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Prevalence of Bovine Trypanosomosis in Assosa District of the Benishangul Gumuz Regional State, Western Ethiopia

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Abstract: A cross sectional study was carried out in Assosa district of Benishangul Gumuz Regional State, Ethiopia from December to November, 2017 to determine the prevalence of bovine trypanosomosis and the existing species of trypanosomes. Blood samples collected from 294 randomly sampled cattle (*Bos indicus*) was examined using parasitological (buffy coat technique) and haematological (Measurement of packed cell volume) procedures. An overall, 16 (5.44%) prevalence of trypanosomosis was recorded. The infection was caused by *Trypanosoma congolense 11/16 (*68.75%), *Trypanosoma vivax* 5/16 (31.25%). The mean packed cell volume (PCV) value of infected animals was lower 17.02±4.95 in Trypanosoma positive animals and 26.52±2.79 for negative animals and the variation was found statistically significant (P<0.05). Similarly, higher prevalence (80%) of trypanosomosis infection was registered in animals with poor body condition when compared to animals with medium (20%) and good(0%) body condition and the difference was statistically significant (P<0.05). In contrast, prevalence of trypanosomosis was not statistically significant among sex groups of study animals (P> 0.05).

Key words: Bovine · *Glossina* · PCV · Prevalence · *Trypanosoma* · Tsetse Fly

INTRODUCTION

Bovine trypanosomosis is a major animal disease constraint to livestock production in sub-Saharan Africa. It is estimated that some 46 million cattle are at risk of contracting African animal trypanosomosis in sub- Saharan Africa [1]. Trypanosomosis is a parasitic disease caused by species of flagellated protozoa belonging to the genus *Trypanosoma* which inhabit the blood plasma, various body tissues and fluids of vertebrate host. The disease is transmitted cyclically by tsetse flies (*Glossina* spp) and none cyclically by other biting flies [2]. This parasite restricts animal production, besides causing economic losses by the clinical signs of the infection such as restricted growth, abortion, anemia, treatment cost and death of the affected animals [3].

Trypanosomosis induces loss of body condition in pregnant animals leading to birth of offspring‘s, with low birth weights fetal and neonatal losses, besides production losses in lactating animals. The consequences of trypanosomiasis are less severe in better-nourished animals but good nutrition does not by itself provide protection. Adequate energy, protein and vitamin nutrition enhances the ability of trypanosome-infected animals to withstand the adverse effects of infection [4]. The most important trypanosome species affecting livestock in Ethiopia are *Trypanosoma congolense*, *Trypanosoma vivax* and *Trypanosoma brucei* in cattle, sheep and goats, *Trypanosoma evansi* in camels and *Trypanosoma equiperdium* in horses [5].

The influence of tsetse on African agriculture through the transmission of trypanosomosis continues to be a major constraint to the development of national economies and their achievement of self-sufficiency in basic food production. The general distribution of tsetse flies is determined principally by climate and influenced by altitude, vegetation and presence of suitable host animals [6]. Tsetse flies in Ethiopia are confined to

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southern and western regions between longitude of 33 0 and 380 East and latitude of 50 and 120 North which amounts to be about 200, 000 Km^2. Tsetse infested areas lies in the low lands and also in the river valleys of Blue Nile, BaroAkobo, Didessa, Ghibe and Omo. Benishangul Gumuz is one of the five regions of Ethiopia infested by more than one species of tsetse flies [7]. Five species of *Glossina* (*Glossina morsitans morsitans, G. pallidipes, G. tachnoides, G. f. fuscipes* and *G. longipennis*) have been registered in Ethiopia [8]. Apart from the cyclical transmission of trypanosomosis by *Glossina* spp, it is highly considered that mechanical transmission is a potential threat to livestock production and productivity in some parts of Ethiopia [5].

Benishangul Gumuz is one of the five regions of Ethiopia infested by more than one species of tsetse flies [7]. In the study region of Benishangul Gumuz regional state, four glossina species namely, *G. tachinoides, G. morsitantsubmorsitances, G. pallidipes* and *G. fuscipes* were found [8]. Assosa is one of the twenty districts of the Benishangul Gumuz regional State with a serious problem of trypanosomosis. Controlling this economically important disease in this area could have a number of benefits to improve the livelihood of the poor people of the district by increasing milk, meat, surplus capital from the sale of livestock and livestock products and improving the availability of draft power (oxen). Although the disease is one of the major obstacles of livestock production in the district, there is no study conducted to know prevalence and situation the disease to take action in the control of the disease.

Benishangul Gumuz is one of the five regions of Ethiopia infested by more than one species of tsetse flies [7]. Apart from the biological transmission of trypanosomosis by *Glossina* spp, it is highly considered that mechanical transmission is apotential threat to livestock production and productivity in some parts of Ethiopia [5].

As stated above, the negative impacts of tsetse flies and trypanosomosis in the Benishangul Gumuz reginal state are so vast, however, since Assosa tsetse flies and trypanosomosis investigation and control center was established in the region the problems of the disease is somewhat addressed in almost half of the region. Hence, intervening in the prevention and control of tsetse flies and trypanosomosisis very vital in the region. Assosa district is one of the twenty districts of the Benishangul Gumuz regional state with a serious problem of trypanosomosis. Controlling this economically important disease in this area could have a number of benefits to improve the livelihood of the poor people of the district by increasing milk, meat, surplus capital from the sale of livestock and livestock products and improving the availability of draft power (Oxen). The disease is one of the major obstacles of livestock production and productivity in the district and study on the prevalence of bovine trypanosomosis was carried out by previous researchers [9] indicating an overall prevalence of 25.8% and no further study and control intervention has been carried out since then. The objectives of the study were to determine the prevalence and to identify the risk factors influencing bovine trypanosomosis in the Assosa district.

MATERIALS AND METHODS

Description of the Study Area: Assosa district is found in Benishangul Gumuz Regional State, that stretches over 2313 km in a major tsetse and tsetse born Trypanosomosis belt area, characterized by low land plane with altitude range of 580-2731 m.a.s.l. and average temperature of 17°C-30°C. The average annual rain fall is 900-1350 mm. The major Agricultural activity in the area is mixed farming system whereby crops are cultivated and different species of livestock are kept. The total livestock population of the district is estimated as 20, 785 cattle, 25943 goats, 5689 sheep, 5420 equines and 53, 185 poultry according to 2017 district survey. The major livestock diseases of the region are Trypanosomosis, Pasteurellosis, Internal and External parasites.

Study Design and Study Animals: Cross sectional study design was implemented to zebu cattle (*Bos indicus*), which are mainly kept under an extensive husbandry system grazing the communally owned pasture land throughout the year was randomly sampled. Study animals were herded together during the day time and returned to their individual owner's farmstead every evening. The body condition of each of the study animal was scored as good, medium and poor [10]. Similarly, their age was determined based on De-Lahunta and Habel [11] principles as young (<2 years), matured (2-5 years) and adult (> 5 years).

Sampling Techniques and Sample Size Determination: The sample size were determined by using 95% level of confidence interval and expected prevalence of 25.8% with desired absolute precision of 5% & simple random sampling method were used [12]. A total of 294 blood samples were collected from selected 5 villages of the district based on simple random selection.

Collection of Blood Sample: Blood samples were collected from ear vein using a sterile lancet into a pair of heparinized capillary tubes (75x1.2 mm) from each of the randomly selected animals. Each tube was sealed with crystal seal on one end [13]. The blood samples were centrifuged at high speed (12, 000 rpm) for 5 min. Finally the packed cell volume (PCV) values were read by micro haematocrit reader, which can be adjusted individually for the length of the blood column in each tube, to get a value indication on the presence, absence and degree of anemia [14]. After centrifugation, the capillary tube were cut down using diamond pointed pen 1 mm below the buffy coat to include the upper most layers of the red blood cells and 3mm above to include the plasma so that the contents will be gently expressed on to a slide, mixed and covered with a cover slip (22 x 22 mm). The preparation were then be examined fewer than 10X eye piece in combination with a 40X objective microscopes to get optimum view allowing large visual field and sufficient magnification for easy identification of trypanosomes and for their morphological features after Giemsa staining under 100X objective will be used [14, 15].

Data Management and Analysis: During the study period address, breed, sex, age and body condition score of the animal were recorded using the animal blood sample collection format & enter into Microsoft Excel spread sheet. Hematological & parasitological data were handled very carefully. The entered data were transferred to stata 7 Software, Chi square test were used to compare the prevalence of trypanosomosis indifferent variables & to determine the relationship between the categorical variables & the result. The prevalence of bovine trypanosome infection was calculated as the number of parasitological positive animal was examined by buffy coat method to the total population at risk [12].

RESULTS

Parasitological Findings: A total of 294 cattle were examined for Trypanosomosis. Out of total Animals examined, 16 (5.44%) animals were infected with trypanosomes. The Trypanosome species identified in blood smear of cattle were *T. congolense*, *T. vivax*. The highest and the lowest prevalence were recorded in

Table 1: Trypanosomosis prevalence in relation to origin

PA's (site)	No animals examined	Tc infected animals	Tv infected animals	Prevalance (%)	χ^2	P-value
Qoshmangal	50	1	3	25	2.0056	0.735
Comoshga 26	150	5	1	37.5		
Selga 22	50	3	-	18.75		
Tsetse aderenum	23	1	-	6.25		
Agusha	21	1	1	12.5		
Total	294	10	5	5.44		

Tc-Trypanosome congolenses, Tv-Trypanosome vivax, no-number

Table 2: Prevalence of bovine Trypanosomosis based on host related risk factors

Variables	No examined	No infected	Prevalence (%)	χ^2	(P-value)
Sex					
Males	161	8	8 (4.96)	0.1549	0.694
Females	133	8	8 (6)		
Age					
< 2	20	4	4 (20)	10.8610	0.004
2-7	174	5	5 (2.87)		
> 7	100	7	7 (7)		
Body condition					
Good	34	0	0 (0)	12.7282	0.002
Medium	160	4	20		
Poor	100	12	80		

Table 3: Mean PCV and SD of Infected and Non-Infected Animals

Condition	Number mean	PCV(%)±std.Deviation	χ^2	P-value
Infected	16	17.02±4.98	38.5154	<0.001
Non infected	178	26.52±2.79		

Qoshmangal 4/16 (25%), Comoshga 6/16(37.5%), Selga 3/16 (18.75%), Agusha 1/16 (6.25%) and Aderenum 2/16 (12.5%) villages, respectively and it was statistically insignificant (P>0.05) (Table 1). From a total of 16 (5.44%) animals infected with Trypanosomosis, 11/16 (68.75%) were infected with *T. congolense*, 5/16 (31.25%) with *T. vivax*. In this particular study, it was found out that infection by *T. congolense* was the most prevalent one as compared *T. vivax*. The prevalence of Trypanosomosis is almost the same in both sexes; the infection in female is slightly higher than in the male even if the results obtained during examination were 8 (50%) and 8(50%) in male and female, respectively and it was statistically insignificant (P>0.05) (Table 2).

Out of sampled animals, 20 were <2 years old, 174 were 2-7 years old and 100 were > 7 years old. From < 2 years old 4/16 (25%) animals were positive, from 2-7 years old 5/16(31.25%) animals were positive and from >7 years old 7/16 (43.75%) animals were positive for the trypanosomosis. The prevalence of bovine trypanosomosis was statistically significant in different age groups of the animals (P <0.05). From the total of 294 animals examined 33 were good, 164 were medium while 101 were with poor body condition scores. Out of total animals examined 4/16 (25%) animals from medium body conditions and 12/16 (75%) animals from poor body condition scores were positive of trypanosomosis and statistically significant (P <0.05) (Table 2).

Hematological Findings: The mean Packed Cell Volume (PCV) value for a parasitaemic (Noninfected) animals were 26.52±2.79 and mean PCV value of the parasitaemic (infected) animals was 17.02±34.98. There was great statistically significant difference in the mean PCV value between the noninfected and infected animals (P<0.05) (Table 3).

DISCUSSION

The present study revealed an overall prevalence of 5.44% trypanosomosis infection in the study area. This finding was slightly higher than the findings of Getachew and Asmamaw [16] in Mandura district of the Benishangul Gumuz regional state, Western Ethiopia, who reported 13.30% prevalence in their study on epidemiology of cattle trypanosomosis and associated anaemia, Bayisa and Getachew [17], who reported 11.70% in their study on trypanosomosis and its associated risks in cattle population of Dangur district of the Benishangul Gumuz regional state, Western Ethiopia and Zelalam *et al*. [18], who reported 16.10% in their study on prevalence of bovine trypanosomosis and associated risks in Mao Komo Special district of the Benishangul Gumuz regional state, Western Ethiopia. However, the current finding was lower than the previous findings of Bayisa *et al*. [19], who reported 22.38% of prevalence in Assosa district of the Benishagul Gumuz regional state, Western Ethiopia and Mulaw *et al*. [20] whose result indicated 28.10% in their study on the prevalence of major trypanosomes affecting bovine in tsetse infested Assosa district of the Benishangul Gumuz regional state, western Ethiopia. The difference in the prevalence of trypanosomosis in the previous and the current findings might be due to the difference in agro ecology and climatic conditions of the areas and partly it might be the difference in seasons in the study period.

The current finding indicated that the infection was mainly caused by *T. congolense* (68.75%), *T. vivax* (31.25%). This result was nearly the same with the reported proportions of *T. congolense* by Abraham and Zeryehun [21] who conducted their study on prevalence of bovine trypanosomosis in selected sites of Arba Minch district, Sothern Ethiopia, whose result showed proportional prevalence of *T. congolense* to be 61.4% [22] whose finding showed proportional prevalence of *T. congolense* to be 63.64% during their work on trypanosomosis and anemia in cattle population of Dale Wabera district of Kellem Wollega Zone, Western Ethiopia. This result was also nearly the same with prior report of Mulaw *et al*. [20] who found proportional prevalence of *T. congolense* to be 66.7%.The high proportional infection rate of *T. congolense* in cattle might be attributable to the high number of serodems of *T. congolense* relative to *T. vivax* trypanosomes. It could also be due to the possible development of better immune response to T. vivax by infected animals as demonstrated by Leak *et al*. [23].

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 andtsetse free areas of Ethiopia respectively [24]. Studies carried out by Leak *et al*. [24] and Rowland *et al*. [25] have indicated that *T. vivax* is highly susceptible to treatment while the problem of drug resistance is higher in *T. congolense*. The effect of different risk factors such as sex and study sites on prevalence of bovine trypanosomosis was studied and statistically insignificant (P>0.05), while body condition, age groups and PCV values were found to be statistically significant (<0.05).

This result was in agreement with previous reports of Mulaw *et al*. [20] whose result indicated that sex and study sites did not show statistically significant association with trypanosomosis infection; It was also in consistent with the previous work of Asmamaw and Mengistu [26] in the neighbouring district (Bambasi) whose result revealed that no statistically significant association was observed among study sites and sex groups; however, in contrast to the present result their finding showed that no statistically significant association was seen between age categories of study animals.

Moreover, the current finding was in agreement with study conducted by Lelisa *et al*. [27] with regard to sex group and study sites of study animals with trypanosomosis infection because their study revealed that no statistically significant association was observed among the above mentioned variables and trypanosome infection. The present finding was also in consistent with the previous work of Yehunie *et al*. [28] in that their finding indicated that there was statistically significant association between body condition score of study animals.

The mean PCV value of infected animals was lower 17.02±4.98 than that of non-infected animals 26.52±2.79and there was statistically significant association between PCV values and trypanosome infection of the study animals. This result was in alignment with previous works of Asmamaw and Mengistu [26], Lelisa *et al*. [28] and Gemeda [29] whose PCV values and trypanosome infection in the previous study animals coincide with the present result.

CONCLUSION

The overall moderately high prevalence of trypanosomosis obtained in cattle of Assosa district indicated the importance of the problem and its contribution to hampering the product, productivity, work performance and general health status of these animals. The most widely distributed and dominant species of trypanosome in the study sites are *T. congolense* and the only identified trypanosome species are *T. congolense* and *T. vivax*. Assosa district is favourable for the successive breeding of tsetse and other biting flies that play a major role in the transmission of trypanosomes to susceptible hosts and hence, designing and implementing control strategies of trypanosomosis focusing on vectors control and against the parasites will be undertaken in the study area and farmers of the district have to be educated about the impact of trypanosomosis on the health and productivity of animals so as to implement participatory approach in the control of the vectors and parasites.

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