

Full Length Research Paper

Cross sectional study on prevalence of bovine trypanosomosis and associated risk factors in Mao komo special woreda, benishahgul gumuz, Western Ethiopia

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Trypanosomosis is a chronic haemo-protozoal disease, which is a barrier to livestock and agricultural production. A cross-sectional study with the aim of determining prevalence rate of bovine trypanosomosis and risk factors was carried out from April 2016 to November 2017 in the Mao Komo district in the Benishangul-gumuz, Ethiopia. Buffy coat followed by thin blood smear technique were employed to identify the species of the trypanosomes. Out of total 384 cattle examined, 18 were infected with trypanosomes with the overall prevalence of 4.69%. High prevalence of *Trypanosoma congolense* was recorded in the area (65.7%) followed by *Trypanosoma vivax* and *Trypanosoma brucei*. The study revealed that there was statistically significant difference ($p < 0.05$) of the prevalence in cattle with body condition. This is explained as there was higher prevalence of the diseases in cattle with poor body condition than medium and good body condition. Relatively higher prevalence was found in females and adult animals, and Fafafa peasant association but there was no significant ($p > 0.05$) difference between the variables. In conclusion, bovine trypanosomosis is prevalent disease which has been negatively affecting livestock production in the study area. Therefore, strategic disease prevention and control programme is mandatory to improve livestock health and production in the study area.

Key words: Buffy coat, cattle, thin blood smear, Benishangul-Gumuz, trypanosomosis.

INTRODUCTION

Trypanosomosis is one of hemo protozoal disease which limits livestock production in tropical countries including

Africa in general and Ethiopia in particular. The overall economic loss due to the disease was estimated

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between US \$1408 and 1540 million per annum (Taylor et al., 2007). Most African trypanosomes are transmitted by tsetse flies, which inhabit many parts of the continent that extend about 15°N and 20°S of the equator (Mekonnen et al., 2012; Ilemobade, 2009), but the disease can also be transmitted by biting flies.

The disease can affect wide range of host including domestic and wild animals as well as human beings (STEP, 2012; Shimelis and Shibeshi, 2009). In Ethiopia, tsetse flies are confined to Southern, Southwestern and North Western regions between longitude 33° and 38°E and latitude 5° and 12°N an area covers 220000 km² (NTTICC, 2004). The presence of animal trypanosomosis is a major constraint to the introduction of highly productive exotic dairy animals and draught oxen to lowland settlement and resettlement areas for the utilization of large land resources (Cherenet et al., 2006). Since more than 90 percent of crop production in Ethiopia is dependent on animal draught power mainly on ploughing oxen, many large fields lie fallow due to a lack of these animals in trypanosomosis infested area, which worsens the food supply and living conditions in affected areas (MoARD, 2005; Van den Bossche et al., 2006). The most common species of *Trypanosoma* found in Ethiopia are *T. congolense*, *T. vivax* and *T. brucei* in cattle, sheep and goats. Camels are affected by *T. evansi* which is common species in camel rearing areas of the country while equines mainly horses are affected by *T. equiperdum* in some highland parts of the country (Geiger et al., 2005; Efrem et al., 2013).

The definite diagnosis of trypanosomosis depends on history followed by clinical sign and detection of the parasite through direct and/or indirect demonstration of the parasite (Dhami et al., 1999; Kumar et al., 2012; Sharma et al., 2012; Molalegne et al., 2011). Direct demonstration of the parasite can be accomplished with a blood smear in the form of a wet blood film with or without concentration for motile trypanosomes, buffy coat technique and giemsa stained blood smear and indirect demonstration of the parasite can be done by different serological and molecular tests like ELISA, IFAT CATT and PCR (Regassa and Abebe, 2004; OIE, 2004; Taylor and Authie, 2004). Strategic Control should be based on control of trypanosomosis and its vectors (Abebe, 2005; Ayele et al., 2012), implementing improved husbandry, management and selecting breeds which are more resistant to the disease animals can be given prophylactic drugs in areas with a high population of trypanosome-infected tsetse fly. Drug resistance must be carefully monitored by frequent blood examinations for trypanosomes in treated animals (IanMaudin et al., 2004; Sharma et al., 2012).

There are many research works indicating higher prevalence of animal trypanosomosis in different parts of Ethiopia, but still the disease remains one of the main obstacles to livestock production in Ethiopia. Many

research done indicated that the disease is highly associated with the tsetse fly (Aweka, 2000; Addisalem et al., 2012; Lelisa et al., 2015). Regardless of this, there is no work done on bovine trypanosomosis in Mao Komo special woreda. Thus, this study were planned with the objectives to estimate the prevalence of bovine trypanosomosis and associated risk factors in selected areas and to identify the species of trypanosomes in the study areas.

MATERIALS AND METHODS

Study area description

The study was carried out at Benishahgul Gumuz Mao Komo special woreda west part of Ethiopia bordering Abay river tributaries. The climate condition of the area is ultimate with summer rainfall (April to October) and winter dry season (November to March) with mean annual rainfall of 1650 to 1800 mm. The altitude of the area is 1650 to 1850 m.a.s.l with daily average temperature of 27°C. The weather condition of the area includes kola 81% and woyina dega. The wild animals are baboons, monkey, bush pig, arthog and hyena. The major livestock reared in the area include cattle, goat, sheep, donkey mule, horse and chickens. In 73266 livestock population are estimated to exist. The livestock rearing system in the districts is traditional which depends on natural grass and crop residue (KMAO, 2015; CSA, 2014).

Study animals and sampling techniques

384 local breed cattle under extensive management system were randomly selected, from three peasant associations (100 from Shampoll, 124 from Totora, and 160 from Fafafa). The cattle were evaluated for body condition during sample collection. They were classified as poor, medium and good by observing the body condition of the animals in the field (Nicholson and Butterworth, 1996). The animals were also categorized into three age groups by dentition method (Gatenby, 1991).

Study design

The cross sectional study design was used between April 2016 to November 2017 with the aim of estimating the prevalence of bovine trypanosomosis in selected district.

Sample size

The sample size was determined following the formula given on the veterinary epidemiology book (Thrusfield, 2005) with 95% confidence interval and an expected prevalence of 50% and at 5% absolute precision.

$$n = \frac{(Zx)^2 - P_{exp}(1 - P_{exp})}{d^2}$$

Where: n = the required sample size

P_{exp} = the expected prevalence rate (50%)

Z_x = the values of the required confidence interval (1.96)

d = desired absolute precision (5%). Therefore, the total sample

Table 1. Prevalence of Trypanosomosis based on sex.

Sex	Number of animal examined	Number of Affected (%)	X ²	P-value
Male	189	7 (3.70)	3.21	0.20
Female	195	11 (5.64)		
Total	384	18 (4.69)		

Table 2. Prevalence related with body condition.

Body condition	Animals examined	Positive (%)	X ²	p-value
Poor	129	13 (10.7)	13.14	00
Medium	132	3 (2.27)		
Good	123	2 (1.63)		
Total	384	18 (4.69)		

size is 385.

Sample collection and laboratory analysis

Blood samples were collected from the marginal ear vein into a heparinized capillary tube. Then one end (heparinized end) of the capillary tubes was sealed with crystal sealant. The samples were centrifuged at 12,000 rpm for five minutes to separate the blood cells. Then the packed cell volume (PCV) was determined and recorded followed by examination of buffy coat to detect the presence of motile parasites. Finally thin blood smear was made from positive buffy coat for identification of the species of the parasite (Murray et al., 1977; NTTICC, 2004; Kumela et al., 2014).

Data analysis

The collected data was entered into microsoft excel sheet. SPSS statistical software was used to analyse the data. The association between trypanosomosis infection rate and study variables (such as age, sex and PCV) was determined by Pearson's Chi-square (X²) test. A statistical significant association between variables exists when $p < 0.05$ and at 95% confidence level (CI) (Lelisa et al., 2015; Moti et al., 2013).

RESULTS

Out of 384 cattle examined, 18 (4.69%) were found to be positive with *trypanosoma*. out of the 18 cattle positive for trypanosomes, 2 (0.52), 4 (1.04%) and 12 (3.13%) cases were found to be infected by *Trypanosoma brucei*, *T.vivax* and *T.congolense*, respectively which was statistically non-significant ($p > 0.05$).

DISCUSSION

This study revealed that from the total of 384 cattle examined, 18(4.69%) of them were positive for

trypanosomes. This is higher than the studies in Bedele district of South-West Ethiopia (4.2%) (Lelisa et al., 2015), but lower than reports in Diga District of Eastern Wollega (6.86%) (KMAO, 2015), in Bure district Western Ethiopia 6.1% (CSA, 2014), in Mandura district North West Ethiopia (5.43%) (Lelisa et al., 2015), and in Haro Tatesa, South west Ethiopia (5.3%) (Zelalem and Feyesa, 2015). This might be due to the control measures against the fly, which is applied by Bedele National Tsetse and *Trypanosoma* Investigation and Control Center (NTTICC).

The prevalence reported in this study is in agreement with the previous study in Dangur district 11.27% (Bayisa and Getachew, 2015). Nonetheless, the prevalence was relatively lower than studies in Gawo Dale District of western Ethiopia (25%) (NTTICC, 2004), and in Abbay Basin area of North West Ethiopia (17.07%) (STEP, 2012). This difference might be due to abundance of the trypanosome vectors in the district. Highest prevalence of trypanosomosis was recorded in female 11(5.64%) than male animals 7 (3.70%) but there was no significant difference ($p > 0.05$) between infection rate and sex (Table 1). This agrees with the previous reports (Moti et al., 2013; Tewelde, 2001; Girma et al., 2014; Leak, 1999). This might be due to female animals are prone to different physiological factors which causes susceptibility to the disease. This is disagreeing with that of the study in Eastern Gojam (Adane, 1995) and Western part of Ethiopia (Bogale et al., 2012). The possible suggestion for this might be due to regular intervention of the disease through vector control and the parasite by prophylactic trypanocidal drugs. Statistically significant difference was observed ($p < 0.05$) (Table 2) between infection rate and body condition of the study animals, which indicates poor body condition is due to chronic nature of the trypanosomosis. This is explained as cattle with poor,

Table 3. Prevalence association with peasant associations (PAs).

PAs	Animals examined	Positive (%)	X ²	p-value
Shampoll	124	5 (4.03)	1.50	0.83
Totora	100	4 (4.00)		
Fafafa	160	9 (5.63)		
Total	384	18 (4.69)	-	-

Table 4. Prevalence of Trypanosomosis based on age group.

Age group	Animals examined	Positive (%)	X ²	P-Value
Young	52	2 (3.85)	6.90	0.02
Adult	210	12 (5.71)		
Old	122	4 (3.28)		
Total	384	18 (4.69)	-	-

Table 5. Prevalence rate based on PCV.

PCV category	Animals examined	Positive (%)	Mean PCV	X ²	P-value
<24	92	13 (14.13)	18.22	16.96	0.00
24-37	290	4 (1.38)	23.05		
>37	6	1 (16.67)	32.45		
Total	384	18 (4.69)	24.57	-	-

medium and good body condition was 13 (10.7%), 3 (2.27%) and 2 (1.63%), respectively. The disease in cattle with good body condition indicated recent infection that can be changed to chronic one if the animal will not be treated. This finding showed similarity with the previous reports, high prevalence in cattle with poor than medium and good body condition (Addisalem et al., 2012; Lelisa et al., 2015; Bayisa and Getachew, 2015).

The study also identified the association between prevalence and peasant association. In this case, higher prevalence was recorded in Fafafa 9 (5.63%) than Totora and Shampoll which were 4 (4.0%) and 5 (4.03%), respectively but there is no significant difference between the infection rate and peasant association (PAs) (Table 3). Similar findings were reported by (Mekonnen et al., 2012; Aweka, 2000). This might be due to similar agro ecology between the PAs. Among the three age categories of the cattle (1 to 2(young) age, 3 to 5(adult) age, and >5(old) age) highest prevalence was found in adult 12 (5.71%) than young 2 (3.85%) and old 4 (3.28%) animals but significant difference was not found ($P>0.05$) between age group (Table 4). This might be due to the animals are equally exposed to vectors and the number each group was not equal during sampling. It is agree with previous reports (Cheremet et al., 2006; Habtamu,

2009) in the Jawi district of the Amhara region, Northern Ethiopia.

Similarly the higher prevalence was recorded in animals those were anemic when compared to non-anemic animals (Table 5). The mean PCV values of infected and non-infected animals were 18.22 and 23.05, respectively which was statistically significant ($P<0.05$). This is due to the disease is chronic by nature and live in the blood circulation (Sharma et al., 2012; Taylor and Authie, 2004). Three species of trypanosomes were identified in this study: *T. congolense*, *T. vivax* and *T. brucei*. Among the three, *T. congolense* was highly prevalent 12 (3.13) followed by *T. vivax* 4 (1.04) and *T. brucei* 2 (0.52) (Table 6). The domination of the former species over the two species might be due to high abundance of a biological vector (*Glossina* spp.) than mechanical biting flies (Desquesnes and Dia, 2004). Another suggestion for this is the high number of serodemes of *T. congolense* as compared to the two species and the development of better immune response to *T. vivax* by the infected animal (Abebe, 2005).

CONCLUSION AND RECOMMENDATIONS

The present study indicated bovine trypanosomosis is

Table 6. *Trypanosoma* species identified in study area.

No of animal examined	Total positive	Infection rate			X ²	P-value
		<i>T. congolense</i>	<i>T. vivax</i>	<i>T. brucei</i>		
384	18	12 (3.13%)	4 (1.04%)	2 (0.52%)	0.54	0.000

prevalent disease in Mao komo area. Higher prevalence was recorded in females, in adult cattle with poor body condition and in Fafafa peasant association. Similarly *Trypanosoma congolense* is the major species in this study followed by *Trypanosoma vivax* and *Trypanosoma brucei*. Obviously the disease can be constraint to livestock production in the study area. Based on the above conclusions, the following recommendations were forwarded:

- (i) Regular screening of the disease followed by early treating of positive animals with the trypanocidal drugs is necessary.
- (ii) Integrated tsetse control strategy should be implemented in the area.
- (iii) Awareness creation about the economic importance of the disease and its vectors for the stake holders is crucial.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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