Acta Parasitologica Globalis 4 (3): 99-104, 2013
ISSN 2079-2018

DOI: 10.5829/idosi.apg.2013.4.3.7554

Prevalence of Small Ruminants Trypanosomosis in Assosa District of Benishalgul Gumuz Regional State, Western Part of Ethiopia

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Abstract: A cross sectional study was conducted in western part of Ethiopia Assosa district Benishalgul Gumuz region from November 2011 to March 2012 to determine the prevalence of trypanosomosis in small ruminants in the area. Blood samples were collected from local sheep (210) and goats (200) of different sex, age, body conditions and coat colors. Up on parasitological survey blood sample of 410 small ruminants were examined using Buffy coat technique and the packed cell volume of each animal was also measured. Of the total small ruminant examined during the study period 28 (6.8%) animals were infected with trypanosomosis of which 15 (3.6%) were sheep and 13 (3.17%) were goats. The species identified in the infection were *Trypanosoma congolense* 12 (42.8%), *Trypaanosoma vivax* 7 (25%), *Trypanosoma brucie* 3 (10.7 %), mixed infections were also identified. The prevalence of Trypanosoma species in each small ruminant is *Trypanosoma congolense* 6 (40%), 6 (46.1%), *Trypaanosoma vivax 4* (26.6%), 3 (23%), *Trypanosoma brucie* 2 (13.3 %), 1 (7.7%), mixed infection of *Trypanosoma congolense* and *Trypanosoma vivax* 2 (13.3%), 2 (15.3%) and mixed infection of *Trypanosoma congolense* and *Trypanosoma brucie* 1 (6.6%), 1 (7.7%) in sheep and goat respectively. The mean PCV of parasitemic and aparasitemic animals during the study period was 16.82 and 27.13 with a significant difference ($P< 0.05$). The infection in poor body conditioned animals where significantly different from those with Good and Medium body conditioned animals ($P<0.05$). As the study revealed trypanosomosis in small ruminant of the study area has great impact on production and potential risk for transmission to other livestock, implementing control of trypanosomosis with an integrated approaches have vital importance in the study site.

Key words: Small ruminants · Assosa District · Prevalence · Trypanosomosis

INTRODUCTION

Sheep and goats play an important role in improving the economy of small farmers, for those who are unable to keep large animals such as cattle in Ethiopia [1]. According to Food and Agricultural Organization [2] of the United Nations (UN) report, Trypanosomosis is probably the only one that profoundly affects the settlement and economic development of major parts of Africa. In general the existence and severity of trypanosomosis risk shapes farmers to choices about the size and structure of their cattle herds. Trypanosomosis likely reduces the total production of livestock by 10-50% [3-5].

Trypanosomosis is a serious disease in domestic livestock that causes a significant negative impact in food and economic growth in many parts of the world, particularly in sub Saharan Africa. African animal trypanosomosis and its vector occur in vast areas of sub Saharan Africa with devastating impact on livestock productivity. Its epidemiology and impact on livestock production is determined largely by the prevalence and distribution of the disease and its vector in the affected areas [6].

Trypanosomiasis restricts the keeping of domestic farm animals which limits the development of mixed livestock farming by affecting the traction force they have [7]. The disease directly affects the milk and meat productivity of animals and reduces birth rate, increase the abortion rate as well as mortality rate; all of these affect the herd size and composition [8].

Currently tsetse flies (glossina) inhabit wide range of habitat covering approximately 11.6 million km^2 of Africa, representing 37% of the land area of the continent and affecting 37 countries including Ethiopia. About 30% of total cattle population in African continent and about

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50 million people are exposed to animal trypanosomosis and human sleeping sickness respectively. It is estimated that 7 million km^2 of tsetse infested areas in Africa would be suitable for livestock and mixed agriculture, if trypanosomosis could be controlled [9].

Tsetse flies in Ethiopia are confined to southern, western and southwestern regions between longitude 33° and 38°E and latitude 5° and 12°N. Tsetse infested areas lie in the low lands and also in river valleys of Baro, Akobo, Didesa, Abay, Ghibe and Omo [6]. Tsetse transmitted animal trypanosomosis is, therefore, one of the most significant and costly diseases in Ethiopia hindering the effort made for food self-sufficiency [10].

Tsetse flies feed on small ruminants as a result; these animals are susceptible to trypanosomosis. Goats has been reported to be resistance to trypanosomosis, However several studies on the prevalence of trypanosomosis in goats in different countries such as Nigeria, Ethiopia and Kenya revealed that goats acquire natural infection resulting in economic loss [11]. Although small ruminant appear to perform better than cattle in various agro ecological zones the importance of trypanosomosis has not been extensively investigated in these lives stocks. Although there have been several reports in live stocks tryponosomosis, there is no data on the prevalence of tryponosmosis in sheep and goat in western and north west part of Ethiopia. Even though trypanosomosis is known to be endemic in Assosa Benishalgul Gumuz regional state; there were no records on the importance of trypanosomosis in the sheep and goats of the region. Therefore, the study was designed to determine the prevalence of trypanosomosis in sheep and goats in Assosa district, identify in which small ruminant species the trypanosomosis was more prevalent, identify and determine the dominant trypanosome species in the study sites and compute different parameters such as PCV in relation with trypanosomosis.

MATERIALS AND METHODS

Study Area: The study was conducted on prevalence of trypansomosis in sheep and goats kept in Assosa Wored/district which is found in Benishangul Gumz regional state of Ethiopia. The region consists of three administrative zones, namely Assosa zone, Kemashi zone and Metekel zone and twenty districts of which two are special districts. The regional state is located in the west and north western part of Ethiopia. Assosa is the town in western Ethiopia and capital of the Benishangul Gumuz regional state of being located in Assosa zone. It is 675 km away from Addis Ababa. The region has common boundary with Amhara in north, Oromia in the north and east, Sudan in west and Gambela in the South [12]. According to the Assosa district agricultural and rural development office, the district is divided in to 78 peasant associations with total population of 92,144. The district is located in 580-1500 meter a.s.l, with average temperature of 19-34c° The average rain fall is 900-1200 mm annually and the total size of the area is about 2317 km^2. The total livestock population of the area is estimated to be cattle 2992, sheep 4778, goats 24139, donkeys 5171, mules 74 and poultry 31177. The livestock management system is mixed farming system [12]. The major crop grown in the area are sorghum, maize, soya been, ground nut, sweet potato, banana and mango. The major livestock diseases of the region are trypoanosomosis, pasteurellosis, Contagious Bovine pleuropneumonia (CBPP) and internal and external parasites are the known ones.

Study Design and Study Animals: A Cross sectional study was conducted to determine prevalence of trypanosomosis in sheep and goats from November 2011 to May 2012. For this particular research, the study animals were sheep and goats under extensive traditional husbandry system from different kebeles in Assosa Wored/district. The animals were classified in different body conditions (medium, poor and good), age groups (above 6 month and bellow six month) and other factors including sex and species to determine prevalence of trypanosomosis in sheep and goats [13].

Sample Size and Sampling Methods: A total of 410 blood samples were collected from the district's selected villages based on simple random selection. 200 goats and 210 sheep where used. The sample size was determined by using 95% level of confidence internal and expected prevalence of 50% trypanosomosis with desired absolute precision of 5% and simple random sampling method was used [14]. The formula used to calculate the sample size is shown bellow.

$$N=\frac{(1.96)^2 \text{ p exp (1-p)}}{d^2}$$

P exp = expected prevalence
P = prevalence
N = required sample size
d = desired absolute precision

Sample Collection and Parasitological Examination: Paired blood samples were collected from ear vein of selected sheep and goats after properly securing the animal and aseptically preparing around the vein by using sterile blood lancet needle and heparinized microheamatocrit capillary tube to its ¾ volume.

Parasitological Examination: Preparation of thin stained blood films: A drop of fresh blood was placed on the narrow edge of a microscope slide. This edge is then placed on another slide lying on a flat surface, so that the blood droop lies in the acute angle between the two slides. The inclined slide was then pushed along the recumbent one so that the blood is pulled behind it and spread in a thin layer over the stationary slide. The latter was then air dried.

Giemsa Staining Technique: A blood smear was air dried and fixed by methanol for 10 minutes. It was then dried and immersed in Giemsa stain (10% Giemsa in Weise buffer and P^H 7.2) for 35-40 minutes. It was then washed under tap water to remove extra stain and then air dried. The stained smears were then observed under a microscope at 100 X oil immersion [15].

Buffy Coat Technique (BCT): Following blood centrifugation at 12,000 rpm for 5 minute in heparinsed microheamatocrit capillary tubes sealed in the Buffy-coat zone. The capillary tube was then cut using diamond pen 1mm below the Buffy-coat to include the upper most layer of the red blood cells and 3 cm above to include the plasma. The content of the capillary tube expressed on the slides and mixed then covered with a covered slip (22x22cm) the preparation was then examined with oil immersion at 100 X. This makes it easy to recognize the trypanosomes by their appearance and by their movement. *T. congolense* was recognized by its small size in relation to red blood cell diameter, its sluggish activity and its invariable attachment to the red blood cells. *T. vivax* on the other hand was seen large and striking apparent by the speed with which it traverse the microscopic field. *T. brucie* was distinguished by its large size and going round in circle in particular location [15].

Data Management and Analysis: During the study period, data were collected using the sample collecting format and entered into Microsoft Excel. Hematological and parasitological data were managed very carefully. Then the data from the Microsoft excel sheet were processed and analyzed by using a statistical software program (SPSS version 16 ©2007 SPSS inc). Chi-square was used to compare the prevalence of trypanosomosis in different variables and to determine the relation between variables and the result. Data collected on PCV values were analyzed by ANOVA to compare the mean PCV values of parasitemic animals against that of aparasitemic animals. In all cases the difference between parameters were tested for significance at probability level of 0.05 or less. The prevalence of small ruminant trypanosomosis infection was calculated as a number of parasitological positive animals as examined by buffy coat method to the total population at risk [14].

RESULT

Parasitological Findings: In the study area, the overall prevalence of trypanosomosis was found to be 6.8%. It was 7.1 % in sheep and 6.5% in goats. The trypanosome species identified in blood smear of both species of small ruminants were *T. cogolense*, *T. vivax, T. brucei* and mixed infections of *T. congolense* and *T. vivax* and *T congolense* and *T. brucei*. All organisms were found in both species, *T. brucie* had the lowest over all prevalence. The difference in the prevalence of trypanosomiasis in both species of animal was not significant ($P > 0.05$) (Table 1)

The total prevalence of *T. congolense* was 2.9% and 3% in each species. In association the overall prevalence of *T. vivax* was 1.7% being 1.9% and 1.5% in sheep and goat respectively. The total prevalence of *T. brucei* was found to be 0.7% and 1% and 0.5% in sheep and goat consecutively. The on the other hand overall prevalence of mixed infection of *T. congolense* and *T.vivax* was 1% and similarly 1% in each species. In this particular study it was found out that, infection by *T.congolense* species was the most prevalent one followed by *T.vivax,* mixed infections and *T.brucei* (Table 2). The prevalence of trypanosome species was found to be statistically significant ($P < 0.05$).

From the total of 276 (67.3%) small ruminants which were greater than 6 month old 23 (5.6%) of them were positive for trypanosomosis. On the contrary out of 134 (32.7%) which were less than 6 month only 5 (1.2%) of them were found to be infected.

The study also tried to categorize animals in to different body conditions as good medium and poor body conditions. From total 410 animals examined 88 (21.5%) were good, 252 (61.5%) were medium and 70 (17.1%) were poor body conditioned animals. The difference of prevalence of trypanosomosis among the body condition

Table 1: Prevalence of trypanosomosis in small ruminant

Animal species	No Examined	No of positive animals (%)	P-Value
Sheep	210	15 (7.1)	0.476
Goat	200	13 (6.5)	
Total	410	28 (6.8)	

Table 2: Distributions of trypanosoma species in the small ruminants in the study area

Parasite species	No of positive animals	Prevalence %	P- value
T. congolence	12	2.9	0.00
T. vivax	7	1.7	
T. brucie	3	0.7	
Mixed (*T. con& T. vivax*)	4	1.0	
Mixed (*T. con &T. brucie*)	2	0.5	
Total	28	6.8	

Table 3: The prevalence of trypanosomosis in relation to age, sex and body condition

Variable	No of animals examined (%)	No of positive (%)	P-Value
Age			
>6 month	276	23 (8.3)	0.59
< 6 month	134	5 (3.7)	
Sex			
Male	141(34.4)	5 (3.7)	0.056
Female	269 (65.6)	23 (8.3)	
Body condition			
Poor	70 (17.1)	9 (12.9)	0.014
Medium	252 (61.5)	18 (7.1)	
Good	88 (21.4)	1 (1.1)	
Total	410	28 (6.5)	

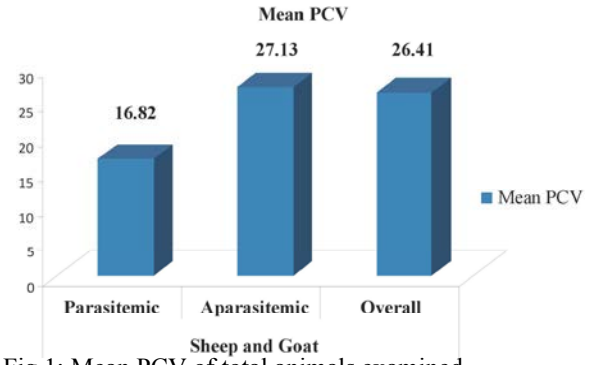

Fig 1: Mean PCV of total animals examined

score was significant (P<0.05) being higher in poor body conditioned animals. The prevalence of trypanosome in both species is varying in both sexes; the prevalence in female animal is slightly higher than in male. However difference in the prevalence of the trypanosome between sexes was not significant (Table3).

Hematological Findings: The overall mean PCV value of examined animals was 26.41 ± 5.1 (SD). However, when we compare the mean PCV value of parasitemic animals (16.82 ± 2.9) with that of aparasitemic animals (27.13 ± 4.4) statistically significant difference between the mean PCV of infected and non infected animals had been observed (P< 0.05).

The mean PCV value of the total parasitemic sheep was 17.40 ± 2.64 SD and the mean PCV value of total aparasitemic sheep was 27.99 ± 4.2 (SD). Similarly the mean PCV of parasitemic and aparasitemic goats was 16.2 ±3.1 (SD) and 26.2±4.5(SD) respectively.

DISCUSSION

Trypanosomosis is a serious disease in domestic livestock which causes a significant negative impact in food production and economic growth, particularly in sub Saharan Africa. In Ethiopia, the disease restricts the keeping of domestic animals, which limit the development of mixed and livestock farming by affecting the composition and uses of small ruminants and direct economic loss from the treatment expense.

The overall prevalence of trypanosomosis in the study area was 6.8%. This finding was higher than the report from other parts of Ethiopia, Nigatu *et al.* [16] who reported a prevalence of 5.6% in Guangua distinict of Awi zone and Hunduma and Getachew [17] who reported a prevalence of 5.1% in Didesa and Ghibe valley, similar low prevalence of 5.45% and 5.37% was observed by Shikur [18] and Bezabh [19] in different parts of the country. The higher prevalence of trypanosomosis in small ruminant by this study may be attributed to lack of application of different control measures such as impregnated insect side, trapping and regular treatment of sick animals.

Higher prevalence was reported in sheep (7.1%) than in goat (6.5%); this report is higher than the finding of Abebayehu and Gurarra [20] who reported prevalence of 2.76% and 1.70% in sheep and goat respectively. It is also higher than repot of Samson and Frehiwot [21] who reported a prevalence of 4.5% and 3.7% in sheep and goat respectively. Likewise it was higher than the finding of Kalu [22] who observed prevalence of 1.2% in sheep and 0.7% in goat. However the prevalence in sheep is lower than the finding of Dinka and Abebe [23] who reported 7.6% in sheep and 3.6% in goat.

Several authors have shown that the prevalence of trypanosomosis is low in goat than in sheep this is because of the nature of sheep and goat. This was usually

related to tsetse feeding where the anti feeding behavior of goat and docile nature and wool cover of sheep [24]. The low prevalence rate might be because of tsetse and biting flies prefer cattle than other domestic animals [25]. In mixed farming system in the study area where different species of animals are kept together in communal grazing land, tsetse and biting flies would preferably attack cattle,leaving most of the small ruminants uninfected. Another factor contributing this, include the low feeding success of tsetse on sheep and goat [26]. This might be related to their smaller body size and anti-feeding behavior such as leg kicking and skin ripping.

The *T. congolense*, *T. vivax, T.brucei* and mixed infections were identified in small ruminants of the study area this agrees with Hunduma and Getachew [17]. The statistical analysis result revealed that there was no significant difference (P>0.05) in the prevalence of trypanosomosis between female and male animals. Dinka and Abebe reported similar finding. Small ruminant of both, sex of the study area were grazing together and they might have acquired the infection, since they have equal chance of contracting the disease. Although the difference in prevalence of trypanosomosis between age groups was not significant (P> 0.05), the current finding indicated very high prevalence in adult than young animals. Since adult animals of the study area were generally kept in the field for long period of time which might predispose them to fly bite than the young animals [24].

The higher prevalence of trypanosome infection was found in animals of poor body conditioned than good and medium body conditioned animals. This was statistically significant (P< 0.05). It might be attributed due to poor management and husbandry practice [25].

The packed cell volume was calculated by taking in account 22-45% as normal for sheep and 22- 38% as normal for goats [27]. The mean PCV value of parasitemic sheep and goat was 17.40 and 16.15 respectively. Even though significant difference is found in the study, PCV alone could not be used for diagnostic criteria for trypanosomosis because there are also other factors causing anemia such as worm infestation and nutritional deficiency [28].

CONCLUSION

The overall prevalence of trypanosomosis in small ruminant in the study area was 6.8%. This implies the endemicity of the disease with potential reservoir host to other livestock particularly a serious threat to health, production and productivity of cattle in the study area. In this finding the study result of trypanosomosis was found to be negatively affecting the PCV value and body condition score of affected animals. Also aged animals were more likely to be infected with trypanosomosis regardless of the species they belong. The most commonly encountered trypanosoma species in small ruminant of the area was *T.cogolense* followed by *T. vivax* mixed infections and *T.brucie*. The prevalence of trypanosomosis of small ruminant in the study area was higher; therefore its potential impact on small ruminant production and its role as reservoir of the disease should get attention, particular attentions towards the identified trypanosome species are essential to control the impact of the disease on small ruminant that are the potential reservoir of the infections and development of control options that could minimize the biting and tsetse flies in the study area should be introduced in this approach.

ACKNOWLEDGEMENTS

The authors immensely thank Wollega University for financial support to execute this research work. Managers and technical staff of the Assosa Veterinary Diagnostic Laboratory are acknowledged for their crucial support and collaboration during the study period.

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