Trypanosomosis in Sheep and Goats in Yayo District and Chewaka Settlement Area, Ilubabor Zone, Oromia Region, South Western Ethiopia

Kumela Lelisa Dera, Rafael Argiles Herrero and Delesa Damena Mulisa

Abstract: This study was conducted in Yayo district and Chewaka Settlement area, Oromia Regional State, south Western Ethiopia from January to February 2015 to determine the infection rate of trypanosomosis in sheep and goats. The study was conducted using conventional parasitological and hematological techniques. A total of 401 blood samples were randomly collected and examined for trypanosomosis. Of the total sheep and goats examined during the study period, 13 animals (3.24%) were positive for trypanosomes. The prevalence trypanosomosis in sheep and goats was 4.35 and 1.75% respectively. Infections were due to *Trypanosoma congolense* (1.75%) and *T.vivax* (1.50%) in these small ruminants. Infection rate was significantly higher (P<0.05) in adults (4.67%) than in young (0.76%). There was no statistically significant difference (P>0.05) between species and sexes on infection rate. The overall mean packed cell volume (PCV) value of examined animals was 27.88%, 95%CI=27.40-28.37. The difference in mean PCV of parasitaemic (17.31%) and aparasitaemic (28.23%) small ruminants was significant (P<0.05), being lower in the former one. The present study revealed trypanosomosis can be classified as a top health problem among sheep and goats in the study areas. Therefore, appropriate parasite and/or vectors control measures need to be taken to alleviate the effect of this disease on health and production of sheep and goats.

Key words: Chewaka • Goats • Prevalence • Sheep • South West Ethiopia • Trypanosomosis • Yayo

INTRODUCTION

There are more than 25.5 million sheep and 24.06 million goats in Ethiopia [1] that play great role in the economy and livelihoods of the society. Small ruminants are widely used in the country as source food and source of financial income for rural and urban poor farmers, or livestock owners. In Ethiopia, sheep and goats provide 46% of the national meat production and 58 % of the value of skin production [2]. In spite of the large population of sheep and goats, productivity in Ethiopia is low due to poor nutrition, poor husbandry system and prevailing animal diseases. Trypanosomosis is one of the health and production constraints to small ruminants’ production in Ethiopia [3, 4].

In tsetse fly infested areas, animal trypanosomosis is the most important livestock disease caused by a variety of species and sub species of the genus *Trypanosoma* [5]. *Trypanosoma congolense*, *T. vivax* and *T. brucei* are the most economically important trypanosomes species affecting cattle, sheep and goats [6, 7]. Tsetse transmitted trypanosomosis is prevalent in the north-west and the south-west regions associated with the presence of the vectors of trypanosomosis (*Tsetse fly*). According to Abebe *et al.* [8] tsetse fly transmitted animal trypanosomosis is a major constraint to utilization of the large fertile land resources in these regions.

Tsetse flies are the cyclical vectors of trypanosomosis in Sub-Saharan Africa. The influence of tsetse fly on Africa agriculture through the transmission of trypanosomosis continues to be a major constraint to the development of national economy, and their achievement of self-sufficiency in basic food production [9].

In Ethiopia, southern, southwestern and northwestern are tsetse infested regions, where there are five species of tsetse fly namely, *G. morsitans submorsitans*, *G. pallidipes*, *G. fuscipes fuscipes*, *G.
tachnoids and G. longipennis. Among these species the first four are widespread and most important due to their wide distribution in most grazing lands and cattle rearing areas; while G. longipennis is of minor economic importance because it its limited to forest lands not used for livestock grazing [10, 11]. Although, trypanosomosis is considered as an important disease in Ethiopia, few records exist on the prevalence and effect of trypanosomosis in sheep and goats in Ethiopia in the study area. Therefore, this study was proposed to determine the prevalence of trypanosomosis in sheep and goats in Yayo district and Chewaka settlement area, Ilubabor zone, Oromia Regional State, south western Ethiopia.

MATERIALS AND METHODS

Study Area: Yayo and Chewaka are located in Ilubabor zone of Oromia Regional Sate, southwestern Ethiopia. They are situated at 563 km and 547 km from Addis Ababa, respectively. The areas of the districts are 84,626 and 54,219 hectares of land for Yayo and Chewaka in the given order. The agro-climate of the areas alternates with summer rainfall and winter dry season. The mean annual rain fall in Yayo ranges from 1191- 1960 mm; whilst it is about 800ml in Chewaka. Yayo is divided in to three ecological zones: 43.6% highland, 44.93% midland and 11.47% lowland, while Chewaka is roughly lowland as a whole. The annual mean temperature in Yayo and Chewaka ranges from 18-27°C and 37-42°C respectively. Yayo district has altitudes ranging from 1200-2400 meters above sea level and that of Chewaka ranges from 1250-1800 m.a.s.l.

Sample Size, Sampling Method and Study Population: The sample size was estimated based on the formula given by Thrustfield [12] considering 50% expected prevalence (\(P_{exp}\)) and 0.05 desired absolute precision (d).

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

Accordingly, 384 small ruminants were needed to be sampled although, a total of 401 sheep and goats were randomly sampled from eight (8) purposively selected peasant associations of two areas to determine the infection rate of trypanosomosis in small ruminants, out of which 171 were goats and the rest (230) were sheep.

Prevalence Study: This study was conducted in Yayo district and Chewaka Settlement area from January to February 2015 to determine the prevalence of trypanosomosis in sheep and goats. Blood samples were collected from the ear vein of sheep and goats after disinfecting and puncturing of the ear vein. The blood was channeled into heparinized micro- hematocrit capillary tubes and then after one end of the tube was sealed by crystal sealant. Collected samples were spun at 12,000 revolutions per minute (rpm) for five minutes to concentrate trypanosomes as buffy coat and to separate blood cells. The PCV of each sample was read on hematocrit reader and recorded. Then the sample was examined under microscope using 40X magnification power to detect the presence of motile trypanosomes. The trypanosome species were identified by Giemsa stained thin blood films [13].

Data Analysis: Data obtained on individual animals, parasitological and hematological examination results were entered into Microsoft Excel program 2007, and later on analyzed with STATA version 10.0 statistical software program. The prevalence of trypanosomes infection was calculated as the number of parasitologically positive animals examined by the buffy coat method divided by the total number of animals investigated at that particular time and multiplied by 100. The association between the prevalence of trypanosome infection and risk factors were assessed using Pearson’s Chi-squared test, whereas the Student’s t-test was used to assess the difference in mean PCV between parasitaemic and aparasitaemic ones. The test result was considered to be significant when the calculated \(P\)-value was less than 0.05.

RESULTS

Parasitological Findings: The overall prevalence of trypanosomosis in small ruminant in the study area was 3.24%. Out of the total examined sheep (230), 10 were infected with trypanosomes while three goats were infected out of 171 goats examined. Higher trypanosomes infection rate (5.26%) was recorded in Geri village of Yayo district, while the lowest was (2.04%) in Chefe Megertu (Table 1). The prevalence of trypanosomosis in Ovine and Caprine was 4.35 and 1.75%, respectively. Higher proportion (53.85 %) of the parasitaemic animals were infected with T. congolense and the rest (46.15%) were infected with T. vivax. As to the infection rate between
Table 1: Prevalence of small ruminant trypanosomosis in selected peasant associations of Yayo district and Chewaka settlement area

<table>
<thead>
<tr>
<th>Study areas</th>
<th>PAs</th>
<th>No. of examined (=N)</th>
<th>No. of positive (=N)</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yayo</td>
<td>Witete</td>
<td>66</td>
<td>3</td>
<td>4.55</td>
</tr>
<tr>
<td></td>
<td>Geci</td>
<td>26</td>
<td>1</td>
<td>3.85</td>
</tr>
<tr>
<td></td>
<td>Geri</td>
<td>38</td>
<td>2</td>
<td>5.26</td>
</tr>
<tr>
<td></td>
<td>Bondawo Megela</td>
<td>68</td>
<td>2</td>
<td>2.94</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>198</td>
<td>8</td>
<td>4.04</td>
</tr>
<tr>
<td>Chewaka</td>
<td>Dabena</td>
<td>59</td>
<td>2</td>
<td>3.39</td>
</tr>
<tr>
<td></td>
<td>Dire Misoma</td>
<td>48</td>
<td>1</td>
<td>2.08</td>
</tr>
<tr>
<td></td>
<td>Buneya</td>
<td>47</td>
<td>1</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>Chefe Megertu</td>
<td>49</td>
<td>1</td>
<td>2.04</td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td>203</td>
<td>5</td>
<td>2.46</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>401</td>
<td>13</td>
<td>3.24</td>
</tr>
</tbody>
</table>

\( (\chi^2=1.53, \ P=0.98) \) PAs= Peasant Associations

Table 2: Prevalence of trypanosomosis and associated risk factors in small ruminants

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of examined (%)</th>
<th>No. of positive (%)</th>
<th>P-value</th>
<th>( \chi^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>133 (33.17)</td>
<td>7 (5.26)</td>
<td>0.12</td>
<td>2.59</td>
</tr>
<tr>
<td>Female</td>
<td>268 (66.83)</td>
<td>6 (2.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caprine</td>
<td>171 (42.64)</td>
<td>3 (1.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ovine</td>
<td>230 (57.36)</td>
<td>10 (4.35)</td>
<td>0.15</td>
<td>2.10</td>
</tr>
<tr>
<td>Age groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 6 months</td>
<td>132 (32.92)</td>
<td>1 (62.50)</td>
<td>0.04</td>
<td>3.87</td>
</tr>
<tr>
<td>&gt;6 months</td>
<td>269 (67.08)</td>
<td>12 (37.50)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Mean PCV of trypanosome positive and negative small ruminants in Yayo and Chewaka

<table>
<thead>
<tr>
<th>Result</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>95%CI</th>
<th>DF</th>
<th>( t/-value )</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>17.31</td>
<td>2.90</td>
<td>0.80</td>
<td>15.56-19.06</td>
<td>12</td>
<td>8.33</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Negative</td>
<td>28.23</td>
<td>4.60</td>
<td>0.23</td>
<td>27.78-28.69</td>
<td>387</td>
<td>18.12</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>27.88</td>
<td>4.95</td>
<td>0.25</td>
<td>27.40-28.37</td>
<td>400</td>
<td>15.70</td>
<td></td>
</tr>
</tbody>
</table>

SD=Standard Deviation, SE= Standard Error, CI= Confidence Interval, DF= Degrees of Freedom, t=Student t-test, P=precision

The prevalence reported in the present study is relatively higher than those of the reports of Lemecha et al. [20] who reported 2.0 and 0.4% in sheep and goats respectively and Ohaeri [21] who had earlier reported 1.1% of trypanosomosis prevalence in sheep and 1.2% in goats in Abia, Nigeria. This might be attributed to the finding is lower to what was reported from different parts of Ethiopia by Mekonnen et al. [16] who reported 10.57% prevalence in goats in south-western Ethiopia; Dinka and Abebe [17] reported an infection rate of 5.1% in Didessa and Ghibe Valley, south-western Ethiopia; Kebede et al. [18] reported 6.3% prevalence of small ruminant trypanosomosis in west Gojam, north-western Ethiopia and Kebede et al. [19] reported 5.6% prevalence in north-western Ethiopia. The lower prevalence of trypanosomosis recorded in small ruminants in this study may be due to decrease in fly population by application of control measures such as spray/dipping of animals with acaricides, insecticide impregnated targets and regular treatment of sick animals with trypanocidal drugs.

DISCUSSION

The overall prevalence of trypanosomosis in sheep and goats in Yayo district and Chewaka settlement area was 3.24%. Leta and Mesele [14] reported a nearly similar value (3.75%) in small ruminants in Upper Didessa valley, southwestern Ethiopia. Farougou et al. [15] also reported a prevalence of 3.8% in sheep in Benin. The present the two sex groups, an infection rate of 5.26 and 2.24% was recorded for male and female animals, respectively. There was no significance difference in the prevalence of trypanosomosis between the two sexes (Table 2).

Hematological Findings: The overall mean PCV value of examined animals was 27.88%. The mean PCV values of trypanosome positive and negative animals were 17.31 and 28.23% respectively (Table 3). The mean PCV value was 27.33, 95%CI=26.67-27.98 and 28.61, 95%CI=27.89-29.3% in Ovine and Caprine respectively.
differences in epidemiological factors such as tsetse fly and/or other vector of trypanosomes’ density and the breed of these small ruminants.

The difference in the infection rate between Yayo district (4.04%) and Chewaka settlement area (2.46%) and peasant associations were not significant. This may be due to similarities in distribution and densities of the vectors of the disease and other epidemiological factors. Higher prevalence of trypanosomosis was recorded in sheep (4.35%) than in goats (1.75%). Several additional studies have replicated this finding. Samdi et al. [22] reported infection rate of trypanosomosis 2.39% in sheep and 1.88% in goats from Nigeria; Applewaighte [23] also reported 4.6 in sheep and 1.3 in goats from Guyana; Kalu and Uzoigwe [24] observed a prevalence of 1.2 in sheep and 0.7% in goats in Nigeria; Bacha et al. [25] reported 3.6% in sheep and 3.17% in goats from Ethiopia and Ameen et al. [26] reported 4.7% in sheep and 3.5% in goats from Nigeria. Ng’ayo et al. [27] also concluded that sheep are more sensitive than goats. Several authors have shown that the prevalence was lower in goats than in sheep because of differences in susceptibility to trypanosome infection between goat and sheep. This is usually related to tsetse feeding, i.e. the anti feeding behavior of goats (Leg kicks and skin rippling) and the docile nature and wool cover of the sheep [28, 29].

Two species of trypanosomes, namely $T. congolense$ and $T. vivax$ were identified in the study area during the study period. Of the total infected small ruminants, 53.85 and 46.15% were infected with $T. congolense$ and $T. vivax$ respectively. $T. congolense$ and $T. vivax$ are dominant trypanosomes species in sheep and goats. This finding is consistent with reports by different authors from different parts of Africa who concluded that $T. congolense$ and $T. vivax$ were the two trypanosomes species that pose major threats to sheep and goats in the continent [30-33].

The current finding indicated significantly higher prevalence in adults than young animals ($P<0.05$). Adult animals in the study are generally kept in the field for long periods of time that might predispose them to fly bite, instead, young animals, are usually kept indoor. Several other authors in the same way described that the adult animals are frequently more affected than the young animals [34, 35].

The PCV value was classified considering 22-45% as normal PCV for sheep and 22-38% for goats. The mean PCV value of infected small ruminant (17.31%) was statistically significant ($P<0.05$) from that of the non-infected (28.23%). Different studies indicated that trypanosomosis causes decline of PCV in small ruminants [36-39]. On the other hand, some animals with PCV below the threshold were parasitologically negative. This might be due to infection of these small ruminants with other diseases and inadequacy of the detection method (Buffy coat). This indicates that PCV alone cannot be used as diagnostic criterion for trypanosomosis because there are also other factors that may cause anemia. Other diseases considered to be affecting the PCV values in animals include blood parasites such as Babesiosis, Theileriosis, and Anaplasmosis [40] blood sucking helminths parasites, and nutritional deficiencies [41].

CONCLUSION

The prevalence of small ruminant trypanosomosis in Yayo district and Chewaka settlement area is 3.24%, indicating trypanosomosis is an important health problem in sheep and goats in studied areas. Therefore, due attention should be given to the control of this disease in order to alleviate its impact on the production and productivity of small ruminants and risks of transmission to other livestock.

REFERENCES


