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Prevalence, Farmers' Knowledge and Management of Bovine Trypanosomosis in Mandura District, Northwest Ethiopia

Nigatu Kebede

Akillu Lemma Institute of Pathobiology (ALIPB),
Addis Ababa University, P.O. Box: 1176, Addis Ababa, Ethiopia

Abstract: *Introduction*: African animal trypanosomiasis is caused by extracellular protozoan parasites of the genus *Trypanosoma* and severely affects the livestock industry. The present cross-sectional study was carried out to determine the prevalence of cattle trypanosomosis, assess farmers' knowledge and management practices on trypanosomosis at Mandura district, Ethiopia. *Methodology*: Questionnaire and parasitological surveys were conducted. Blood samples of 344 cattle and questionnaires of 155 farmers were collected and examined for parasitemia. The age, sex and body condition of animals were recorded. Semi-structured questionnaire was used to collect information. *Results*: The overall prevalence of trypanosomosis in cattle was found to be 27.3%. Trypanosome species detected were *Trypanosoma congolonse (9.0%), T. vivax (7.0%), T. brucei* (4.9%) and mixed infections (6.4%). The prevalence showed no significant difference in susceptibility between sex, age groups and body condition. Among 155 farmers involved in the survey, 112 (72.3%) were males and 43 (27.7%) females. Participant's major occupation was farming 146(94.2%) and 100% of them own one or more species of domestic animals. Majority of the study participants, 136(87.7%) knew trypanosomosis and 87.1% indicated that it is a health problem for their animals. Among the total respondents only 23.9% replied that trypanosomosis is preventable. *Conclusion*: The current finding indicated that trypanosomosis is prevalent in cattle and the inhabitants of Mandura developed good awareness and however, their prevention and control practice were very low.

Key words: Farmers Knowledge · Management Practice · Mandura · Prevalence · Trypanosomosis

INTRODUCTION

African animal trypanosomiasis (AAT) is caused by extracellular protozoan parasites of the genus *Trypanosoma* and it severely affects the livestock industry, PATTEC [1]. The wide distribution of the disease is attributed to the abundance of its biological and mechanical transmitting vectors which are tsetse flies and biting flies, respectively [2]. All warm-blooded animals including wildlife species have been implicated in the transmission cycle of the disease [3]. The mature infective form of the parasite, metacyclic trypomastigote, is found in the invertebrate host where several reproductive and developmental stages takes place [4]. Trypanosomes evade the immune system of the host because it possesses a variable surface antigen (VSG) which prevents them from lysing by complement alternative pathway [5, 6].

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 hosts [7]. Tsetse-transmitted trypanosomosis is one of the most devastating diseases of domestic animals and humans in Sub-Saharan Africa and has a profound effect on rural development over large areas [8].

Different forms of trypanosomosis occur in large areas of Latin America, Asia, Middle East and Africa. In Tropical Africa, trypanosomosis is found over an area of about 10 million km^2 or roughly one-third of the continent. The disease is caused by protozoan parasites, which affect most type of domestic livestock, wildlife species and humans. In Africa, the major pathogenic species of trypanosomes for domestic ruminants and wildlife are *Trypanosoma ongolense T. vivax* and *T. brucei*. These are transmitted by tsetse

Corresponding Author: Nigatu Kebede, Akillu Lemma Institute of Pathobiology (ALIPB), Addis Ababa University, P.O. Box: 1176, Addis Ababa, Ethiopia. Tel: +251112763091, P.O. Box: 150480.

flies (*Glossina* spp.) and very occasionally by other biting flies. *T. evansi* also affects livestock in Africa and elsewhere, transmitted by biting flies. Outside Africa, pathogenic trypanosomes are transmitted by biting flies or occasionally sexually [3, 9].

Animal trypanosomosis is an important livestock disease in Africa which is considered as a threat to the ongoing effort on poverty alleviation in the continent [10]. It is a serious disease in domestic livestock that causes a significant negative impact in food production and economic growth in many parts of the world particularly in sub-Saharan Africa [11]. Bovine trypanosomosis is one of the most prevalent and important disease in Ethiopia limiting livestock productivity and agricultural development [3].

The disease is very economical because of its highest prevalence in the most arable and fertile land with high potential for agricultural development in the South West and North West part of the country along the great river basins of Abay, Omo, Ghibe and Baro which are infested by the vector tsetse fly. In Ethiopia, tsetse flies are confined to southwestern and northwestern regions between longitude 33° and 38°E and latitude 5° and 12°N an area covers 220, 000 km^2 [12]. There are also studies which show the disease to be equally important in non-tsetse infested highland part of the country [9].

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 [3, 9]. Since more than 90% 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 [13].

Tsetse transmitted animal trypanosomosis is an important constraint to livestock development in Africa. It occurs in around 10 million km^2 in 37 sub-Saharan countries [1] and constitutes a major threat to the survival and productivity of domestic livestock in sub-Saharan Africa [2]. In Ethiopia, it has been described as a major impediment to the livestock development and agricultural production; contributing negatively to the overall development and to food self-reliance efforts of the country. The annual losses to the national economy are estimated to exceed US$200 million, due to its direct and indirect impact to the agricultural and livestock production. Currently, this disease and its vector (tsetse) are excluding about 180, 000-220, 000 km^2 of agriculturally suitable land of Ethiopia and also 14 million cattle, an equivalent number of shoats and nearly of a million equines are at risk of contracting the disease [3, 4].

The distribution of trypanosomes in Ethiopia is dynamic due to climatic change, ecological disturbances and human interventions. Some tsetse infested areas are scarce in infrastructure and devoid of human settlements. In such areas' information is lacking about the status of trypanosomosis. Even in already studied areas updating the prevalence and status of the disease have paramount importance for understanding the epidemiology of the disease, to facilitate the choice of suitable control methods and to help in planning for development programs in the area. Previous studies revealed the prevalence of the disease in many districts in northwestern part of the country with obvious economical consequences [14-17]. The problem was seen to be prominent in districts bordering the Abay river basin where both cyclically and mechanically transmitted trypanosomosis were reported. Mandura district of Metekel zone is such a district where there was serious complaint of the disease. Therefore, the aims of this study were to assess the prevalence and knowledge, attitude and practice of farmers towards bovine trypanosomosis at Mandura district of Metekel zone, Northwestern Ethiopia.

MATERIALS AND METHODS

Study Area: The study was conducted at Mandura district of Metekel zone, in the northwestern direction about 585 km away from Addis Ababa the capital of Ethiopia. The study district, Mandura, is selected on the basis of endemicity of animal trypanosomosis. The study area experiences bimodal rainfall. The main rainy season is from June to September and the short rainy season is from February/March. The dry season extends from October to February. In the study sites mixed cop-livestock production system is practiced, natural pasture provides greater than 95% of the feed resource the remaining is from straw and hay. It lies at an altitude range of 1500-2000 meters above sea level. The average annual rainfall is 1350mm while the average monthly air temperature ranges from 17°C to 37°C. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia [18], this woreda has a total population of 40746, of whom 21, 241 are men and 19, 505 women; 7, 518 or 18.45% are urban inhabitants. The majority of the inhabitants practiced traditional beliefs, with 47.76% reporting that as their

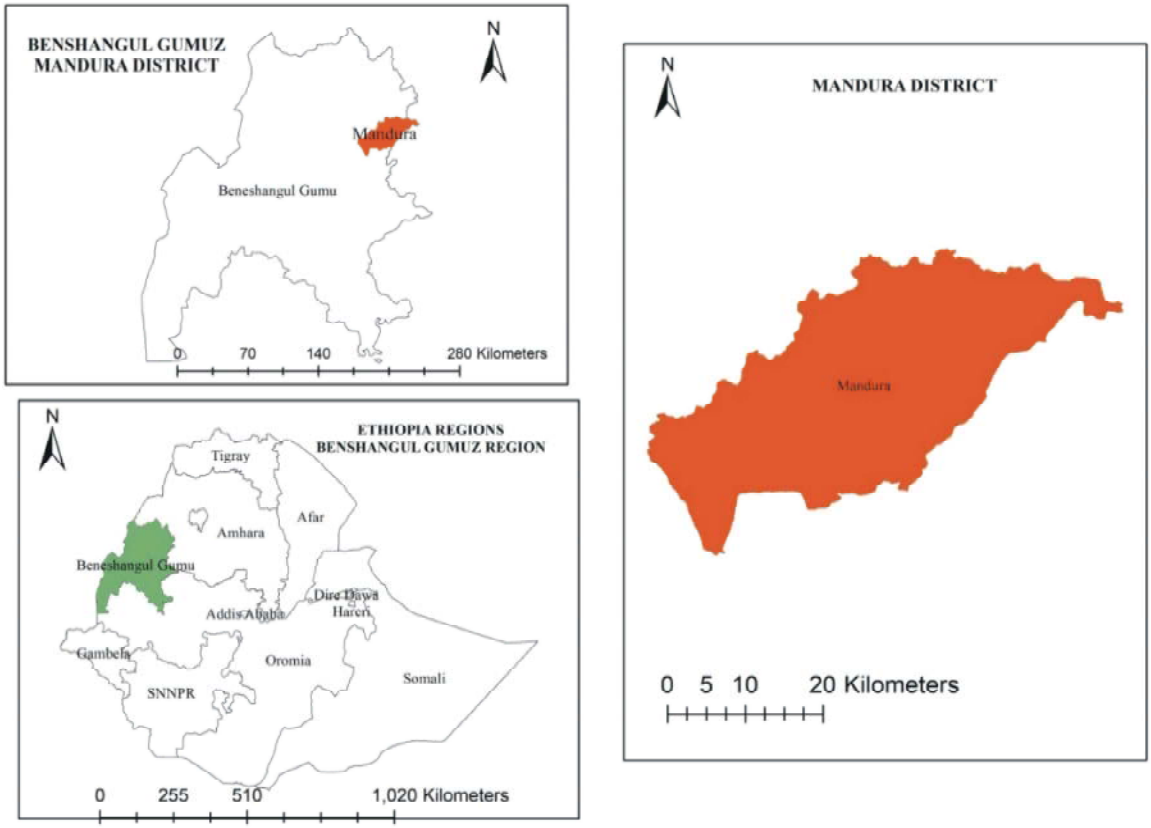

Fig. 1: Map of the study area, Mandura district

religion, while 39.26% of the population practiced Ethiopian Orthodox Christianity and 7.59% were Moslem. The major cattle breeds found in the study area were local zebu breed. Cattle are kept for animal traction, manure, savings, milk and meat production and social obligations. Below is map of the study area (Fig. 1).

Study Design: A cross sectional study that involves questionnaire survey and parasitological and hematological examinations were carried out. The study was conducted between August 2017 and March 2018 to assess the prevalence of trypanosomiasis in cattle and community's knowledge, attitude and practice on cattle trypanosomosis using structured questionnaire.

Study Animals: A total of 344 cattle of different sex and age were selected by random sampling in the district. Information on age, sex and body condition [19] of sampled animals were recorded. The sample size was calculated using 95% confidence interval with the absolute error of 5% and the expected prevalence of 25%, Tesfaye and Ibrahim [20] according to the formula given by Thrusfield [21].

$$N = \frac{1.96^2 P_{exp}(1 P_{\exp})}{d^2}$$

where:

n = required sample size
Pexp = expected prevalence
d = desired absolute precision
1.96^2 = the value of z at 95% confidence interval
Pexp = expected prevalence

$$n = \frac{1.96^2 * P_{exp} X(1 P_{\exp})}{d^2}$$

$$\frac{3.84 * 0.25(1-0.25)}{(0.05)^2} = 288$$

Questionnaire Survey: A pre-tested questionnaire was administered to the participants of Mandura district in order to collect information on their demographic, socioeconomic and farmers knowledge and management practice on bovine trypanosomosis. The questionnaire was addressed to subjects regardless of gender to respondents aged 18 years and above. A pre-test and

introduction of the study objectives to the community leaders were done before the study was conducted. Oral consent was obtained before a questionnaire was administered to the respondents. Sample size of 155 respondents was interviewed. Information was collected from the respondents via face-to-face interviews conducted by trained research assistants. The assistants were aware of the purpose of the study and the way in which to administer the questionnaire.

Parasitological Study

Buffy Coat and Thin Blood Smear: Blood samples were collected by puncturing the ear vein with a lancet which was then transferred into a heparinized capillary tube. The tubes were centrifuged at 12, 000 rpm for 5 minute Since *Trypanosomas* are found in the Buffy coat layer, the capillary tube was cut 1 mm below and 3 mm above the Buffy coat. The Buffy coat was then placed onto a glass slide and covered with cover slip and was examined for movement of parasite under x40 objective and x10 eye piece [22]. Identification of the *Trypanosoma* species was done based on morphological descriptions as well as movement in wet film preparations [23, 24].

A small drop of blood from a micro-hematocrit capillary tube was applied to a clean slide and spread by using another clean slide at an angle of 45°. The smear was air dried and then fixed for 2 minutes in methyl alcohol. The thin smear was flooded with Giemsa stain (1:10 solution) for 30 minutes. Excess stain was drained and washed by using distilled water. Then it was allowed to dry by standing up right on the rack and examined under the microscope (x100) oil immersion objective lens [25].

Data Analysis: The data collected was entered in MS-Excel spreadsheets and hematological data was analyzed using statistical packages for social sciences (SPSS) version 20 software program. The association between prevalence of *Trypanosoma* infection and risk factors such as age, sex, breed, body conditions and coat color of animals was done using Pearson's chi-square (χ^2). Statistical significance was held at P-values less than 0.05 in all analysis.

Ethical Clearance: Ethical clearance for this study was obtained from Aklilu Lemma Institute of Pathobiology (ALIPB), Addis Ababa University Institutional Review Board (IRB) approval number RD/PY-333/2017.

RESULTS

Socio-Demographic Characteristics: A total of 155 individuals were involved in this study, 112 (72.3%) of the respondents were males and 43 (27.7%) females. The participants age was varied between 18 and 65 years where the medium age being 44 years. Participant's major occupation was farming 146(94.2). Majority of the participants 112 (72.3%) were married, 100% of them own one or more species of domestic animals and Orthodox Christianity was the dominant religion 106 (68.4%) at Mandura. Of the study participants 74(47.7%) were able to read and write while 81(52.3%) of the participants neither read nor able to write. The study participants were composed of Amhara, Gumze, Shinasha and Agaw by ethnicity. The general socio-demographic characteristics of the study participants were presented in Table 1.

Knowledge on Animal Trypanosomosis among Study Participants: From the total study participants majority of them, 136(87.7%) knew trypanosomosis and very few19 (12.3) responded that they did not heard of about AT. Most of the study participants (87.1%) knew that trypanosomosis is a health problem for their animals. 61(39.4%) of the participants responded that trypanosomosis is transmitted by biting flies, 34(21.9%) responded by tsetse flies and 10 (6.5%) by ticks. Nearly 32.3% have no knowledge how trypanosomosis is transmitted. About 48.4% of the participants responded that the main clinical symptom of trypanosomosis was anemia whereas 41.9% responded emaciation. The majority of the participants 78(52.3%) indicated that they use the district veterinary clinic for treatment, 27.1% take their animals to traditional healers for treatment, 14.8% use animal health post to get the service and 7.7% indicated self-treating of their animals (Table 2).

Management Practice Related to Bovine Trypanosomosis among the Study Participants in Mandura: Of the total 155 study participants who heard about AT, most of them 68.4% have the attitude that trypanosomosis is a problem for their animals in study area and have positive attitude towards the treatment of trypanosomosis whereas 22.6% have no any attitude whether AT is treatable. Regarding their treatment preference the majority 77.4% has the attitude that treatment from veterinary clinics is effective. Of the respondents 56.1% have the attitude that the outcome of the disease is death of their animals, 25.8%

Table 1: Sociodemographic characteristics of the study participants in Mandura district, Metekel Zone, Northwest Ethiopia

Item		Frequency	Percent
Sex	Male	112	72.3
	Female	43	27.7
Age	18-30	26	16.8
	31-40	67	43.2
	41-50	57	23.9
	51-60	22	14.2
	>60	3	1.9
Relation to Household Head	Head	129	83.2
	Spouse	26	16.8
Permanent residence	Rural	123	79.4
	Urban	32	20.6
Family size (number)	2	27	17.4
	3-5	44	28.4
	>5	84	54.2
Major occupation	Employed	7	4.5
	Trade	2	1.3
	Farmer	146	94.2
Educational status	Illiterate	81	52.3
	Read and write	46	29.7
	Grade 1-6	18	11.6
	Grade 7-8	6	3.9
	Grade 9-12	4	2.6
Do you own animals?	Yes	155	100
	No	0	0.0
If yes, species of the animals?	Cattle	155	100
	Sheep	23	14.8
	Goats	74	47.2
	Equine	112	72.3

Table 2: Knowledge on animal trypanosomosis among study participants in Mandura district, Metekel Zone, Northwest Ethiopia

Item		Frequency	Percent
Have you ever heard of animal trypanosomosis?	Yes	136	87.7
	No	19	12.3
Do you beilive that animal trypanosomosisis a health problem for your animals?	Yes	135	87.1
	No	20	12.9
What do you think the cause of animal trypanosomosis?	Tsetse fly bite	34	21.9
	Biting flies	61	39.4
	Poor hygiene	10	6.5
	Don't know	50	32.3
What are the symptoms of animal trypanosomosis?	Pruritis	4	2.6
	Anemia	75	48.4
	Emaciation	65	41.9
	Diarrhea	7	4.5
	Coughing	4	2.6
	I do not know		
Where often your animals get treatment for animal trypanosomosis?	District vet. ATinic	78	52.3
	Animal health post	23	14.8
	Traditional healers	42	27.1
	Self	12	7.7

responded self-cure whereas 18.1% indicated production reduction if their animals are not treated. Of the respondents 39.4% indicated that biting flies as the main way of trypanosomosis transmission, 21.9% indicated tsetse flies as the main means of transmission while 23.9% responded as transmission is by contact with sick animals. Of the participants 65.2% indicated that tsetse flies breed in the vegetation. Of the participants 89% did not participate in the trypanosomosis control activities (Table 3).

Table 3. Attitude towards animal trypanosomosis among study participants in Mandura district, Metekel Zone, Northwest Ethiopia

Item		Frequency	Percent
Is animal trypanosomosis a problem in your area?	Yes	106	68.4
	No	35	22.6
	I don't know	14	9.0
Is animal trypanosomosis treatable?	Yes	120	77.4
	No	35	22.6
	I don't know		
What do you think the outcome of animal trypanosomosis if not treated?	Death	87	56.1
	Reduced production	28	18.1
	Self-cure	40	25.8
	Others		
How is animal trypanosomosis transmitted?	Tsetse fly bite	34	21.9
	Contact with sick animals	37	23.9
	Biting flies	61	39.4
	Tick	11	7.1
	Others	12	7.7
Where do tsetse flies breed?	Vegetation	101	65.2
	Houses	46	29.7
	Others	8	5.2
Have you ever participated in tsetse fly &animal trypanosomosis control activities?	Yes	0	0.0
	No	138	89.0
	Don't know	17	11.0

Table 4: Practice of respondents towards animal trypanosomosis prevention and control in Mandura district, Metekel Zone, Northwest Ethiopia

Item		Frequency	Percent
Is animal trypanosomosis a preventable disease?	Yes	37	23.9
	No	77	49.7
	Don't know	41	26.4
What methods do you know to prevent animal trypanosomosis?	Insecticide	13	8.4
	Bush ATearing	26	16.8
	No prevention methods	64	41.3
	I don't know	52	33.5
Keeping all animal indoor	Yes	0	00.0
	No	155	100

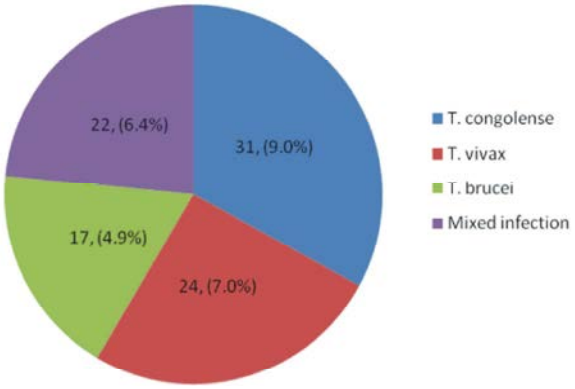

Fig. 2: Distribution of trypanosomes species among infected animals at Mandura district, Metekel zone, Northwest Ethiopia

Among the total respondents only 23.9 replied that trypanosomosis is preventable, 49.7% responded that it is not preventable and 26.4% did not know whether it is preventable. Regarding methods of prevention they use bush clearing (16.8%) and insecticide (8.4%). Majority of the respondents (74.8%) did not use any prevention methods. All of them keep their animals outdoor throughout the year (Table 4).

Parasitological Findings: Out of 344 cattle examined 94 (27.3%) were found to be infected with trypanosomes. The prevalence in terms of trypanosome species was 9.0% *T. congolense*, 7.0% *T. vivax*, 4.9%T. brucei and 6.4% mixed infections. The proportion of trypanosome species was 33.0% (31/94) *T. congolense*, 25.5% (24/94) *T. vivax*, 18.1% (17/94) T. brucei and 23.4% (22/94) mixed infections (Figure 2).

Table 5: Prevalence of bovine trypanosomosisin relation to various risk factors at Mandura district northwest Ethiopia

Variables		No. animals examined	No. Positive	Prevalence (%)
Peasant Associations	1	112	33	29.5
	2	120	31	25.8
	3	112	30	26.8
	Total	344	94	27.3
Sex	Female	183	45	13.1
	Male	161	49	14.2
	Total	344	94	27.3
Age	<2years	81	17	4.9
	>2years	263	77	22.4
	Total	344	94	27.3
Body condition	Poor	109	41	11.9
	Medium	123	28	8.1
	Good	112	25	7.3
	Total	344	94	27.3

Prevalence of Trypanosomosis in Relation to Various Risk Factors: The prevalence of trypanosomosis in cattle was slightly higher in males 14.2% than female animals, 13.1%, however, difference was not statistically significant ($P > 0.05$). The highest prevalence was observed in the adult animals greater than 2 years old, 22.4% ($P< 0.05$). The prevalence of trypanosomosis between body condition scores was 11.9% in poor, 8.1% medium and 7.3% in good body conditioned cattle. However, the variation in prevalence regarding body condition of animals is not statistically significant ($p > 0.05$) (Table 5).

DISCUSSION

Bovine trypanosomosis is known to occur in different areas in Ethiopia. This finding provides prevalence in bovine and detailed analysis of knowledge, attitude and practice on bovine trypanosomosis by farmersin Mandura, one of bovine trypanosomosis endemic site in Metekel zone of Benishangul-Gumez Regional State, Northwest Ethiopia. In the study experienced individuals were used for data collection especially in administering the questionnaire. These individuals were indigenes to Mandura, speak the local language of the study participants and interact directly with the target population, involving them could facilitate compliance and cooperation of the participants to give honest information required [26]. Furthermore, all the survey activities were supervised by the researcher. Blood sample from cattle was collected by animal health technicians and the researcher.

This study indicated that 87.7% the farmers participated in the study knew trypanosomosis and believe it is a health problem for their animals. However, 12.3% of the participants does not know that trypanosomosis is a health problem, revealing there were people who had poor or no understanding of trypanosomosis. Majority of the respondents 34(21.9%) and 61(39.4%) indicated knowing that trypanosomosis is caused by tsetse fly bite and biting flies, respectively whereas 50(32.3%) believe blood parasite is the cause and 10(6.5%) did not know the cause of trypanosomosis. The implication of this discrepancy of information is that farmersmay not take suitable actions to protect their cattle. In this study, most of the participants 75 (48.4%) knew that the most common signs of the disease include rough hair coat (48.4%), emaciation (48.4%) and anemia (41.9%). Very few of the participants mentioned diarrhea (4.5%) and coughing (2.6%). About 48.4% of the participants knew one or more signs and symptoms of trypanosomosis. In addition, this survey indicated that most of the participants 67.1% preferred veterinary clinics to get treatment for their animals, indicating they have knowledge on the usage of modern treatment centers such as district veterinary clinics/animal health posts. However, approximately 27.1% and 7.7% of the participants still consider traditional healers and self-treatment of their animals, respectively. Although, majority of the participants preferred veterinary clinics for treatment their cattle, their knowledge of the drugs used in the treatment of the disease was poor, showing awareness on trypanosomosis in the population is low.

The attitudes of the farmers related to trypanosomosis showed that most of them, 68.4%, view it to be problematic disease that causes economic problem in their area. The fact that slightly more than half of the participants indicated that they view trypanosomosis to be a problem shows that awareness and knowledge of disease is lacking among the farmers of Mandura.

Thus, there is a need to increase efforts to improve education of the residents to ensure efficient control of trypanosomosis. The majority, 77.4% of the participants assumed that trypanosomosis is treatable, 10.2% believed that it could not be treated and cure completely and 34.9% did not know whether rypanosomosis is treatable. This showed that the community practice towards the treatment of rypanosomosis is low. In our study, a considerable proportion of the farmers sought treatment from local traditional healers. This might increase disease duration and in turn, increase the chance of transmission of the disease. This might be due to different reasons like poor community awareness creation activities.

Thirty-nine point four of the respondents replied that trypanosomosis is transmitted through biting flies, 23.9% indicated it is transmitted through tsetse fly bite, 21.9% said contact with sick animals, 7.1% by ticks and 7.7% indicated other means could transmit the disease. Majority of the respondents (65.2%) indicated that tsetse flies breed in vegetation where as 29.7% replied bred around the house and 5.2% indicated other places. None of the respondents participated in tsetse fly and trypanosomosis control activities whereas approximately 89% of the respondents did not believe that trypanosomosis could be controlled through community participation and 11% of the respondents have no idea. More than half (56.1%) of the participants indicated the death of their animals is the outcome of trypanosomosis if not treated, 18.1% replied reduced productivity is the outcome of trypanosomosis if not treated and 25.8% indicated self-cure. When the overall attitude of the study participants are considered, had favorable attitude towards trypanosomosis that is a health and productivity problem for their cattle but attitude to its transmission is poor, this may favored the increase in the occurrence of trypanosomosis.

About 49.7% of the study participants indicated that preventability of trypanosomosis is unthinkable; 23.9% of them mentioned that trypanosomosis is preventable and the others 26.4% did not know whether it could be preventable. All of them, 100% keep their cattle outdoor. In order to prevent trypanosomosis, 16.8% of the participants use bush clearing, 8.4% only insecticide spray, while 41.3% of the participants did not use any prevention methods against trypanosomosis and 33.5% do nothing to control the disease. This might be due to poor awareness of the community in Mandura.

The overall prevalence of bovine trypanosomosis in the study area was 27.3%. This finding relatively similar to Cherenet *et al.* [9], who reported infection rates of 20.9% and 25.7%, respectively. The finding of the current study is greater than a range of studies conducted previously in Ethiopia: Tafese *et al*. [27] reported prevalence rate of 8.5%; Mekuria and Gadissa [16] reported 12.41% in different parts of the country, Abebe and Jobre [28] reported 17.67%; Dagnachew *et al.*[14] reported 12%; and Afework [29] reported 17.20%.

Out of the 27.3% overall prevalence of trypanosome infection, 9.0% were due to *T. congolense*, 7.0% were due to *T. vivax*, 4.9% were due to *T. brucei* and 6.4% were due to mixed infections. The finding of this study showed that of the total trypanosome positive animals 33.0% were found to be infected with *T. congolense*, 25.5% were infected with *T. vivax*, 18.1% were infected with *T. brucei* and the remaining 23.4% were due to mixed infections. The higher proportion of *T. congolense* in this study was in agreement with the previous results of Abebe and Jobre [28], Woldeyes and Aboset [30], Rowlands *et al.* [31]. The predominance of *T. congolense* infection in cattle suggests that the major cyclical vectors or Glossina species are more efficient transmitters of *T. congolense* than *T. vivax* in East Africa [32]. According to Abebe and Jobre [28], *T. congolense* and *T. vivax* are the most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of the Ethiopia, respectively. The prevalence of bovine trypanosomosis was studied in different sex, body condition and age groups of cattle and significant variation was not observed ($P > 0.05$). This might be because of an equal chance of exposure to the parasite. This result is in agreement with the previous researches reported by Tafese *et al.* [27], Mihret and Mamo [33], Abebayehu *et al.* [34], Bekele and Nasir [35]. In the present study sex and body condition were not found to be the risk factor.

CONCLUSION

This study indicated that trypanosomosis is an important disease and a potential threat that affects the health and productivity of cattle in Mandura district. The major species of trypanosomes in the study area were T. congolense followed by T. vivax, T. brucei and mixed infections. Furthermore, the findings of this study showed that the residents of Mandura had good awareness and favorable attitude about trypanosomosis however; their practice regarding prevention and control of the disease was low. Hence, this investigation recommended continued awareness creation activities to the farmers at Mandura district.

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