Preliminary Study on Mechanically Transmitted Bovine Trypanosomosis and Management of Trypanocidal Drugs in Selected Peasant Associations of Tigray

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Abstract: A cross sectional study was carried out in selected peasant associations of Tigray (Tanqua-argellle, Ofa, Humera and Maytsebri) from April 2011 to July 2011 with the objective of assessment of mechanically transmitted animal trypanosomes and the management of trypanocidal drugs. Judgemental sampling was used to include a total of 510 (234,163 and 113 from Humera, Ofa and Tanqua-argellle respectively). Parasitological examination of buffy coat smears indicated that an overall prevalence of *T. vivax* infection of 10.4%, 7.7% and 0.8% in Ofla Woreda, Kafta-Humera and Tanqua-argellle respectively. The association of the disease with sex and age was not statistically significant in both Ofla and Kafta-Humera. However; the association between the occurrence of the parasite and PCV level was statistically significant. The result of questioner survey indicated that the majority of the interviewees farmers agreed that trypanosomosis was serious disease affecting the survival and productivity of animals. Interestingly, some of the clinical signs indicated by them were similar with the clinical signs observed in clinical cases. However, the trend of indiscriminate use of Trypanocidal drugs is a frustrating event as it may lead to development of drug resistant strains. Generally, *Trypanosoma vivax* is a serious problem to livestock production in the study areas. It is concluded that extension work on training of farmers, training of field experts and developing and enforcement of drug use policy is the critical issue. Further more studies on drug resistance pattern of the parasite are of immediate action.

Key words: Buffy Coat Smears · Mechanically Transmitted · PCV · Tigray · Trypanosoma Vivax

INTRODUCTION

Livestock are the backbone of the socioeconomic systems of most of the rural communities in the continent of Africa. However, it is difficult to realize more gain in livestock production and productivity without first ensuring corresponding improvements in animal health problems, which are the principal causes of poor performance leading to an ever increasing gap between the supply and the demand for livestock products [1].

Trypanosomosis is one of the world’s most important diseases of livestock and man [2]. It is caused by protozoan parasites of the genus *Trypanosoma* and is arguably still the major constraint to livestock production on the continent of Africa, preventing full utilization of land to feed the rapidly increasing human population [3]. Infection by one or other species of the trypanosomes in man gives rise to a disease that takes a variety of forms, sleeping sickness and the cattle trypanosomosis “Nagana” [4]. The African Animal Trypanosomiasis (AAT) is one of the major threats for the Livestock in Africa. About 9 million km² of Sub-Saharan Africa, representing about one-third of the total land, is infested with tsetse flies (*Glossina* spp.), which are the main vectors for *Trypanosoma*.

In Ethiopia, tsetse borne trypanosomiasis is possibly the single most important disease, which excludes over 150, 000 to 200,000 km² of fertile land in the west and southwest of the country from agricultural production. This area covers 15% of the total arable land [6]. Moreover [7] had indicated that there are frequent reports of Trypanosomosis cases in Tsetse free areas of the country. There are six pathogenic species of trypanosomes discovered in Ethiopia, namely...
Trypanosoma (T.) vivax, T. congoense, T. brucei, T. evansi, T. equiperdum and T. rhodesiense. But the most important trypanosomes in the country are T. vivax and T. congoense. Both species affect a great number of cattle which are the most important species of the domestic animals in Ethiopia. Due to its extensive distribution, T. vivax is more important than T. congoense [6].

The impact of trypanosomosis on African agriculture is most obviously seen in the birth and mortality rates of young animals [8]. In susceptible cattle breeds, the disease reduces calving by up to 20% and causes the death of another 20% of young stock. Even the so-called “trypanotolerant” animals such as the N’Dama cattle are affected. It strongly reduces milk off-take (reduction of 26%) and lambing and kidding rates (reduction of 37%) in the Gambia. Trypanosomosis reduces the availability and efficiency of drought animals used for preparing land for crop production (reduction of 33%) in Ethiopia [9]. In mixed farming systems, where trypanosomosis is so severe that it constrains the number of oxen that farmers own, it can reduce the average area planted per household by as much as 50% [10]. Some 10-14 million heads of cattle in Ethiopia and an equivalent number of small ruminants together with a significant number of equines and camels are exposed to the risk of disease [11]. If trypanosomosis could be controlled in Ethiopia, much of the best-watered and most fertile lands of the southwest could be utilized [12].

Natural transmission of the African pathogenic trypanosomes has two phases; one in the insect vector or cyclical and the second is biting flies (non-cyclical or mechanical) transmission [13]. Biting flies of the genus Tabanus, Haematopota, Chrysops and Stomboxys transmit trypanosomes mechanically between vertebrate hosts [15]. The importance of this mode of transmission is variable from place to place depending on the number of hosts and biting insects present and also the species of trypanosomes. Intragenic transmission is also possible which occurs when using the same needle or surgical, instruments on more than one animal at sufficiently short intervals that the blood on the material does not dry. This mode of transmission has proven to be sufficiently effective to maintain T. vivax and T. evansi [14].

Control and prevention of animal trypanosomosis is depends on the use of appropriate therapeutic/ prophylactic measures, control or elimination of tsetse vector flies. Treatment of trypanosomiasis frequently is complicated by developing drug resistance, toxicity and the damaging dermonecrosis produced by some of the trypanocidal agents [12]. The development of drug resistance against the trypanosomosis has been found increasingly in different countries of the world which is a serious problem to prevent and/or treat the disease [12, 17]. Only small groups of chemoprophylactic and chemotherapeutic trypanocidal compounds are currently in use and new compounds are unlikely to become available in the near future. It is estimated that in Africa 35 million doses of veterinary trypanocidal drug are administered each with isometamidium chloride (ISM), ethidium bromide (EtBr) and diminazene aceturate (DA) estimated to be represent 40%, 26% and 33%, respectively [18].

Although livestock trypanosomosis is a well-known constraint to livestock production in Ethiopia, most of the studies are conducted in south west, tse tse belt, region of the country and there is limited information in other part of the country (in tsetse free regions). Therefore, the objectives of this study were to assess the prevalence of mechanically transmitted trypanosomosis, particularly T. vivax infections of cattle in selected districts of Tigray region and document information on the management of suspected animals by professionals and farmers.

**MATERIALS AND METHODS**

**Description of Study Area:** Kafta Humera is about 560 km to the West of Mekelle, the Capital City of Tigray Regional State, with an altitude ranging from 5801820 meters above sea level; and estimated population of 94,210.

In the study district, there are 15 rural and two urban kebeles with a population of 70, 210 and 24,000 respectively, where households in rural kebeles are clustered in confined areas where as Yechila (Tanqua Abergelle) is located 110 km south west of Mekelle at 13.3° north latitude and 39° East longitude at an altitude of 1590 m.a.s.l. Average annual temperature ranges between 27 and 30°C, the vegetation of the area is dominated by xerophytic plants. But the other study area Ofla is one of the five rural woredas in South Zone of Tigray region that has 20 tabias/ 18 rural tabias & 2 urban tabias. Its geographical location is in between 39°31’ E longitude, 12°31’ N latitude. It is bordered with Endamohoni woreda in the North, Raya Azebo woreda in the North East, Alamata woreda in the South East & Amhara region in the West. The woreda capital is called Korem & is located 172 km from regional capital. Its area is approximately 1086.55 sqkm or 133500 ha. The land use pattern of the woreda shows that 23000 ha is cultivated land, 17000 ha is covered with forest, 22439 ha is covered with bush & shrubs (CSA, 2007).
Sample Collection and Study Methodologies: The ear vein of the animal was disinfected by alcohol and pierced by individual sterile needles/blood lancets and blood sample was collected into Heparinized microhematocrit capillary tubes (up to ¾ of their height). The capillary tubes were sealed at one end with crystal sealer and placed in pre-labeled modified capillary tube racks. Samples were transported to temporary resting sites where they were centrifuged in a Microhematocrit centrifuge for 5 minutes at 12000 rpm. After centrifugation, the packed cell volume (PCV) was determined by placing on Haematocrit reader as described in [3]. As indicated in [19], a PCV measurement of 25% was regarded as a threshold value. Animals with a PCV = 25% were considered to be anemic. The PCV level of each animal was recorded and buffy coat smear was prepared on microscopic glass slide by breaking the capillary tubes. The thin blood smears of buffy coat samples were fixed by methanol for 5 minutes, stained with Giemsa staining and examined under a light microscope using x100 oil immersion objective lens. Identification of the parasite was made by observing the structure of the parasite as indicated in [20].

Questionnaire Survey: Structured questioner format was used to interview farmers in order to acquire base line information about Trypanosomosis and its management. 45 farmers form Kafta Humera district and 80 farmers from Ofla district were included for questionnaire survey. The questions addressed to farmers contained about knowledge of trypanosomosis/slim/, species of animals frequently affected, the main clinically signs/symptoms of diseased animals and management/treatment options used by the farmers if they encounter sick animals. The sources of drugs used to treat their animals and any information related to the cause and seasonal of occurrence in the area.

Data Entry and Analysis: Individual data were entered on prepared excel sheet format and coded appropriately. SPSS version17 statistical software was used for data analysis. Proportions were used to indicate the percentages of the occurrence of the disease and Chi-square (X²) test was used to see the association of the disease with different variables (age, sex and % PCV).

RESULTS

Parasitological Findings: From a total of 397 cattle examined in this study, n=35 (8.8%) of them were infected with T. vivax. The occurrence of T. vivax infection was higher in Ofla district (10.4%) than Kafta-Humera district (7.7%), however this variation was not statistically significant (p-value = 0.051). There was no difference in the occurrence of T. vivax infection between females (8.9%) and males (8.5%) with P-value of 0.903. The prevalence of T. vivax infection was higher in cattle with age group of 5 – 10 years (11.7%) than other age groups and this was statistically significant (p-value = 0.044) (Table 1).

Haematology: In this study, to assess the effect of T. vivax infection on a PCV measurement we use a threshold value of 25%. The number of animal with PCV value less than 25% was higher in Ofla (38.0%) than
Kafta-Humera (28.6%) district and had no significant difference (p-value = 0.050). In addition, 65.7% the animals with the age group of less than 5 years had a PCV value less than 25% compared to the other age groups and this was statistically significant (p-value = 0.032). Similarly, most (70.1%) of male had PCV below 25% than female (16.8%). The number of parasitaemic animals (68.6%) with PCV value below 25% was higher than aparasitaemic animals (29.0%). However, there was no significant difference in the prevalence of trypanosomosis between parasitaemic and aparasitaemic animals (p-value = 0.052) (Table 2).

**Questionnaire Survey Results**

**Kafta Humera District:** The result obtained from questionnaire survey showed that the most predominant species affected by the disease are cattle with response rate of 76.19%, followed by goat, sheep and equine with the response rate of (4.76%). Moreover, almost all respondents indicated that the infection is more common in adult animals while 83.3% respondents also said it is common in young animals. According to the respondent, the clinical signs manifested by Trypanosomosis sick animals include emaciation (50%), rough hair coat (55.1%), reducing milk yield (14.28 %) and diarrhoea (54.76%). When the animal owners got a suspected cases of Trypanosomosis (slim locally) about 77.7% of respondents agreed that they treat the animals by themselves while 22.3 % took their animals to nearby veterinary clinic.

The interviewed farmers described that the reason to treat their animals by themselves were the absence of veterinary service in their locality (52.38%), limited access /long distance/ (16.6%), poor veterinary service (14.28%) and aggressive behaviour of animals to veterinary professionals/ guests (4.76%). The sources of trypanocidal drugs were from private pharmacy (71.42%), governmental clinic (28.57%), illegal market/shop (14.28%) and from both government and private pharmacy (4.76%). The respondent indicated that, dimenzone acturate and homodium chloride /Ethidium tablet/ are the main trypanocidal drugs used to treat their animals. Although the farmers don’t know the name of drugs but they differentiate by the colour and by the form of the drugs just like saying, yellow sachet for diamanzenz acturate and red tablet for homodium chloride. Even though all respondent know the route of administration, they do not use the appropriate doses and preparation of the drugs. Instead of the recommended 12.5 ml saline water, they used 10 ml of boiled and cooled tap water to dissolve one sachet of Diminazene aceturate. With regard to the seasonal disease distribution, 57.16% of the respondents said the disease is common at any season while the rest 19.04% and 23.8% respondents said that it is common at the end of rainy season and in drought/dry season, respectively. For the cause and transmission of the disease, of the respondent said that the disease is transmitted/caused by drinking of contaminated water (57.22%) and fly bite (14.28%) while the rest 28.5% said that it mainly associated with drought seasons.

**Woreda Ofila:** Of the 80 interviewed farmers 98.7% (75/76) of them reported that the disease was known in the study area for many years and still considered as an important and first priority disease. In this long period of time, trypanosomosis hampered animal production and productivity and resulted considerable socio economic losses through mortality and morbidity of drought power animals in particular and other animals in general. All farmers indicated that they don’t administer any trypanocidal drug by themselves when they suspected a clinical case and take the animals to nearby veterinary clinician. However, 81.6% (62/76) of the farmers underlined that there is shortage of availability of Trypanocidal drugs and professionals in their nearby veterinary posts. Though small in number, 100% of professional respondents indicated that they can tentatively diagnose the disease and were treating the disease for the last 10 years with veriben and diminazene aceturate.

**DISCUSSION**

In this study the observed prevalence (8.8%) suggests that trypanosomosis is an important diseases of cattle in the study areas. The current study was conducted during the long dry season and the prevalence of the disease in the study areas can increase more than the obtained result as the prevalence of trypanosomosis infection decreases substantially during the long dry season and remained high during the early dry season (end of rainy season) [21].

The observed 8.8% % prevalence of *T. vivax* infection in this study was lower as compared with the previous 14% report of Langridge [22] in south west part of Ethiopia. This could be due to the variation in availability of suitable vectors, season of the study and diagnostic tools utilized. Desalegn, Etsay and Getachew [23] stated that the prevalence of trypanosomosis
infection decreases substantially during the long dry season and remained high during the early dry season (end of rainy season). Indicating that, the prevalence of T. vivax infection in this study area could be higher than the obtained result (since it was conducted during the long dry season). Moreover, the unethical use of trypanocidal drugs existing in Kafta Humera could reduce the parasitemic level there by unable to be diagnosed by parasitological techniques.

There was no statistically significant difference \((P \text{ value} = 0.051)\) in the prevalence of the disease between Kafta-Humera and Ofla districts, which might be due to the similarity of their agro ecology and animal husbandry system. There was also no statistical significant \((P \text{ value} = 0.903)\) in the prevalence of the disease between male and female cattle. This might be due to the presence of similar husbandry system which exposed the animals equally to the field infection in the study area. The prevalence of T. vivax infection in animals with the age group of 5-10 years was higher (11.7%) than the rest category. This could be explained by the fact that, the cumulative effect of repeated exposure to the mechanical vectors for longer time could increase the prevalence of the disease in older animal than younger animals.

In the current finding, there was no statistical significant association in the level of anaemia between the two districts and the status of the infection. Even though animals with the age group of 5-10 years were more affected by the disease, most of the animals (65.7%) with the age group of less than 5 years had a mean PCV value of less than 25 and this was statistically significant difference \((P \text{ value} = 0.032)\). 70.1% of male animals had a mean PCV value of less than 25. This was also statistically significant difference \((P \text{ value} = 0.046)\). These all variations in the level of PCV value and the occurrence of the disease among the different risk factors affected by many factors. As indicated by Murray, Murray and McIntyre [3], the observation of parasitological negative animals with a PCV values of less than the threshold value set (25%) may be due to the inadequacy of the detection method used, or delayed recovery of the anaemic situation after current treatment with trypanocidal drugs. Also the occurrence of positive animals with PCV value of greater than 25% might be thought of recent infections of the animals. Hence, the mean PCV value could better be an indicator of the health status of cattle population under study. It was generally accepted that mean PCV value was affected by many factors other than trypanosomosis. However, these factors are likely to affect both trypanosomosis positive and negative animals [25].

The experience of the farmers about trypanosomosis was in agreement with the previous report [23]. Absence of veterinary service in their locality, limited access /long distance/ to veterinary clinics, poor veterinary service, insufficient availability of trypanocidal drugs in government veterinary clinics and limited diagnostic facilities were among the major problems, not to treat the disease, listed by the respondent. In addition, all the professionals interviewed in this study reported that they never confirmed this disease by laboratory diagnostic method and they simply make tentative diagnosis by its clinical signs and its respond to trypanocidal drugs. This can create in misuse of Trypanocidal drugs which might end up in failure in therapeutic response. These all factors together with the use of trypanocidal drugs from illegal market/shop by the farmers can be a predisposing factor for the development of Trypanocidal drug resistance. More over the long time usage of a single trypanocidal drugs

**CONCLUSION**

In general, the present study demonstrated that trypanosomosis is becoming a serious problem to livestock production in the study areas. However, it seems that the low quality of veterinary service may lead to failure of treatment and the development of drug resistant strains of T. vivax. As a result the animal production will be reduced due to mortality and morbidity there by seriously affecting the crop production. Thus, attention should be given to improve the veterinary service delivery both in quality and quantity of facilities, accessibility and affordability. Legislative and strict supervision should be implemented to solve the indiscriminate usage of drug around the study areas and awareness should be given to farmers about the feature implications of indiscriminate drug use. Further study on seasonal dynamicity of the disease, characterization of the strains and drug resistance will give better picture of the disease.

**REFERENCES**


