Prevalence of Bovine Trypanosomosis
(Studied in Arbaya Veterinary Clinic)

Samuel Engdaw¹ & Kindalem Bayew²

¹Dr. Samuel Engdaw & ²Dr. Kindalem Bayew
¹Animal Health Disease Surveillance Expert in West Belessa Wereda
²Animal Health Department Head in Janamora Wereda
West Belessa, Ethiopia

Abstract: A cross-sectional study was conducted from October 2018 to April 2019 in Arbaya veterinary clinic with the objectives of determining the case for the prevalence of Bovine trypanosomosis. During the study period, blood samples were taken randomly from 384 animals brought to Arbaya Veterinary Clinic for parasitological study using conventional buffy coat technique. The result of parasitological study revealed that 52 animals were positive with an overall prevalence of 13.5%. From these 52 trypanosome infected animals, T. congolense was the most prevalent (67.3%) trypanosome species than T.vivax (32.6%). Risk factors such as: sex, age, body mass condition, management system and animals’ origins were taken. Age, body mass condition, origin and management system with their respective p-value .001, .000, .000 and .003 are all significantly associated with the risk of being infected with bovine trypanosomosis. But, sex was not significantly associated with its p-value >0.05. Animals with age young, adult and old were found with the respective prevalence of 9.5%, 12.2% and 15.7%. Poor, medium and good body mass conditions were found with the prevalence of 20.9%, 7.9% and 4.6% respectively. Animals with extensive management systems were infected with the prevalence of 14.5% while semi intensive management systems were found with the prevalence of 8.95%. The animal’s origin: Arbaya, Abaytara, Asawegari and Shura were found with the disease prevalence of 6.1%, 14.3%, 14.9% and 17.9% respectively. The Mean PCV of infected and non-infected animals were 21.61% and 25.32% respectively with statistically significance difference (p=0.000). The present study revealed that trypanosomosis is the most economically important disease that causes loss of economy due to reduced production, cost of treatment and death of the animals. Therefore, trypanosomosis and its vector control and prevention strategies should be implemented in the area.

Keywords: Risk factor, Prevalence, Trypanosomosis, PCV & Arbaya.
1. INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. There are estimated numbers of 56.71 million, 14.71 million and 3.22 million cattle respectively in Ethiopia, Amhara region and North Gondar Zone Administration [1]. From these livestock population, cattle production is one of the major agricultural industries in Ethiopia. They also play very important roles in food security of the people [2]. In this study area, cattle are the major economic resources that the farmers’ economic income mainly depends on the result of farming and dairy products. Even though the country has all these cattle resources, full exploitations of these animals are greatly constrained by the parasitic diseases infections [3].

Trypanosomosis is the main haemoparasitic disease in domestic animals that causes a significant negative impact in food production and economic growth in many parts of the world, particularly in Sub-Saharan Africa [4]. Trypanosomosis in livestock causes great losses in terms of mortality, abortion, reduced fertility, milk and meat production and ability to work as traction animals [5]. It is caused by infection with the protozoan parasite of the trypanosome species and is transmitted mainly by tsetse flies (cyclically) and other biting flies [6]. The most economically important trypanosomes in livestock are the tsetse transmitted species: *T. congolense*, *T. vivax* and *T. brucei* [7].

Even though trypanosomosis is economically important disease, no enough studies were done in Ethiopia and no study was done in this study area. Therefore this study is aimed at the following objectives:

a. To determine the prevalence of bovine trypanosomosis from the case brought to Arbaya Veterinary Clinic.

b. To recommend suitable preventive and control strategy.

2. MATERIALS AND METHODS

2.1. Study Area

A cross sectional study was conducted from October 2018 to April 2019 in Arbaya Veterinary Clinic of West-Belessa District, Ethiopia. Arbaya is a town in North-West Ethiopia, in Central Gondar Zone Administration. It is found at a distance of 81 km from its zone city Gondar and 178 km far from its regional city Bahirdar. It has a minimum annual average temperature 13 °C and maximum average temperature 35 °C with annual rainfall range from 800 mm to 1200 mm. It is found at 1800-2100 m high above the sea level [8].

2.2. Study Animals

The study was conducted on cattle which were brought to Arbaya Veterinary Clinic with a different case for a diagnosis. The Study animals were all indigenous cattle breeds with different age, sex, body mass condition and origins which were kept in extensive and semi intensive husbandry systems. The animal case history shows that these cattle under extensive management systems were allowed to graze in the field freely in day light and housed during the night in poorly constructed houses.

2.3. Study Design

A cross sectional study was conducted randomly in extensively and semi intensively managed indigenous cattle breeds for the determination of the prevalence of Bovine trypanosomosis infections. Information about age, sex, management system, body mass condition and origin of the study animals were gathered appropriately. The ages were determined based on owners information obtained and animals dentition pattern as described by Johnson[9] and they were grouped into age <2(young), 2-5(adult) and >5(old) [10-12]. The body condition was done according to the method described by Nicholson and Butterworth [13] and recorded as good, medium and poor.

2.4. Sample Size Determination:

The sample size required for this study was determined according to [14]. Since there was no previous work done in this study area, 50% prevalence as an expected prevalence for sample size
determination and 95% confidence interval with 5% desired absolute precision were considered. Hence the sample size is estimated as:

\[
N = \frac{1.96^2 [\text{Pexp} (1-\text{Pexp})]}{d^2}
\]

\[
N = \frac{1.96^2 [0.5 (1-0.5)]}{0.5^2}
\]

Using the above formula, 384 animals were required and examined.

2.5. Sample Collection

Blood samples from an ear vein using heparinized micro-hematocrit capillary tube were collected and sealed. The sample was collected using sterile procedures to avoid mechanical transmission of trypanosomes.

2.6. Laboratory Examination

2.6.1. Buffy Coat Technique:

Blood was collected from an ear vein using heparinized micro-hematocrit capillary tube and the tube was sealed. A heparinized capillary tube containing blood was centrifuged for 5 min at 12,000 rpm. After the centrifugation, trypanosomes were usually found in or just above the buffy coat layer. The capillary tube was cut using a diamond tipped pen 1 mm below the buffy coat to include the upper most layers of the red blood cells and 3 mm above to include the plasma. The content of the capillary tube was expressed on to slide and covered with cover slip. The slide was examined under ×40 objective and ×10 eye pieces for the movement of parasite [15].

2.6.2. Thin Blood Smear:

A small drop of blood from a micro hematocrit capillary tube to the slide was applied to a clean slide and spread by using another clean slide at an angle of 45°, air dried and fixed for 2 min in methyl alcohol, then immersed in Giemsa stain (1:10 solution) for 50 min. Drain and wash of excess stain using distilled water, allowed to dry by standing up right and examined under the microscope with oil immersion objective lens [15].

2.6.3. Measuring of Packed Cell Volume (PCV):

Blood samples were obtained by puncturing the marginal ear vein and collected directly into a capillary tube. The capillary tubes were placed in micro hematocrit centrifuge with sealed end outer most. The tube was loaded symmetrically to ensure good balance. After screwing the rotary cover and closing the centrifuge lid, the specimens were allowed to centrifuge at 12,000 rpm for 5 min. Tubes were then placed in hematocrit and the readings were expressed as a percentage of packed red cells to the total volume of whole blood. Animal with PCV <24% were considered to be anemic [15, 16].

2.7. Data Management and Analysis

The collected data were coded and entered into Microsoft Excel spread sheet and Statistical analyses was performed using SPSS version 20 software packages. Descriptive and regression analysis was made to know the Chi-square (\(X^2\)) and the significance of the risk factors with the occurrence of the Bovine trypanosomosis. Chi-square test at \(P<0.05\) was considered as significant.

3. RESULTS

A total of 384 cattle blood samples which were brought to Arbaya Veterinary Clinic were taken and examined for the presence and absence of bovine trypanosomosis. From these samples taken, a total of 52 animals were positive with the overall prevalence of 13.5%. The species of trypanosome identified by this study were \(T.\) congolense and \(T.\) vivax. From the total 52 trypanosome infected animals, \(T.\) congolense was
the most prevalent trypanosome species (67.3%), whereas T. vivax was found with the prevalence of 32.6%. But, there was no T. brucei and mixed infection found during the study.

Risk factors such as; sex, age, body mass condition, management system and animals origins were taken to know their relationship to the prevalence of the disease. The logistic regression analysis indicated the presence of strong association of *bovine trypanosomosis* with age, body mass condition, origin and management system with their respective p-values of .001, .000, .000 and .003. This shows, age, body mass condition, origin and management system are all significantly associated with the risk of being infected with *bovine trypanosomosis* since their p-value, P<0.05. But, in this study, the risk factor sex was not significantly associated with its p-value= 0.940.

The prevalence in male and female animals was 13.7% and 13.2% respectively. Based on the age, animals with age young, adult and old was found with the respective prevalence of 9.5%, 12.2% and 15.7%. Animals with poor, medium and good body mass conditions were found with the prevalence of 20.9%, 7.9% and 4.6% respectively. Animals with extensive management systems were infected with *trypanosomosis* with the prevalence of 14.5% while semi intensive management systems were found with the prevalence of 8.95%. The animal’s origin: Arbaya, Abaytara, Asawegari and Shura were found with the disease prevalence of 6.1%, 14.3%, 14.9%, and 17.9% respectively.

Based on the hematological findings, the mean PCV value was found 21.61% for the infected animals and 25.32% for none infected animals. The association was also significant (p<0.05) between the infected and none infected animals.

Table 1: Prevalence of Trypanosome species based on their origin

<table>
<thead>
<tr>
<th>Species detected</th>
<th>Arbaya</th>
<th>Asawegari</th>
<th>Shura</th>
<th>Abaytara</th>
<th>total Prevalence in %</th>
<th>Chi-Square (X²)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. congolense</td>
<td>4</td>
<td>12</td>
<td>0</td>
<td>19</td>
<td>35</td>
<td>9.1</td>
<td>36.8</td>
</tr>
<tr>
<td>T. vivax</td>
<td>0</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td>17</td>
<td>4.4</td>
<td>.000</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>21</td>
<td>8</td>
<td>19</td>
<td>52</td>
<td>13.5</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Analysis results of bovine trypanosomosis based on different risk factors

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Category</th>
<th>Total Animals examined</th>
<th>Positive Animals</th>
<th>Prevalence in %</th>
<th>Chi-Square (X²)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>male</td>
<td>233</td>
<td>32</td>
<td>13.7</td>
<td>.12</td>
<td>.940</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>151</td>
<td>20</td>
<td>13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Young (&lt;2 yr)</td>
<td>42</td>
<td>4</td>
<td>9.5</td>
<td>23.2</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Adult (2-5 yr)</td>
<td>164</td>
<td>20</td>
<td>12.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Old (&gt;5 yr)</td>
<td>178</td>
<td>28</td>
<td>15.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body mass condition</td>
<td>poor</td>
<td>181</td>
<td>38</td>
<td>20.9</td>
<td>41.9</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>138</td>
<td>11</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>good</td>
<td>65</td>
<td>3</td>
<td>4.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management System</td>
<td>extensive</td>
<td>317</td>
<td>46</td>
<td>14.5</td>
<td>11.3</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td>Semi</td>
<td>67</td>
<td>6</td>
<td>8.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>intensive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Origen</td>
<td>Arbaya</td>
<td>65</td>
<td>4</td>
<td>6.1</td>
<td>36.8</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Abaytara</td>
<td>132</td>
<td>19</td>
<td>14.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asawegari</td>
<td>141</td>
<td>21</td>
<td>14.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shura</td>
<td>46</td>
<td>8</td>
<td>17.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: The Mean PCV of infected and non-infected animals in the study area

<table>
<thead>
<tr>
<th>Status of infection</th>
<th>No of animals</th>
<th>Overall PCV (%)</th>
<th>Mean PCV (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infected</td>
<td>52</td>
<td>1124</td>
<td>21.61</td>
<td>.000</td>
</tr>
<tr>
<td>Non-infected</td>
<td>332</td>
<td>8409</td>
<td>25.32</td>
<td></td>
</tr>
</tbody>
</table>

4. DISCUSSION

The present study revealed an overall *trypanosomosis* prevalence of 13.5%. This result (13.5%) agrees with the study results of [17-19] with their study result 12.2%, 14.9%, 14.45% and study area of Dale Wabera District, Botor Tolay District and Dabo Hana District respectively. This result is also relatively higher than the study result of [20-22] that reported 7.8%, 4.8% & 5.84% prevalence in Wemberma district, Mirabeabaye and Dale sadi District respectively. This result study is also relatively smaller than the study results of [23-26] that reported as a prevalence rate of 27.5%, 23%, 21% and 17.5% in the study area of Selected District of Arba Minch, Southern Nation, Nationalities & peoples, Jabi Tehenan district and Western Ethiopia respectively. This difference might due to the difference of tsetse fly distribution as agro ecological variation and difference in the vector and parasite controlling practice of the study area.

According to the study result, from the total 52 *trypanosome* infected animals, *T.congolense* was the most prevalent (67.3%) *trypanosome* species than *T.vivax* (32.6%). This result is in agreement with the concept of Urquhart *et al.* [27] that described as *T.congolense* is the most common species than the other. This study result also agrees with the study results of [18, 22 & 28-30] that were reported in different areas of Ethiopia. This high prevalence of *T.congolense* might be due to the high numbers of serodems of *T.congolense*, the development of animal’s immune system to *T.vivax* infections and the areas suitability to the multiplications of the biological vectors.

Animals body condition was significantly associated (p<0.05) with the occurrence of the disease and was found higher prevalence in poor body mass condition (20.9%) followed by medium (7.9%) and good body mass condition (4.6%). This result is in agreement with the study results of [19, 25& 29] which were studied in Dabo Hana District, Jabi Tehenan District and selected villages of Arbaminch town respectively. This high prevalence in poor body mass condition might be due to the chronic nature of the disease that cause decrease in body mass condition. Age was significantly associated (p=0.001) risk factor with less prevalence in young age animals (< 2 years) than adult (2-5 years) and old (>5 years). This also agrees with the study results of [23, 31&32] that were reported less prevalent in young animals. This difference of high prevalence in old and adult animals than young might be due to young animals pass most of their time in door which decrease their exposure to the biological vector tsetse fly.

In this study, animal’s origin was taken as a risk factor and the result show significance association (P=.000). This result agrees with the study of [19] and disagrees with the study result of [18, 31].This difference may be due to the difference of the agro ecological zone and climatic variation of the study area. Animals’ management systems were significantly associated (p=0.003) with less prevalence in semi intensively managed animals (8.95%) than extensively managed (14.5%). This may be in relation to semi intensively managed animals are less frequently exposed to tsetse fly than extensively managed animals. In this study, animals sex was statistically non significance (p>0.05) with relatively similar occurrence in female (13.2%) and male (13.7%) animals. This result agrees with the study reported by [17, 23, 19, and 20].

The PCV of individual animals was measured for the assessment of degree of anemia. The Mean PCV of infected and non-infected animals were 21.61% and 25.32% respectively with statistically significance difference (p=0.000). This might indicate that *trypanosome* involve in reduction of PCV. This was due to the lower PCV value that might be resulted from the debilitating nature of the disease. But Poor nutrition and gastro-intestinal helminthes infection could also contribute to the general low PCV as described by Radostits *et al.*[33].This result is in agreement with the study results of [19, 20, 32, & 34].
5. CONCLUSIONS AND RECOMMENDATIONS

In general, this study indicated that trypanosome is one of the major protozoans infectious disease problem of the case brought to Arbaya Veterinary Clinic which can pose threat to livestock owners in the area, due to loss in production and productivity of cattle. Risk factors such as age, sex, body mass condition, origin and animals’ management systems were taken for the assessment. The study result show high prevalence in animals managed extensively, poor body mass condition, in adult and old animals than young. The Preventive and control methods of the vector and the parasite is low practiced in the area. Based on the above conclusions, the following recommendations are forwarded:

a. Educating farmers, especially those nearest to the main tsetse challenge areas is critical to reduce the chance of contact of animal with flies.

b. Tsetse burden in the area should be reduced through continual use of traps and insecticide-impregnated targets or through application of available chemicals on the animal.

c. Awareness creation about the disease and control methods and about the risk of trypanocidal drug resistance is required in the area.

d. Regular screening of bovine *trypanosomosis* and early treating of positive animals with trypanocides are necessary.

e. Public awareness creation to owners on sufficient feed supply and minimizing extensive open grazing management systems that expose the animals to vectors are important.

6. REFERENCE


