Bovine Trypanosomosis in Asossa District, Benishangul Gumuz Regional State, Western Ethiopia: Prevalence and Associated Risk Factors

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Abstract: This study was conducted in Asossa district of Benishangul Gumuz Regional State, West Ethiopia between May, 2015 and June, 2015 to determine the prevalence of bovine trypanosomosis and the prevailing species of trypanosomes as well as to identify associated risks. Blood samples collected from 202 randomly selected cattle (Bos indicus) were analysed using parasitological and haematological techniques. Out of the 202 animals examined, 46/202(22.8%) was found trypanosomosis positive. The proportion of trypanosomes species revealed that Trypanosoma congolense was the most predominant 40/47 (85.1 %) followed by Trypanosoma vivax 6/47 (12.77%) and co-infection of these trypanosomes 1/47(2.13%). This difference in trypanosomes species prevalence was statistically significant (P<0.05). The mean packed cell volume (PCV) value of parasitaemic animals was lower (19.4%) than that of aparasitaemic animals (21.22%), however, the difference was not statistically significant (P>0.05). The prevalence of trypanosomosis was higher in animal with poor body condition than animals with good body condition and the discrepancy was statistically significant (P<0.05) Moreover, statistically significant variation was observed in contracting trypanosomosis between the age groups (P< 0.05) and the study kebeles. In conclusion, the result of the present study indicated the prevailing occurrence of trypanosomosis in the area necessitating integrated control measures.

Key words: Asossa District · Bovine · Prevalence · Risk Factor · Trypanosome · Trypanosomosis

INTRODUCTION

Trypanosomosis is a chronic infectious disease of livestock characterized by progressive loss of body condition, intermittent fever and edema caused by a range of unicellular protozoan parasites of the genus Trypanosoma. Trypanosoma congolense, Trypanosoma vivax and Trypanosoma brucei are species responsible for considerable production losses and livestock morbidity in Africa [1,2]. Most African trypanosomes are transmitted by biting flies with tsetse flies being the most important among the genus Glossina inhabiting many parts of the continent that extend about 15°N and 20°S of the equator [3,4].

Ethiopia is located at the East end of the African tsetse belt and tsetse flies are confined to West, Southwest and Southern regions [5,6] between longitude 33°and 38°E and latitude 5°and 12°N of an area covering 220,000 km² [7]. In Ethiopia, studies have confirmed the presence of five species of Glossina namely: Glossina morsitans submorsitans, Glossina pallidipes, Glossina tachinoides, Glossina fuscipes fuscipes and Glossina longipennis with the first four lists being the most widespread having significant economic importance [6]. Moreover, cattle pathogenic trypanosome species of T. congolense, T. vivax and T. brucei were identified in Ethiopia with T. congolense and T. vivax being the most prevalent in tsetse-infested areas [8].

In Ethiopia, bovine trypanosomosis is one of the major impediments to livestock development and agricultural production [6, 9]. Its effect is not only due to the direct losses resulting from mortality, morbidity, infertility of the infected animals and costs of treatment or controlling the disease but also due to indirect losses
including exclusion of livestock and animal power from the huge fertile tsetse infested areas [10] accounting for about 10 to 15% of the land believed to be suitable for livestock production [7]. Nevertheless, very few and limited studies were carried out previously to assess the prevalence of this disease in Asossa district. Therefore, the present study was conducted to determine the prevalence of bovine trypanosomosis and the prevailing species of trypanosomes as well as to identify host-related risk factors for bovine trypanosomosis prevalence.

**MATERIALS AND METHODS**

**Study Area:** Ethiopia is divided into administrative regions. Each region is divided into zones and zones are divided into districts which are further divided into kebeles. The study was conducted between May, 2015 and June, 2015 in Asossa district of Benishangul Gumuz Regional State. The region consists of three administrative zones namely: Asossa zone, Kemashi zone and Metekele zone and twenty districts. Asossa district covers an area of 2317 km² having altitudinal range of 580-1544 meter above sea level. The average annual rainfall is 900-1200 mm with uni-modal type of rainfall that occurs between April and October and average temperature ranges of 19°C-34°C [11]. The area is characterized by mixed type of farming system having 34.2% cattle, 15% goats, 37% sheep, 18% donkeys, 13% poultry and 10% beehives of the livestock population of the Asossa zone [12, 13].

**Study Design and Study Population:** Across sectional study design was used. The study kebeles (Abrhamo and Kushmengel) were purposively selected for their accessibility and large livestock population. The study animals were zebu cattle (*Bos indicus*) kept under extensive traditional husbandry condition grazing the communally owned pastureland throughout the year. A total of 202 cattle were sampled at their communal grazing area using simple random sampling. The body condition of each of the study cattle was scored as good, medium and poor [14]. Simultaneously, their age was determined based on De-Lahunta and Habel (1986) [15] standards.

**Study Methodology and Procedures**

**Packed Cell Volume (PCV) Determination:** Blood samples were obtained by puncturing the marginal ear vein with a lancet and collected directly into a pair of heparinised capillary tubes. The tubes were then sealed at one end with crystal seal. PCV was measured in a micro-haematocrit centrifuge (Hermmle Labortechnik, type Z, Germany). The capillary tubes were placed in microhaematocrit centrifuge with sealed end outermost. Then 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 minutes. After centrifugation, the capillary tubes were placed in a haematocrit reader. The length of the packed red blood cells column is expressed as a percentage of the total volume of blood. Animals with PCV less than 24% were considered to be anaemic [16].

**Buffy Coat Technique:** Heparinised microhaematocrit capillary tubes, containing blood samples were centrifuged for 5 minutes 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 onto a glass slide and covered with cover slip. The slide was examined under x40 objective and x10 eye piece for movement of parasite [17]. Trypanosome species were identified according to their morphological descriptions as well as movement in wet film [16].

**Data analysis:** All the collected raw data and, the results of parasitological and haematological examination data were entered into a Microsoft excel spread sheets program and then was transferred to Intercool STATA version 7 for analysis. The prevalence of trypanosome infection was calculated as the number of positive animals as examined by buffy coat method divided by the total number of animals examined at the particular time. Pearson’s chi-square ($x^2$) was used to evaluate the association of different variables with the prevalence of trypanosome infection. In all the statistical analysis executed, a confidence level of 95% is used and $P$-value of less than 0.05 (at 5% level of significance) was considered as statistically significant.

**RESULTS**

**Packed Cell Volume (PCV) Measurement:** The overall mean PCV value of 20.79% was recorded during the study period. The mean PCV value of infected animals was lower (19.4%) than that of non-infected animals (21.22%). However, the difference was not statistically significant ($P>$0.05).
Trypanosomes Prevalence: Among the 202 cattle examined, 46(22.8%) was found trypanosomosis positive. The proportion of trypanosomes species indicated that *T. congolense* 40/47(85.1%) was the most prevailing trypanosome followed by *T. vivax* 6/47(12.8%) and mixed infections 1/47(2.13%). The difference in prevalence between the species of trypanosomes was statistically significant (P<0.05).

Risk Factors for Trypanosomosis Prevalence: The prevalence of trypanosomosis was higher in males as compared to females, but the difference was not statistically significant (P> 0.05). The highest prevalence was observed in adult animals (>2 years old) and the variation in prevalence between the age groups was statistically significant (P<0.05). There was a statistically significant variation in the prevalence of trypanosomosis (P<0.05) among cattle with different body conditions with poor body condition animals being the most susceptible. Trypanosomosis prevalence among kebeles was statistically significant (p<0.05) with higher prevalence being recorded in Kushmengel than Abrhamo.

**DISCUSSION**

The present study revealed an overall prevalence of 22.8%, which is in consistent with previous reports in Asossa district [18]; in the neighbouring areas such as Mao-Komo district [19] and Metekele zone [20] and in South Nations, Nationalities and People’s Region, south Ethiopia [21]. The similarity amongst these reports could be because of the comparable altitudes and fly density of the study areas.

In this study, *T.congolense* was the predominant species causing bovine trypanosomosis in the area followed by *T. vivax, T.congolense and T.vivax* mixed infections. This result is in alignment well with earlier works [22-25]. The high proportion infection rate of *T. congolense* in cattle might be attributable to the high number of serodems of *T. congolense* relative to *T. vivax*. It could also be due to the possible development of better immune response to *T. vivax* by the infected animals [26]. Further, it might be attributed to the efficient transmission of *T. congolense* by cyclical vectors than *T.vivax* in tsetse-infested areas. Previous reports indicated that *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of Ethiopia respectively [9, 27].

The current study revealed an overall mean ( $\bar{X}$ ) PCV value of 20.79% indicating that all the examined animals were anemic, however, only 22.8% of them found trypanosomosis reactive. This might be attributable to the lower sensitivity of the buffy coat technique employed [28]. Plus, it could be due to delayed recovery of anemic conditions consequent to current trypanocidal drugs chemotherapy. Furthermore, it may be for the combined impact of malnutrition and blood sucking helminthes infestation [29].

The study showed that the association between trypanosomosis and the different body conditions was statistically significant (P<0.05). The prevalence of trypanosomosis was higher in animals with poor body conditions than in with good body conditions. This is lining up with prior reports [18, 19, 22, 30, 31]. This may be because of the chronic characteristic of trypanosomosis causing progressive emaciation. Also, it can be because of the fact that well-conditioned animals have better immune status than poor ones having the capability of responding to any foreign protein [32].

Statistically significant (P<0.05) higher infection rate was recorded in older (> 2 years old) than young (≤2 years old) animals. Similar results were reported earlier from other research groups [18, 33]. This might be attributable to the tsetse’s feeding behavioral preference for older animals [34] or might possibly be due to restricted grazing of young animals near homestead where there are less number of tsetse flies reducing the probability of being bitten by them. Nevertheless, the precise scientific explanation for the phenomenon is not clearly understood necessitating further research.

The study demonstrated statistically significant (p<0.05) trypanosomosis prevalence between the study kebeles. Higher prevalence was recorded in Kushmengel (altitude 1277m) than Abrhamo (altitude 1440m). This could possibly be due to the relative ecological difference such as tsetse breeding site, vegetation coverage and altitudinal differences. This was substantiated by earlier works [9, 25, 35, 36] demonstrating decrement of apparent density of tsetse flies as altitude increases reflecting ecological pattern variation as a determinant factor for trypanosomosis prevalence.

**CONCLUSIONS**

This study indicated that *T. congolense* was the most prevailing trypanosome followed by *T. vivax* and their mixed infections. In addition, it was revealed that older animals (> 2 years old) and animals with poor body conditions are most susceptible to contract trypanosomosis in the study area. In conclusion,
trypanosomosis is an important disease and a potential threat that affects the health and productivity of cattle in Asossa district. Therefore, proper strategies have to be designed and implemented to minimize its effect on livestock production in the studied area.

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REFERENCES


