Bongota village (22.5%) of Humbo districts of southern Ethiopia [39]. But in Sombo kejo PA, the prevalence rate was 0% and this is due to the application of appropriate control methods and public awareness on how to manage their animals made by Bako Agricultural Research Center (BARC) which is located in the Sombo Kejo PAs. This finding was in agreement with the findings of Ayana, Tesfaheywet and Getnet [34] around Merawi peasant association, where there were no positive cases detected.

In the present study, the rate of infection was compared among the various categories of age, sex and body condition. Accordingly, there was no significant difference in female animals as compared to male animals ($p > 0.05$). This result is in agreement with the work reported by Adane and Gezahgen [40] and Abebayehu et al. [41] and this might be due to the fact that both sexes have virtually similar exposure to biting flies in grazing areas. Analysis was also computed for the two age categories in this study and the infection rate of the disease was high in young animals as compared to adult animals. The analysis showed that there is a significant variation (OR = 2.71, CI = 3.94 - 7.7, $p = 0.044$), in which young animals were infected by the disease almost about 3 times more frequent than adult one. The present finding was contrary to the finding of the previous work of Tesfaheywet and Abraham [42] who reported the infection rate in adult cattle was twice greater than the young one. As Rowlands et al. [43] reported in their work, suckling calves are not allowed to go out with their dams until they are weaned off in Ghibe valley, but the current study indicated as most of the calves were stayed in the field where their dam grazes.

The infection rate was higher in animals with poor body condition as compared with the medium one, but animals with good body condition cattle were appasitaemic for bovine trypanosomosis. The analysis revealed that, there was a significant variation (OR = 1.968, $P =0.000$) among body condition in which poor body condition animals were infected almost twice than the other body conditions. The rest of appasitaemic cattle with poor body condition were due to other factors such as diseases, nutritional factors as well as management system may have contributed for the poor body condition of cattle [44]. Also, the absence of trypanosome infection in the good body condition animals might be related to that well-nourished animals have good level of immunity and are in a better position to resist infection, moreover there is a very rare possibility of re-establishment of infection in animals with good body condition.

The study also revealed that local breeds were more infected by the disease (6.8%) as compared to the cross breeds. As reported by Stein et al. [45], seasonal variation in incidence of Trypanosomes may occur within a Trypanosome endemic area and the risk for trypanosome infection also varied according to the endemic areas in Ethiopia. In this line the peak trypanosomosis season in the habitats of each breed was in April for Gurage breed, May for Sheko breed, June for Horro breed and September for Abigar. Therefore, the present study agrees with the work of Stein et al. [45], as the local breeds were highly infected than the cross breeds due to the poor managerial practices for Horro breeds (Usually extended on the field where they are exposed to the tsetse and other biting flies) as compared to cross breeds. For this reason, the animals become positive of the disease during the study period.
The result of the study also revealed that the mean packed cell volume (PCV) of the anaemic animal was 20.66%±0.5 while it was 26.68%±0.5 for non-anaemic (normal) animals. This finding was agrees with the works of Yibrah [38] who reported lower PCV of (20.2%±3.0) in infected animals as compared to non-infected animals (26.5%±5.1) from Humbo districts of Southern Ethiopia. According to Packed Cell Volume (PCV), the animals were classified as anemic and non-anemic (normal) and animals with PCV less than 24% were considered to be anaemic [24]. The prevalence was also higher in anaemic animals (12.5%) and in normal animals the prevalence was zero. So, anaemia positivity was recorded for which was less than 24% [46]. According to Getachew [8], the development of anemia is the most reliable indicator of the trypanosome infection, even though it also interferes with concurrent diseases and nutritional factors.

The overall prevalence rate was 6.25% and infection rates of each detected Trypanosomes were 58.2%, 37.5% and 4.2% due to T. congolense, T. vivax and T. brucei respectively. This revealed that the three Trypanosoma species were circulating in the study area but T. congolense was dominant. This finding was in agreement with the work of Cherinet et al. [11] who reported that T. congolense is dominant in tsetse endemic areas while T. vivax was more linked to tsetse free areas. 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 in the infected animal [47]. The lower relative prevalence of T. vivax in the current study area as compared to the tsetse-infested area of Amhara region could be due to the difference in the climate and altitude that affect the vegetation, rainfall and temperature which in turn are known to be the primary determinants for proliferation of the flies. The low level of the prevalence rate of T. brucei revealed that as it is limited nearly to the area of the cyclical vector due to the fact that it was not adapted to acyclical transmission [48] and due to it possessed a long period of life cycles [23].

CONCLUSIONS

The overall prevalence of Bovine trypanosomosis in the study area was 6.25% which is not very high. T. congolense was the predominant species in the area followed by T. vivax and T. brucei. Statistically significant difference was observed in the prevalence of trypanosomosis between districts, age, breeds and among the various body conditions of the animals. The prevalence of bovine trypanosomosis was highest in Terkanfeta Gibe and Ongobo Bekenisa Peasant Association of Bako Tibe and Gobu Seyo Districts respectively. The mean PCV value of anaemic animals was significantly lower than mean PCV value of non-anaemic animals. Finally, this study generated valuable information on the epidemiology of bovine trypanosomosis in the study area and revealed that trypanosomosis is an important disease that significantly affects the health and productivity of cattle in the area.

Based on the above conclusions the following recommendations were forwarded: Even though the prevalence of trypanosomosis found in the study area was medium; however, strategic control of the disease including vector control should be strengthening to improve livestock production and agricultural development in the area. Major concern should be concentrated on the identified species of trypanosome with the highest prevalence and control measures should be targeted accordingly. Along the river basin the community should used traps to reduce the number of tsetse flies in the area as earlier times especially during wet. An introduction of trypanotolerant breeds as much as possible to be used by the community should be practiced and the density of tsetse flies and other biting flies in the area were reduced by using insecticide.

ACKNOWLEDGEMENTS

We are very much grateful to the inhabitants of all staff members of Wollega University, College of Medical and Health Science, School of Veterinary Medicine and all staff of Bako Research Center, are highly appreciated for their valuable advice, encouragements, provision of materials and co-operation in different aspects during our work.

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