academicJournals

Vol. 11(6), pp. 500-506, 11 February, 2016
DOI: 10.5897/AJAR2015.10458
Article Number: A94552457131
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

A study on prevalence of bovine trypanosomosis in selected areas of Konta Special Woreda, Southern Ethiopia

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Received 29 September, 2015; Accepted 29 October, 2015

A cross-sectional study was conducted from November 2010 to March 2011 to determine the prevalence of bovine trypanosomosis, to identify the species of trypanosomes in the study area and to assess the community awareness regarding the effect of trypanosomosis and control methods in selected areas of Konta Special Woreda of Southern Nation Nationalities and Peoples Regional States. Thirty households were interviewed using prepared questionnaire format during the study period. In the parasitological survey, blood samples of 300 cattle were examined using a buffy coat technique and thin smear under Gimsa stain. The packed cell volume (PCV) value of each animal was also measured using hematocrit reader. The overall prevalence of trypanosomosis in the study area was found to be 21.33%. There was no significant difference in prevalence between the study areas. The dominant trypanosome species found in the area were *Trypanosoma congolense* (64%) followed by *Trypanosoma vivax* (23%) and *Trypanosoma brucei* (13%). The prevalence of 44.29, 14.13 and 15.22% was observed for animals with poor, medium and good body conditions, respectively and there was statistically significant ($p<0.05$) difference between animals with different body condition. There was no difference in prevalence between the different age groups of cattle. The mean PCV value (%) of parasitaemic and aparasitaemic animals during the study period were 19.42 and 27.64 with a statistically significance ($p<0.05$) difference between the two groups. The study also demonstrated variations in the prevalent between both sexes which was statistically significant ($p<0.05$). It was concluded that the present work evidenced that trypanosomosis has continued to pose a considerable threat to cattle production in the study area warranting an integrated control and prevention to safeguard cattle production and productivity.

Key words: Cattle, Konta Woreda, trypanosomosis, prevalence.

INTRODUCTION

Trypanosmosis is a disease caused by several species of protozoan parasites (Trypanosomes) found in the blood

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and other tissues of vertebrates including livestock, wildlife and people (WHO, 2006). It is one of the most important diseases of livestock, which hampers agricultural production in sub-Saharan Africa including Ethiopia (Abebe, 2005; Bitew et al., 2011). According to FAO (2000), trypanosomosis caused a reduced crop production due to insufficient animal traction power, reduced rates of calving, increased mortality, and reduced milk off take was reported.

In Ethiopia, trypanosomosis is one of the most important disease limiting livestock productivity and agricultural development due to its high prevalence in the most arable and fertile land of South-West and North-West part of the country following the greater river basins of Abay, Omo, Ghibe and Baro with a high potential for agricultural development. Currently, about 220,000 km^2 area is infested with tsetse flies, namely, *Glossina pallidipes*, *Glossina morsitans*, *Glossina fuscipes*, *Glossina tachinoides* and *Glossina longipennis*. The most important trypanosome species affecting livestock in Ethiopia are *Trypanosoma congolense*, *Trypanosoma vivax* and *Trypanosoma brucei*, in cattle, sheep and goat, *Trypanosoma evansi* in camel and *Trypanosoma equiperdum* in horse (Abebe, 2005).

Trypanosomosis was considered to be an important disease of cattle in different part of the country (Mussa, 2002; Tesfaye, 2002; Cherenet et al., 2004; Sinshaw, 2004; Shimelis et al., 2005; Bitew et al., 2011). Even though the survey carried out by Sodo Regional Veterinary Laboratory reported trypanosomosis to be the most serious disease in the study area; studies have not yet been fully studied on the epidemiology, prevalence and species of bovine trypanosomosis in the study area. Therefore, the objectives of the study were to determine the prevalence of bovine trypanosomosis in study area, to identify the dominant species of trypanosomes and some associated risk factors and to compute packed cell volume (PCV) in relation to trypanosomosis and to assess the community awareness regarding the effect of trypanosomosis and control methods.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Konta Special Woreda of Southern Region of Ethiopia. It is located at about 498 km of south of Addis Ababa and it has an altitude of 954 to 1440 m.a.s.l. The distribution of rain is bimodal, with short rain from January to April and long rains from June to mid-September. The average annual rainfall is 1200 mm, the minimum and maximum daily temperature is 18.7 and 28.5°C, respectively (KWOA, 2006). The major crops growing in the area are maize, teff, enset, and sweet potato and to lesser extent other crops (KWOA, 2006). The livestock populations that are found in Konta Special Woreda include cattle, sheep, goats, mule, donkeys and poultry. Among these animals, cattle are the dominant species raised in the area. The cattle population in the three study kebeles is estimated to be about 3,200. According to the information obtained from the agricultural office of the Woreda, animal health problems, such as infectious diseases, internal and external parasitic diseases and protozoal diseases are the main constraints of livestock production and agricultural development in the Woreda. Trypanosomosis is the main constraints in this study area due to the geographical availability to the vectors (tsetse) in the area. Because of its nearness to the Chebera Churchura National Park, there are a number of wild animals living in the forests like hyena, buffaloes, warthogs, lion, leopard, and monkey and other wild animals which serve as reservoirs for trypanosome (KWOA, 2006).

Study population and design

A cross-sectional study was conducted from November 2010 to March 2011 on 300 indigenous cattle managed under small holder mixed crop-livestock farming system and semi-pastoralist community to determine the prevalence of trypanosomosis. The cattle in the district were considered as study population and they are local breeds that are kept under traditional extensive husbandry systems with communal herding. The study animals were selected by using simple random sampling method by taking age, sex, coat color and body condition into account. The animal examined was categorized in different age groups as less than 2 years, between 2 up to 4 years and greater than 4 years. The body condition was estimated as per the recommendations of Nicholson and Butterworth (1986) for evaluating the body condition of the zebu cattle. The body condition of animals was recorded by classifying animals in the three groups as good, medium and poor based on the appearance of the ribs and dorsal spines.

Sampling method and sample size determination

By using simple random sampling method, a total of 300 cattle were selected for bovine trypanosomosis prevalence determination in the study area. Sample size was determined using 95% confidence level, expected prevalence was 17.72% which is previously reported by Wolaita Soddo Regional Veterinary Laboratory (2006) and with desired absolute precision 0.05. The sample size was determined by using the formula (Thrusfield, 2005). Even though the sample size was calculated to be 224, a total of 300 animals were included in the current study to increase precision.

Study methodology

Questionnaire survey

Questionnaire survey was undertaken in order to assess the perception of the farmers on the occurrence of trypanosomosis, livestock constraints, socio-economic status and other control method of trypanosomosis, herd structure, use and source of trypanocidal drugs as well as delivery of the drug for treating their animal. From 44 kebeles found in the Konta Special Woreda, 10 kebeles are established as settlement areas of which 3 kebeles were selected randomly for this study. From each kebeles 10 individuals were selected according to their place of settlement and interviewed using prepared questionnaire format.

Parasitological survey

Blood samples were collected after properly restraining the animal and aseptically preparing the sampling site. It was collected from the ear vein by using sterile blood lancet and haematocrit capillary tubes. A pair of heparinized haematocrit capillary tubes were filled with blood from animals to ¾ of the height and sealed at one end with crystal sealing material. The capillary tubes were loaded on the

Table 1. Prevalence of trypanosomosis on the basis of study kebe*les*.

Kebeles	No. of animal examined	Total positive	Prevalence (%)	95% CI
Konta koysha	100	28	28	19.48-37.87
Kosha Lome	102	20	19.6	12.41-28.64
Delba Genet	98	16	16.33	9.63-25.15
Total	300	64	21.33	16.83-26.40

$\chi^2 = 4.29$, $p = 0.117$.

microhaematocrit centrifuge symmetrically and centrifuged at 1200 rpm for 5 min (Murray et al., 1977). PCV was determined using hematocrit reader, which is used for the determination of anemia and comparison of infected animals with non-infected animals (Woo, 1969). After the PCV was read, capillary tubes were broken 1 mm below the buffy coat to include the red blood cell layer and the content were expressed on microscopic slide and mixed and covered with a 22×22 mm cover slip, ground buffy coat technique (Murray et al., 1977). From positive samples, thin blood smears were made and fixed with methanol for 3 min and stained with giemsa solution for 30 min and examined using oil immersion objective to detect the trypanosome species.

Data management and analysis

The data were analyzed using STATA® version 11.0 software program from STATA corporation, College Station, Texas. Difference between disease status and different risk factors were assessed using Chi-square test and two sample student t-test. Differences between parameters were tested for significance at probability levels of $p<0.05$ and 95% confidence interval.

RESULTS

Questionnaire survey

All the farmers which are interviewed at the time of study depend on mixed farming production system. Livestock are an integral part of the agricultural activity and are used as food, source of income, source of draught power and transportation purpose. The livestock which are found in the study area are cattle, sheep, goats, donkeys and mules. Cattle are the predominant species in the area. The herd is kept together for grazing and watering and is far away from their residential area. Ninety six percent (96%) of them agree that trypanosomosis is a major problem for their animals and it causes great loss of animals every year. All respondents ranked trypanosomosis (locally known as ''Goloba'') as the most economic important disease of cattle followed by blackleg, anthrax and pasteurellosis. Majority of the respondent farmers (85%) claimed the disease did not respond to different types of trypanocidal drugs. According to the respondents, trypanosomosis occurs throughout the year but occurrences vary with season (high during wet season). As they respond, the transmission of the disease (80%) is the vector called tsetse fly (locally called ''Gadeudutsia'') and especially animals are affected while grazing and watering in the forest and savannah vegetation. The response of 80% of the farmers showed that various trypanocidal drugs were used; the most common once being diminazene aceturate (Berenil) and isometamedium chloride (trypamedium). Ninety percent of the respondents indicated that the source of trypanocidal drugs were smugglers. According to the questionnaire (86%) of the livestock owners were treating their cattle themselves and by other farmers against trypanosomosis. All the respondents in the study area responded that there was no community-based tsetse and trypanosomosis control program implemented in the area.

Parasitological survey

The results of the survey showed that out of the total cattle examined during the study period, 64 cattle were found to be positive for trypanosomosis and an overall prevalence of 21.33% (95% CI 16.83-26.40).

Prevalence of trypanosomosis on the basis of the study of kebeles

No significant difference in the prevalence of trypanosomosis was observed between three kebe*les* (Table 1).

Distribution of trypanosoma species in the study area

The species of trypanosomes identified by buffy coat technique and thin smear showed that *T. congolense* is the most prevalent followed by *T. vivax* and *T. brucei*, but there was no mixed infection (Figure 1).

Prevalence of trypanosomes infection in both sexes

During the present study, from the total of 300 cattle examined, 162 were male and 138 of them were female animals. Male animals were more affected than female

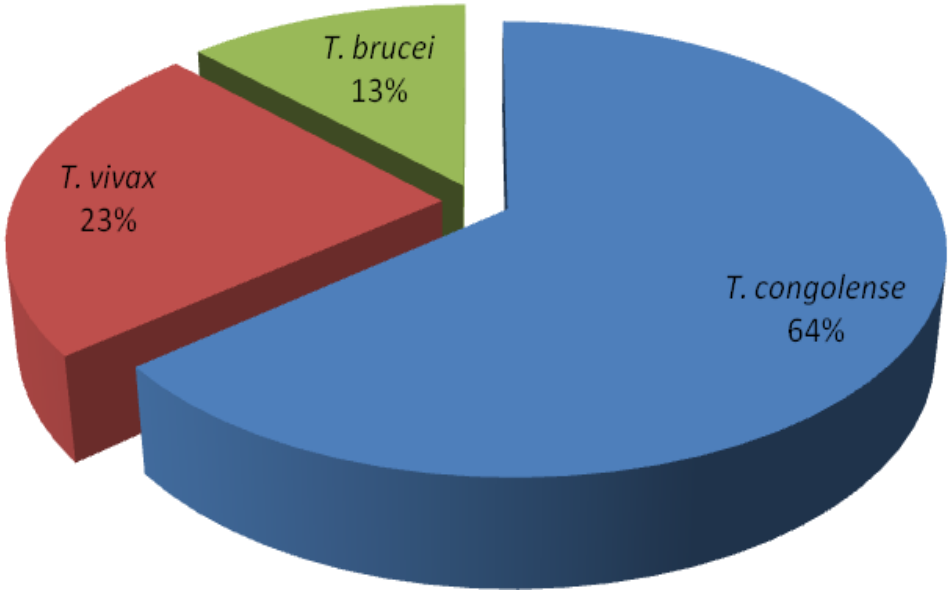

Figure 1. Distribution of Trypanosoma spp. In the study area.

Table 2. Prevalence trypanosome infection in both sexes.

Sex	No. of animals examined	No. infected	Prevalence (%)	95% CI
Male	162	46	28.40	21.59-36.00
Female	138	18	13.04	7.92-19.83
Total	300	64	21.33	16.83-26.40

χ^2=10.46, p = 0.001.

Table 3. Prevalence of trypanosomosis in different body condition scores.

Body condition	No. of animals examined	No. of positive animals	Prevalence* (%)	95% CI
Good	46	7	15.22[a]	6.34-28087
Medium	184	26	14.13[a]	9.44-20.01
Poor	70	31	44.29[b]	32.41-56.66
Total	300	64	21.33	16.83-26.40

χ^2 = 28.6873, p = 0.000, *rows with different letters are significantly different.

animals (p<0.05) (Table 2).

Prevalence of trypanosomosis in different body condition scores of animals

Body condition score was evaluated in cattle which are living under similar environment and management system to observe the impact of trypanosomosis in causing debilitation, which is clinical sign of trypanosomosis. Statistically, there was significant difference (p<0.05) (Table 3).

Prevalence of trypanosome infection in different age groups

The prevalence of trypanosomosis on different age groups was 13.51, 16.18 and 24.62% in calf, young and adult, respectively. Difference in infection rate among the different age groups was not statistically significant (Chi square=3.6773, p>0.05).

Table 4. Prevalence of bovine trypanosomosis on coat color basis.

Coat color	No. of animals examined	No. of positive animals	Prevalence* (%)	95% CI
White	62	5	8.06[a]	2.67-17.82
Red	126	21	16.67[a]	10.62-24.34
Black	112	38	33.93[b]	25.25-43.48
Total	**300**	**64**	**21.33**	**16.83-26.40**

χ^2 = 18.73, p = 0.000, *rows with different letters are significantly different.

Table 5. Mean PCV of parasitemic and aparasitemic animals.

Infection status	No. of animals	Mean PCV (%)	t-test	p-value
Non-infected	236	27.64	12.68	0.000
Infected	64	19.42		

Prevalence of trypanosomosis in different hair coat colors of animals

There was significant difference (p<0.05) in infection among the three coat color animals. Black-colored animals were more affected than the other groups (Table 4).

Hematological examination

The mean PCV of parasitemic animals is 19.42% which is lower than the lower limit of normal PCV for cattle. For mean PCV for aparasitemic animals, 27.62% falls within a normal PCV value (Table 5). There is statistically significant difference in the mean PCV value between the infected and non-infected animals (p<0.05).

DISCUSSION

According to the results of the questionnaire survey, 96% of the interviewed reported that trypanosomosis is a serious problem to keep livestock in their areas. In the present finding, all the farmers interviewed reported that trypanosomosis cases occur either in the dry season (November-May) starts of the rainy season (May-November) and after the rainy season (September-November). Afework (1998) and Tewolde (2001) also reported similar findings.

During the present study, an overall prevalence of 21.33% (95% CI=16.83-26.40) resulted. The result of the present study was similar to the reports of different workers, Shimelis (2004) epidemiology of bovine trypanosomosis in the Ghibe Valley 19.01% during dry season, Wondwosen (1986) in Bunno 18%, Abiy (2002) in Goro district 19.01% and Afework (1998) at Pawe, North West Ethiopia 17.2%, Berhan (1999) in Ghibe Valley South West Ethiopia reported the prevalence of 21.2% and in the same area also Tamirat (1991) reported 18% and Abebe and Jobere (1996) for tsetse infected area of Ethiopia 17.67%. In contrast to this, it was higher than the result of Tewolde (2001) at Keto settlement area of South Western Ethiopia 15%, Habtewold (1993) at Humbo Larena of Wolaita zone 9.3%.

There was significant difference in prevalence among three hair-coat colored animals at the present study area. The highest prevalence was recorded in black hair-coat animals (33.39%) whereas the least prevalence rate was recorded in white hair-coat animals (8.06%). This may be due to the preference of flies towards some color. Tsetse flies prefer dark-colored animals. This result is different which was reported at North Omo by Haile (1996) and at Soddo Zuria Woreda by Getnet (2008) who reported the prevalence of black (7.04%), red (5.09%) and white (3.80%) hair coat animals.

In the present study, higher prevalence was observed in male animals (28.40%) and similar result was reported by Magona et al. (2008) who reported that males had a significant higher prevalence of trypanosomosis than females. In contrast to this, Daya and Abebe (2008) reported that there was no significant difference in trypanosome infection between males and females and Getnet (2008) in Soddo Zuria Woreda also reported that the prevalence of male (5.76%) and female (5.74%). The possible reason for this finding, in this study could be that male animals are more exposed to draught purpose, travel long distance in the areas where tsetse challenge is present and as a result the risk of contracting trypanosomosis is also very high but female animals are not used for draught purpose in the area due to this, they are not that much affected as male animals.

There was no significant difference in trypanosomes prevalence between the study kebeles (p>0.05). This could be due to the geographical location of the three kebeles which are located in the same climatic zones and

distribution of tsetse fly challenge in these areas; this is due to the bordering of forest, which is the source of tsetse flies. Similar results were obtained by Getnet (2008) at Soddo Zuria Woreda. But the higher prevalence recorded in Konta Koysha is because of its bordering with the Chebera Churchura National Park due to harboring of tsetse flies by the wildlife.

Body condition was also found to be one of the risk factors in the present finding. There was significant difference ($p<0.05$) in infection rate among poor, medium and good body condition, that is, the result observed revealed the marked effect of trypanosomosis on the body condition of cattle. Animals with poor body condition were more associated with the disease as compared to animals with good body condition. Trypanosomosis cause weight loss (cachexia) and emaciation is the characteristic sign of trypanosomosis (Urquhart et al., 1996). This result is not different from the result revealed by Getnet (2008) in Soddo Zuria Woreda who observed that poor body condition (11.84%) animals are more affected by trypanosomosis than good body condition (1.64%) animals.

The present study in terms of trypanosome species is in agreement with that of Muturi et al. (2000) and Bekele et al. (2010) who reported a high proportion of *T. congolense* in the Southern Rift Valley. They reported 66.86 and 70% *T. congolense* and 20.75 and 20% *T. vivax* infection, respectively and Muturi (1999) at Merab Abaya, South West Ethiopia reported (66.1%), and Afework (1998) at Pawe, North West Ethiopia (60.9%) and Abebe and Jobere (1996) for tsetse infected areas of Ethiopia (58.5%). Abebe and Jobere (1996) and Abebe (2005) reported the prevalence of 58.5, 31.2 and 3.5% for *T. congolense*, *T. vivax* and *T. brucei* respectively in South West Ethiopia. Bekele et al. (2010) recently reported the prevalence of 70, 20 and 8% in cattle for *T. congolense*, *T. vivax* and *T. brucei*, respectively in Southern Rift Valley and also Abiy (2002) reported the prevalence of *Trypanosoma* species as *T. congolense* 58.75% and *T. vivax* 33.75%. In contrast to this, Sinshaw et al. (2006) indicated a prevalence of trypanosomosis ranging from 4 to 9.6% due to *T. vivax* in three highland districts bordering Lake Tana. The dominance of *T. congolense* infection in cattle may be due to its transmission only by tsetse flies and the high number of seroderms of *T. congolense* as compared to *T. vivax* and the development of better immune response to *T. vivax* by the infected animal (Leak, 1999).

Regarding the PCV determination, most of the parasitemic animals (19.42%) were found to be anemic (PCV<24%) compared to aparasitemic animals (27.64%), and the difference was significant ($p<0.05$). Likewise, Van den Boossche and Rowlands (2001) stated that the average PCV of parasitologically negative animals was significantly higher than that of parasitologically positive animals. Therefore, trypanosomosis may be involved in adversely lowering the PCV value of infected animals. On other hand, delayed recovery of anemic situations after recent treatment with trypanocidal drugs may be due to the compound effect of poor nutrition and hematophagus helminth infection, such as hemonchosis and bunostomiasis (Afework, 1998).

CONCLUSION AND RECOMMENDATIONS

The results of the study revealed that trypanosomosis is one of the major constraints to animal production at the study area. Bovine trypanosomosis is one of the major impediments to livestock development and agricultural production in study area contributing negatively to the overall development in general and to food security in particular. The most prevalent species in the study area was *T. congolense* followed by *T. vivax* and *T. brucei*. The prevalence of bovine trypanosomosis was found to be high in males than females. The mean PCV values indicated an overall poor health status of livestock in the study area and the PCV values among infected animals was significantly higher than the non-infected animals. Based on the earlier conclusion, the following recommendations are forwarded: proper and strict following of trypanocidal drug utilization and awareness creation to the farmers about risks of drug resistance should be made; attempt should be made to expand government and private veterinary services to serve the community properly; suitable community-based tsetse and trypanosomosis control program should be designed and implemented, and further studies on the epidemiological aspects and development of drug resistance in pathogenic trypanosomes are required.

Conflict of Interests

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors would like to thank Haramaya University College of Veterinary Medicine for financial support to execute this research work. They extended their gratitude to Wolayta Sodo Veterinary Diagnostic and Investigation Center for its technical and material support in the realization of this study. They appreciate households for their involvement during data collection.

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