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Assessment of Knowledge, Attitude and Practice on Trypanosomosis and Tsetse Control Methods in Boreda, Gamo Zone, Ethiopia

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Abstract: A cross-sectional study was conducted to assess the knowledge, attitude and practices of respondents on trypanosomosis, tsetse fly and its control methods in purposively selected kebeles (Meteka Dana and Zefine Menuka) in Deme river basin, in Gamo Zone of SNNPs, Ethiopia. The data was collected through a semi-structured questionnaire survey which involved 90 respondents and presented using descriptive statistics. All of the respondents know and reported at least one of the clinical signs such as ruffled hair, coughing, weight loss and lacrimation. Eighty-four (93.3%) of respondents reported that they know the vector of trypanosomosis (Tsetse fly and other biting flies) with in the area and locally called Iwur zinb or Gendi zinb. Seventy-eight (85.75%) respondents can differentiate tsetse fly from other biting flies by observing its color and morphology. Forty-nine (53.8%) of them said that tsetse fly is larger, longer and dark brown with its wings overlapping (Scissor like) when at rest. Twenty-nine (34.95%) responded as they can identify the fly by its light yellow color in addition to larger size and overlapping wings at rest. But 12 (18.95%) of respondents do not know tsetse fly color and morphology. Despite the high level of awareness, only a small proportion (29%) of respondents use chemical spray and target to control tsetse fly and 5.5% use sterile tsetse release. Substantial proportion (65.5%) of cattle owners, however, use treatments of sick animals by modern drug including diminazine aceturate and Isomethamedium. Out of respondents 87% and 44% from Zefine Menuka and Meteka Dana village use treatment of sick animals as a control method for trypanosomosis respectively. Majority (93.33%) of respondents thought that using tsetse control method is not only important to reduce risk of disease but also possible to eradicate the disease trypanosomosis. Respondents in both study sites were active participants in tsetse and trypanosomosis control programs through pour on (83.89%) and target deployment (81.11%). However, 51.11% of respondents were not experienced with sterile tsetse release technique and said that they kill the entire fly in release box and throw release box to river. Therefore, there is a need for further awareness creation to the community about the sterile insect technique for appropriate tsetse control methods.

Key words: Community · Deme River Basin · Sterile Tsetse Release · Survey

INTRODUCTION

Trypanosomosis is a protozoan disease caused by different species of unicellular parasites (Genus: Trypanosoma) and is mainly transmitted cyclically by the genus *Glossina* (Tsetse flies), but also mechanically by several biting flies such as *Tabanus* and *Stomoxys* [1]. Trypanosomosis in cattle, locally referred as "Gendi", is a serious constraint to livestock in areas of northwest and Southwest Ethiopia at an altitude of below 2000 meters above sea level [2]. 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 [3] and constitutes a major threat to the survival and productivity of domestic livestock in sub-Saharan Africa [4].

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There are five species of *Glossina* in Ethiopia: *G. pallidipes*, *G. morsitans submorsitans*, *G. fuscipes*, *G. tachinoides* and *G. logipennis* [5, 6]. Several control approaches are available to eradicate trypanosomosis and its biological vector, the tsetse fly, from the area [3]. Tsetse flies in Ethiopia are confined to Southwestern and Northwestern regions between longitude 33° and 38°E and latitude 5° and 12°N covers an area of 220,000 km² [5]. The presence of tsetse flies forced people and livestock to crowd into partially environmentally fragile tsetse free areas leading to overgrazing and erosion [3]. The main problem facing tsetse fly control is the farmer's perception towards tsetse control. Some farmers with poor cash flow may respond by buying costly drugs but unwilling to pay for cheaper preventive strategies. At times farmers may not know the connection between tsetse flies and trypanosomosis [7]. Current vector control interventions involve the use of insecticides either through sequential aerosol spraying technique (SAT); ground spraying; insecticide-treated targets or insecticide treated animals - live baits and the sterile insect technique (SIT) [8].

Trypanosomosis is a protozoan disease caused by different species of Trypanosoma. It is mainly transmitted cyclically by the tsetse flies (*Glossina* spp), but also mechanically by several biting flies such as *Tabanus* and *Stomoxys* [1]. In Ethiopia, the disease have been causing a serious economic losses. Tsetse transmitted trypanosomosis is widespread in country occupying about 220,000 km^2 area whereas mechanically transmitted disease is even wider than this. *Trypanosome congolense* and *T. vivax* are most important pathogenic trypanosome species found in the country; even though *T. brucei* and *T. evansi* are also found [5, 9]. Tsetse and trypanosomosis control are a series of efforts employed to reduce or eliminate the incidence of African trypanosomosis, transmitted by tsetse flies. Two complementary strategies have been used in the attempts to reduce or eliminate the disease. The two strategies are chemotherapeutic, targeted at reducing the incidence of trypanosomosis in livestock and entomological, aimed at disrupting the cycle of transmission of the disease by reducing or eliminating the vector of trypanosomosis [10].

A disease-free environment be created only by the removal of the tsetse fly. Some of the currently acceptable control methods of tsetse are based on the use of insecticides (The sequential aerosol technique), others on bait technologies (Traps and targets, live bait technique) and others on genetics (Sterile insect technique) [11].

A powerful "Final push" tool in AW-IPM is the sterile insect technique (SIT). The technique has been effectively used for eradication of tsetse (*G. austeni*) from Unguja Island in Zanzibar [8]. If large numbers of sterile males could repeatedly be released into wild populations, it would eventually eliminate population reproduction and lead to eradication [12].

For the successful of these control strategies greater involvement of farmers and communities in decision making, program designing, program implementing, program evaluating and creating awareness are crucial [13]. Understanding of farmers' knowledge and perceptions on the impacts of trypanosomosis and tsetse fly and their participation in developing intervention strategies are prerequisites for effective implementation [14].

The SIT technique has been effectively used for eradication of tsetse (*G. austeni*) from Unguja Island in Zanzibar [8]. For the successful of these control strategies greater involvement of farmers and communities in decision making, program designing, program implementing, program evaluating and creating awareness are crucial [13]. Though studies on the disease trypanosomosis and tsetse flies done so far at different parts of Ethiopia, there is scarcity of data about farmers' knowledge, attitude and practice towards control and eradication methods of trypanosomosis and its vector tsetse fly in Deme river basin, South Ethiopia. Therefore, this study was proposed to assess community knowledge and attitude on trypanosomosis, its vector and control methods and to assess community practice on the tsetse control methods in Deme river basin, Southern Ethiopia.

MATERIAL AND METHODS

Description of Study Area: The study was conducted at two villages in Deme river basin of Arba Minch, GamoZone, South Nation Nationalities and People Regional state (SNNPR). Arba Minch is located at a distance of 505 Kms South of Addis Ababa and 270 Kms from the regional town, Hawassa. Geographically it is found in 37°5'E of longitude and 6°N of latitude with altitude 1200-3125 meters above sea level. The annual rain fall ranges from 750-930 mm with mean average temperature 30°C. The main occupation of the rural population is mixed farming system whereby crop and livestock are managed. The livestock population in the town was unknown in number but Gamo Gofa Zone in the town (Arba Minch) which is the capital city of this zone includes cattle (1,243,017), sheep (196,575), goats (543,385) and equine (58,664) [15].

Study Design: A cross sectional study design was conducted from October 2018 to May 2019 to assess the knowledge, attitude and practice of livestock owners about the disease trypanosomosis and awareness of the community on tsetse control and eradication methods.

Study Population and Sampling Units: Livestock owners living in selected districts along the Deme river basin were the target populations included in the study. All the community members having domestic animals in the study area were included irrespective of the difference in their demographic characteristics. However, livestock owners living in naturally tsetse free area (High land peasant associations) and those suffering mental problem were not included in the study.

Study Method: A Semi-structured questionnaire was prepared and a pilot study was done prior to actual survey. Information that can reflect respondent's knowledge related to causes, sign and symptom and control methods of trypanosomosis; perception of livestock owner on the disease trypanosomosis, its vector and control methods; and socially accepted practice related to trypanosomosis and tsetse control methods were included in the questionnaire format.

Sampling Method and Data Collection: Two villages were purposively selected from Deme river basin (Meteka Dana and Zefine Menuka) where the disease trypanosomosis and tsetse density is high throughout the year. The selected study sites were the main thematic area of Arba Minch Tsetse and Trypanosomosis Control and Investigation Center. Thus, relevant information were collected by interview based questionnaire survey of 90 farmers from the randomly selected households; 50 households selected from Zefine Menuka and 40 from Meteke Dana.

Data Management and Analysis: Data on individual animal owners about knowledge and perception of trypanosomosis and tsetse and practice on its control methods result was entered into Ms-Excel spread sheets program. All data were analyzed by using Statistical Package for Social Sciences (SPSS) version 20. Respondents' knowledge, perception and practice about trypanosomosis, vector and control methods were presented by using descriptive statistics such as percentage, tables and charts.

Table 1: Major clinical signs frequently reported by the respondents in the study sites.

Signs	M/Dana (n=40)	Z/Menuka (n=50)	Total (n=90)	Cumulative percentage
Ruffled hair	14(35%)	20(40%)	34(37.5%)	34(37.5%)
Coughing	10(25%)	10(20%)	20(22.5%)	54(60%)
Weight loss	12(30%)	15(30%)	27(30%)	81(90%)
Lacrimation	4(10%)	5(10%)	9(10%)	90(100%)
Total	40(100)	50(100%)	90(100%)	90(100%)

Z/Menuka=Zefine Menuka and M/Dana=Meteka Dana

RESULTS

Farmers Knowledge on Trypanosomosis and Tsetse Fly: Out of the 90 respondents in the study area, all responded that they know animal trypanosomosis and can identify it by different clinical signs on their animals. Accordingly, the clinical signs of the disease reported by the respondents were ruffled hair (37.5%), coughing (22.5%), weight loss (30%) and lacrimation (10%) (Table 1).

Most respondents84 (93.5%), (95% in M/Dana and 92% in Z/Menuka) reported that they knows the vector of trypanosomosis (Tsetse fly and other biting flies) with in the areas and locally called Iwur zimb or Gendi zimb. Seventy eight (85.75%) respondents can differentiate tsetse fly from other biting flies by observing its color and morphology. Forty nine (53.8%) of them said that tsetse fly is larger, longer and dark brown with its wings overlapping (Scissor like) when at rest. Twenty nine (34.95%) of study participants responded as they can identify the fly by its light yellow color in addition to larger size and overlapping wings at rest. But 12 (18.95%) do not know tsetse fly color and morphology.

Respondents Knowledge on Trypanosomosis and Tsetse Fly Control Methods: Most of the respondents 43 (48%) stated that treatment of affected animals is major method of controlling the disease by using modern trypanocidal drugs including Diminazineaceturate (Berenil) locally known as "*Bicha*" and Isometamidium chloride (Trypamidium) locally known as "Buna". Others 32 (35.75%) responded tsetse control by applying chemical spray or pour on back of animal from hump to tail of animal for control for trypanosomosis. Similar to chemical spray, 14.5% responded that the use of target to kill and reduce tsetse and biting flies, thereby; minimize distribution of disease in animals. Majority (87%) of the respondent individuals from Z/Menuka village replied treatment of sick animals as a method for control of trypanosomosis. None of the respondents in this site

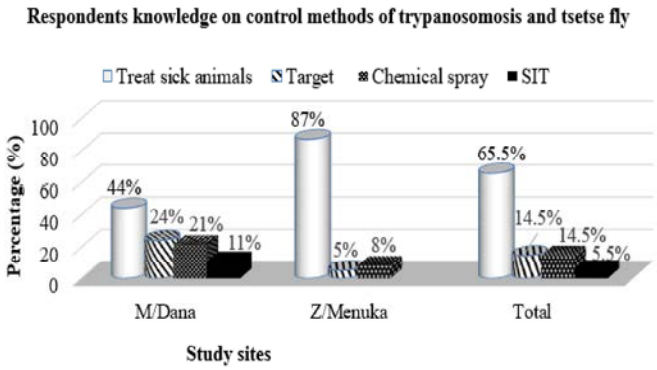

Fig. 1: Control methods used on trypanosomosis and tsetse by farmers in Meteka Dana and Zefine Menuka Kebeles at Deme river basin.

know the importance of SIT to control trypanosomosis; while 11% of respondents from M/Dana stated it as an important control method (Figure 1).

Farmers Attitude on the Control Methods of Trypanosomosis and Tsetse Fly: Of the 90 respondents, 84 (93.5%) of respondents agreed that by using tsetse control method, it is not only to reduce risk of disease but also possible to eradicate the disease trypanosomosis. Only 4 (3.5%) said by using tsetse control method, it is only possible to reduce risk of disease but not possible to eradicate the disease trypanosomosis. The rest 12 (6%) do not aware of control of tsetse fly to reduce or eradicate disease trypanosomosis. Twenty five (27.25%) of respondents said application of chemical (Deltamethrin 1%) on cattle back of 20-50% of the total population is more or less enough for tsetse control, but 63 (70.75%) of respondents do not agreed in this idea and said, it is mandatory to apply on 100% of population to control tsetse in order to eradicate the disease.

Thus use of pour on back of cattle kills only tsetse fly which rest on animal to feed its blood as 80 (89.25%) of respondents agreed, but 3 (6%) of them said pour on animal kills tsetse fly and parasite trypanosome and 7 (7.75%) of respondents do not recognize use of pour on back of animal. This pour on should be applied during rainy season as chemical burns animal skin when applied at dry season and is wastage as 46 (54.75%) of respondents told, but 42 (42.75%) of respondents said pour on at dry season is not wastage as tsetse flies are active and densely populate at this season and suggested that presence of Deme river in the dry season might have forced the animals to come close together and also created a favorable ground for the tsetse flies. But 2 (5%) of respondents do not sure about which season is best to pour on animal to reduce or eradicate disease trypanosomosis.

The color of animal has effect on tsetse attraction as 40 (45%) of respondents described. But 39 (48%) of respondents do not agree with idea of tsetse prefer color of animal and 5 (11.5%) of respondents do not recognize about tsetse fly and animal color. The respondents perception on control method through planting chemical impregnated target kills tsetse fly as 73 (79%) of respondents agreed and 16 (20%) of respondents not agreed in idea of chemical impregnated target not kills tsetse fly and rest 1 (1%) of respondents do not know about chemical impregnated target. Most of respondents on perception of sterile tsetse release were unfamiliar as information gathered from the area 42 (42.75%) of respondents do not familiar and 21 (23.5%) of respondents were familiar and not agreed on idea of sterile tsetse release not infertile wild fly and gradually reduce and eradicate tsetse population from the environment, but 27 (33.75%) responded sterile tsetse release do not infertile wild fly.

Farmers Participation/practice on Control Methods: Most of livestock owners in both study sites were active participants in tsetse and trypanosomosis control programs. Out of 90 respondents, 88 (97.5%) go to veterinary clinic when their animal has sign of rough coat, lacrimation and emaciation, but only 2 (2.5%) of respondents go to drug shop and buy drug to treat animals. Those farmers who purchase drug from shop treat their animals themselves.

All respondents said as they have trend to bring their animal for pour on at any time and 61 (72.25%) of them have experience to spray chemical on the animal with correct site of spray starting back from hump to tail of animal. Seventy three of respondents (81.5%) have experience on target deployment program by planting two sticks at shaded place and tying edge of target to stick by putting urine of animal under it to attract tsetse fly to the area of target planted. 46 (48%) of respondents do not know about sterile tsetse release to control vector tsetse but, 44 (52%) of respondents know about sterile tsetse release as one of final control method. There is less practice on sterile tsetse release in closed box and 51 (60.5%) of respondents said they open the box and then let fly to move as it sterile wild fly. But 39 (39.5%) were not experienced with sterile tsetse technique and said that they kill the entire fly in box and throw box to river.

DISCUSSION

The present study revealed that all 90 (100%) cattle owners in the study area were awared of animal trypanosomosis. Most respondents noticed different clinical signs of trypanosomosis that could easily be identified through visual observation and the level of precision depends on the experience of livestock keepers. All of respondents know the symptom of such as reduced feed intake, ruffled hair, coughing, weight loss and lacrimation. That is similar to those signs stated by Urquart *et al.* [16] animals infected with trypanosomosis become anemic and weak; lose weight and body condition, reduced productivity and often mortality rates are high. Zewdu *et al*. [17] also stated that trypanosomosis retards agricultural development in terms of mortality, abortion, reduced fertility, milk and meat production and ability to work as traction animals. The higher proportion of awareness about the disease and tsetse fly reported in present study could be due to a previous trypanosomosis and vector control intervention by National Tsetse and Trypanosomosis Investigation and Control Center (NTTICC) carried out in the area.

A high proportion (93.5%) of respondents answered that they know tsetse fly locally called Iwur zimb or Gendi zimb and reported it as a transmitter of trypanosomosis. Forty-nine (53.8%) of them could identify tsetse fly from other biting flies by its dark brown color and larger size with its wings overlap (Scissor like) when at rest. Twenty-nine (34.95%) of respondents also listed similar features but with light yellow color. This was in agreement with Leak [18] and Kahn [19] who stated that tsetse flies are narrow bodied, yellow to dark brown and 6 to 13.5 mm long. Similarly, Itard [20] stated when at resting, their wings are held over the back in a scissor like configuration with a characteristics hatched shaped cell in the center of the wings.

Eighty-four (93.5%) of respondents agreed that by using tsetse control method, it is not only to reduce risk of disease but also possible to eradicate the disease trypanosomosis from the area. As most of them reported that control and eradication of tsetse fly is main method to make trypanosomosis free zone. Jordan [11] shared the same view and stated that; only by the removal of the tsetse fly can a disease-free environment be created. It was also stated by Clausen *et al.* [21] that efficient tsetse fly control can lead to a reduction of the use of trypanocidal drugs and leave their role as an efficient means to cure the disease in case of an outbreak. The findings of this attitude among the respondents could be due to implementation of tsetse fly and trypanosomosis control programs in the area which positively influenced community perception about tsetse and the disease.

Most respondents in study area mostly used chemical spray and target to reduce the occurrence of the disease from the area. 70.75% said application of chemical pour on (Deltamethrin) can reduce the occurrence of trypanosomosis and 27.25% do not recognize use of pour on to animals. Similarly, Bauer *et al.* [22] described application of deltamethrin pour-on to cattle against tsetse flies and has proved to be very efficient in controlling tsetse fly vectors.

The respondents' perception towards application of pour on technique based on season of the year to control of tsetse fly showed most (54.75%) of respondents said pour on at dry season is not wastage as tsetse flies are active and densely populate at this season because of presence of Deme river. In support to this Bright well *et al.* [23] suggested an absolute increase in the number of tsetse flies due to favorable environment such as enough moisture, vegetation growth and suitable habitat or spread of flies from the rivers and thickets where they usually inhabit during the dry season, to more open areas during the rains increases relative density in open areas.

Forty (44.44%) of respondents know and agreed that color of animal has effect on tsetse attraction but 39 (43.33%) of respondents do not agree with idea and 11 (12.22%) do not recognize about relation between tsetse fly and animal color. This tells respondents have good knowledge on tsetse preference to animal color. In support of this idea, Green [24] indicated the *Glossina* species or tsetse seem capable of color discrimination, blue is particularly attractive, whereas black and UV-reflecting white tend to stimulate landing and yellow tends to be unattractive.

The respondent's participation on control methods through planting chemical impregnated target was good. Thus 73 (81.11%) of respondents agreed on chemical impregnated target kills tsetse fly and considered it as one of main control method of tsetse fly. This is consistent with the report of Bouyer *et al.* [10] who described that the use of insecticide impregnated targets is effective, easy to use and acceptable to the community. Vector control must be combined to cattle treatment to avoid the spread of resistance.

CONCLUSION AND RECOMMENDATIONS

The findings of this study revealed that livestock owners had good knowledge, attitude and practice about tsetse flies, trypanosomosis and control strategies. Almost all of the respondents know symptoms of trypanosomosis, the vector tsetse fly and almost all of them were awared of its control methods. Community participation in the disease control activities especially on tsetse control is advocated to facilitate the sustainability of the programmes. Despite the high level of awareness, only a small proportion of respondents use tsetse fly control by chemical spray and target. But substantial number of cattle owners, however, use treatments of sick animals by modern drug including diminazine aceturate and isomethamedium, that indicates control method mainly focused on treatment of the disease trypanosomosis. From the above conclusion, the following recommendations are forwarded. There is a need for further awareness creation to the community about the sterile tsetse release for appropriate tsetse control methods in addition to scaling up chemical spray and insecticide impregnated targets. There should be way to access community knowledge, attitude and participation on vector control and give attention to reinvasion of the reclaimed area. Practices such as illegal drug purchase and treatment of sick animals by farmers should be prohibited.

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