Academic Journal of Animal Diseases 9(1): 45-51, 2020
ISSN 2079-200X

DOI: 10.5829/idosi.ajad.2020.45.51

Prevalence of Trypanosomosis and Associated Risk Factors at Kiltu Kara District, West Wollega Zone, Oromia, West Ethiopia

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Abstract: A cross- sectional study was conducted from January 2017 to October 2017 in five villages, Talamso Dembi, Guyo Jirma, Agamsa Bala, Buke Akache and Kiltu Kara city admistration, of Kiltu Kara district which is located at West Wollega zone, Oromia region, West of Ethiopia with the objective of determining the prevalence of trypanosomosis in bovine and associated risk factors in the study area. The study was carried out on 384 animals from which blood samples (wet and thin blood smear) were collected by simple random sampling technique. Blood samples were collected after properly securing the animal and aseptically preparing around the vein. From the study conducted on 384 randomly selected cattle in Kiltu Kara, overall prevalence was calculated to be 4.2 % (n=16) for bovine trypanosomosis. The highest remarkable 6.06% and 5% prevalence was observed in Talamso Dembi and Guyo Jirma respective villages in the study area. From this study, it was possible to conclude that trypanosomosis is an important disease and a potential threat affecting the health and productivity of animals in the study area. Further surveys and studies should be conducted and appropriate and feasible control of trypanosomosis must be done.

Key words: Bovine · Kiltu Kara · Trypanosomosis · Prevalence

INTRODUCTION

Livestock is a major part of African agricultural sector and plays an important role in food and economic security through provision of a variety of products and services including hides, skins, milk, meat, draught power, manure, fiber, and energy and capital accumulation. Besides its significant contribution to agricultural gross domestic product (GDP) and to food security in many countries, livestock is an intrinsic part of people's identity and way of life and also have various social and cultural functions that vary among different cultures, socio-economies, agro-ecologies, and locations in tropical and sub tropical Africa [1].

Ethiopia's ruminant livestock population is the largest in Africa and 10th in the world [2]. They are important components of the livestock subsector and are sources of cash income and play a vital role as sources of meat, milk and wool for small holder keepers in different farming systems and agro-ecological zones of the country [3]. They are also sources of foreign currency. However, the economic gains from these animals remain insignificant when it is compared to their huge number. There are various factors that contribute for low productivity, feed shortage both in quality and quantity, poor feeding, health constraints and management [4].

Large ruminant livestock production is threatened by several diseases, of which bovine trypanosomosis is one of the most important. It is a group of parasitic disease

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caused by different species of unicellular parasites (trypanosome) found in the blood and other tissues of vertebrates including livestock, wild life and people. Bovine trypanosomosis causes a significant loss in animal production and it greatly hampers human settlement in a considerable part of the world [5].

In sub-Saharan Africa, about three million livestock die every year due to tsetse fly transmitted trypanosomosis. Ten million Km^2 areas of the Africa's greatest agricultural potential are infested by tsetse fly, which is the main vector of the disease. The wide occurrence of this disease in people and livestock retards agricultural and economic development in Africa and 30% of the continent cattle population estimated to be 160 million and comparable numbers of small ruminants are at risk of trypanosomosis [6].

In Ethiopia, trypanosomosis is one of the most important disease limiting livestock productivity and agricultural development. Tsetse flies are estimated to infest over 220,000 Km^2 fertile lands in western, south western and southern parts of the country. About 14 million heads of cattle are exposed to the risk of trypanosomosis. It can be transmitted between the hosts mainly by tsetse flies cyclically, by other biting flies mechanically and by other means of transmission [7]. Trypanosomosis of cattle (locally known as "Gandii") can be found in many provinces of Ethiopia where it has greatly hindered development. The most important trypanosome species affecting livestock in Ethiopia are *T. congolense, T. vivax* and *T. brucei*, in cattle, sheep and goats, *T. evansi* in camels and *T. equiperdium* in horses [8].

Several attempts have been made to control trypanosomosis in the country with chemotherapy and chemoprophylaxis. However, bovine trypanosomosis is tremendously affecting the productivity and health of livestock in different areas. Kiltu Kara district is one of the areas in which trypanosomosis causes problem in livestock production. As a result, the people suffer from low level of draught power and productivity that compromise the socio-economic and nutritional status of inhabitants. Knowing the current status and clearly understanding the epidemiology of typanosomosis and its vectors are crucial to integrate all efforts towards combating the disease and reducing economic losses.

Therefore, the objective of this study was to determine the prevalence of trypanosomosis in bovine and associated risk factors at this district.

MATERIALS AND METHODS

Study Area and Study Population: The study was conducted from January 2017 to October 2017 in in five villages, Talamso Dembi, Guyo Jirma, Agamsa Bala, Buke Akache and Kiltu Kara city admistration, of Kiltu Kara district which is located at West Wollega zone, Oromia region, West of Ethiopia. The district is located 550 km away from Addis Ababa. The district is bounded by Leta Sibu district from East, Mana Sibu district from West, Babo Gambel district from North and Benishangul Gumuz region from South. The human population of the district was 55,000. It has an average annual rainfall of 900mm to 1500 mm while the maximum and minimum temperature is 24°C and 17°C respectively. The livestock population of the district was estimated to be 47,193 cattle, 15,649 sheep, 16,850 goats, 44 mule, 9,213 donkey and 84,460 poultries. The farming system of the area was mixed farming where 87% of the total population was engaged in agriculture. Crop and livestock sales are important sources of income for all wealth groups [9]. The study population was undertaken on both sexes and all age groups of local breed of bovine species.

Sample Size Determination: A simple random sampling method was employed and the sample size was determined by the formula given by Thrusfield [10].

$$N = \frac{1.96^2 Pexp(1 - Pexp}{D^2} = 384$$

where

N = Required sample size
Pexp = Expected prevalence (50%)
D = Desired precision level (5%)
1.96 = Z value of the 95% CI

For sample size calculation, 95% CI and 5% desired absolute precision and expected prevalence of the disease (P= 50%) was used. There had been no data base preferences. Thus, the calculated sample size for blood examination was 384 to determine the prevalence of trypanosomosis in the area. Proportional sampling for age and sex was considered.

Study Design: A cross-sectional study type with simple random sampling was conducted to determine prevalence of bovine trypanosomosis in the study area using blood

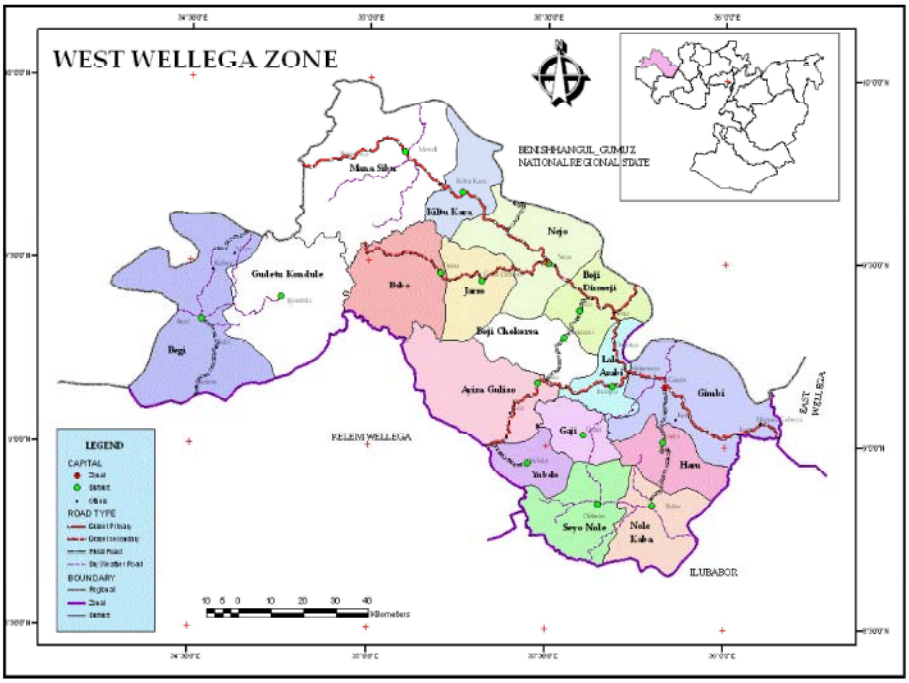

Fig. 1: Map of the study area

smear (wet and thin blood smear). Initially, from 23 kebeles found in the district, 5 areas (Kiltu Kara city administration, Buke Akache, Agamsa Bala, Talamso Dembi and Guyo Jirma) were selected purposively based on accessibility to time, energy and costs. A total of 384 animals were sampled. The number of animals sampled from each village was based on the population of the animal of the village and from each village individual animal was selected based on simple random sampling technique. Epidemiological risk factors such as sex, age, body score condition and origin of animal were assessed for the presence of association with the prevalence of trypanosomosis.

Sample Collection: Blood samples were collected after properly securing the animal and aseptically preparing around the vein. In the present study, blood samples were obtained from the marginal ear vein after picking the vein with the tip of sterile lancet. The lancet was cleaned with cotton and disinfected after bleeding each animal to prevent cross contamination of the sample.

Sample Examination: The slides were polished with dry, clean cloth. The blood collected from animals was placed on the slide, approximately 5 mm away from one end. The spreader (another slide) was placed on ahead of the drop of the blood approximately at an angle of 45°. The spreader slide was drawn back to make contact with blood. The blood was allowed to run to both ends of the spreader slide with steady motion. The slides were dried by waving it in the air. The thin smear was flooded with Giemsa stain for 45 min [11]. Excess stain was drained and washed off by using distilled water and finally allowed to be dried and examined under microscope at x40 objective.

Data Management and Analysis: Data from the study was entered into Microsoft excel data sheet, coded and analyzed using SPSS. Statistical testes such as descriptive statistics, chi-square and other which would be assumed important for the data were applied. For statistical significance, 95% CI and P-value of 0.05 were considered. In all cases, differences between parameters were tested for significance at probability levels of 0.05 or less. Finally, the data obtained were summarized in tables according to the age groups, sex, village and other factors.

RESULTS

A cross sectional study was conducted on 384 randomly selected cattle in Kiltu Kara settlement area from January 2017 to October 2017 and an overall prevalence was calculated to be 4.2 % (n=16) for bovine trypanosomosis. The highest remarkable 6.06% and 5%

Table 1: Prevalence of trypanosome infection in cattle by villages

Sites (Villages)	Number of animals examined	Number of animals infected and prevalence (%)
Talamso Dambi	66	4 (6.06)
Agamsa Bala	94	3 (3.2)
Buke Akache	93	4 (4.3)
Guyo Jirma	40	2 (5)
Kiltu Kara city administration	91	3 (3.2)
Total	384	16 (4.2)

Table 2: Prevalence of trypanosome infection in both sexes

Sex	Number of animals examined	Number infected and prevalence (%)	95% CI
Female	230	12 (5.2)	2.0-7.2
Male	154	4 (2.67)	0.80-6.20
Total	384	16 (4.2)	2.20-6.11

Table 3: Trypanosome infection in different age groups

Age group	Number of animals examined	Number infected and prevalence (%)	95% CI
Calf (< 2 years)	31	0	0
Young (2-5 years)	160	6 (3.75)	0.20-6.20%
Adult (> 5 years)	193	10 (5.2)	2.40-7.40%
Total	384	16 (4.2)	2.20-6.20

Table 4: Prevalence of bovine trypanosomosis with respect to body condition score

Body condition	No. of examined	No. of positive and prevalence (%)	CI
Poor	228	10 (4.4)	
Medium	70	3(4.3)	
Good	86	3 (3.4)	
Total	384	16 (4.2)	

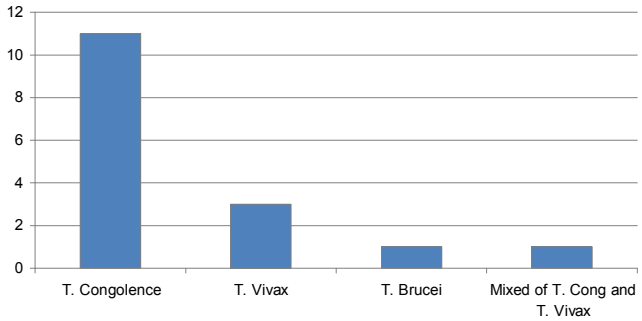

Fig. 2: Distribution of *T. congolense, T. vivax, T. brucei*, mixed infection of *T. congolense* and *T. vivax* in the study area

prevalence was observed in Talamso Dembi and Guyo Jirma respective villages in the study area as presented in Table 1.

During the present survey, from a total of 384 cattle examined, 230 were females and 154 of them were male animals. Of the female animals examined, 5.2% (n=12) were positive for trypanosome infection while 2.67% (n=4) of the male animals were found infected as summarized in Table 2. The trypanosome infection in female animals was slightly higher than in the male animals. However, statistically there was no significant difference in the infection rate between both sexes (Chi square = 0.3222, 1df, P> 0.05).

The animals examined were categorized in different age groups as calf (less than 2 years old), young (2 - 5 years) and adults (greater than 5 years old).

The trypanosome infection prevalence was found to be zero in the animals of calf hood age, 3.75% (n=160) infection rate in the young age group and 5.2% (n=193) in the adult animals as indicated in Table 3. There was statistically significant difference in infection rate among the different age groups (Chi square =0.067, 1df, P<0.05).

Body condition of the animals under study was taken into consideration to determine if there was association between body condition of the animals and prevalence rate of the disease.

During the present study, *Trypanosoma congolense, T. brucei, T. vivax* and mixed infection (*T. congolense* and *T. brucei*) were detected. From among 384 cattle examined, 16 animals were infected with trypanosome parasites of which 11 (68.75%) cattle were found to be infected by *T. congolense*, 3(18.75%) by *T. vivax*, 1 (6.25%) by *T. brucei* and 1 (6.25%) animal was found to be infected by mixed trypanosome parasites as shown in Fig. 2.

DISCUSSION

Trypanosomosis is a major constraint to the utilization of large land resources and also affect livestock, cattle in particular as a major role in agriculture economy of Ethiopia. The introduction of draught oxen was severely constrained by the spread and presence of trypanosomosis [8]. In the present study on 384 local zebu cattle, an overall prevalence of 4.2% (n=16) bovine trypanosomosis was recorded which was virtually similar to the result of the previous work documented as 4.20% in Kenaf settlement area, East Wollega zone [12].

Other studies on the disease were carried out in different areas. When it was compared with results from different areas by different researchers, the present study was lower than that of the result reported by Tafese [13] in which 8.55% prevalence rate was reported from Diga and Sasiga districts of East Wollega zone and Yibrah [14] reported a prevalence rate of 15.57% from Guto Wayu and Sibu Sire districts of East Wollega zone. The prevalence of bovine trypanosomosis in Hawa Gelan district of Kelem Wollega zone of West Ethiopia to be 8.6% [15] and also a range of prevalence were also documented from multiple previous studies conducted in the country as 12.5% at Meda Jalala, West Ethiopia [6], 19.01% in Goro district [16]. The present finding of relatively low prevalence might be attributed to the frequent use of chemotherapeutic drugs, an increase in agricultural investment and decreased tsetse challenge in the area.

The prevalence of the disease between the addresses was compared and found to be slightly higher in Talamso Dembi (6.06%) followed by Guyo Jirma (5%). However, there was no significant association between prevalence rate and addresses. This might be due to the similarity of the addresses in climate, altitude and vegetations since they are located around each other. All of them were virtually exposed to the infestation of tsetse flies.

The prevalence of bovine trypanosomosis in both sexes was assessed where 5.2 % (95% CI = 2.0-7.2%) and 2.67% (CI = 0.80-6.20%) infection rates were detected in female and male animals respectively. Although slightly higher infection was depicted in female animals, there was statistically no significant difference between both sexes (Chi square = 0.322, 1df, P>0.05). This observation coincides with the findings of Getachew [8] and Quadeer *et al.* [17] and this might be due to the fact that both sexes have virtually similar exposure to biting flies in grazing areas.

Present finding revealed that prevalence in adult animals was slightly higher than younger animals. There was significant association between age and prevalence rates which was due to high preference of tsetse for adult animals and less exposure of young animals to tsetse challenge as they were usually being kept at homestead which contrast to the result of the previous work by Alekaw [18] who concluded that there was no significant difference in infection rate between the age groups.

Significant association was observed between body condition score and infection rate. According to the present result, the prevalence rate of the disease was slightly higher in animals with poor body condition. This finding was consistent with the observations of Tadesse and Tsegaye [19]. However, it would be difficult to conclude either poor body condition predispose to trypanosome infection or trypanosome infection cause loss of body condition based on such cross-sectional study done by Yehunie *et al.* [20].

In the present study, *Trypanosoma congolense* is the predominant species in the study area as compared to the other species of trypanosomes. An infection rate of 58.5% for *T. congolense* and 32.2% for *T. vivax* was reported in South-west of Ethiopia [21]. From northern Ethiopia, an infection rate of 54.3% for *T. congolense* and 45.7% for *T. vivax* was reported. Such a high ratio of *T. congolense* might be caused by the presence of a biological vector (Glossina), whereas *T. vivax* is more readily transmitted mechanically by biting flies than tsetse flies and *T. congolense* is mainly confirmed in the blood, while *T. vivax* and *T. brucei* also invade the tissues [22].

CONCLUSION AND RECOMMENDATION

The study carried out on bovine trypanosomosis in five peasant associations of Kiltu Kara district indicated that an overall 4.2% prevalence of the disease was

recorded. In this study, *T. congolense* (68.75%), *T. vivax* (18.75%), *T.b. brucei* (6.25%) and mixed for *T. vivax* and *T. congolense* (6.25%) were trypanosome species identified. Higher prevalence of trypanosomosis infection was observed in animals with poor body condition with a significant association between them. No significant association of prevalence rate in relation with other risk factors (sex and villages) was observed. From this study, it was possible to conclude that trypanosomosis is an important disease and a potential threat affecting the health and productivity of animals in the study area.

Based on the above conclusion, the following recommendations were suggested:

- Strategic control of bovine trypanosomosis including vector control and parasite control should be strengthened to improve livestock production and agricultural development in the area.
- Effective use of trypanocidal drugs must be exercised in the area and farmers of the area should be advised not to use drugs locally without the prescription of the veterinarians.
- Laboratory facility and skilled veterinary higher professionals should be fulfilled in the veterinary clinics to avoid tentative diagnosis which is a challenge for drug resistance.
- Educating the public in the affected areas of trypanosomosis to participate in the control strategies.
- Further surveys and studies should be conducted and appropriate and feasible control of trypanosomosis must be done.

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