

# Sheep and Goat Trypanosomosis in and Around Arbaminch, Southern Ethiopia

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## Abstract

A study was conducted from November 2019 to May 2020 in and around Arbaminch to assess prevalence of Sheep and goat trypanosomosis, and its associated risk factors. A total of 384 small ruminant, 242 goats and 142 sheep were randomly sampled for hematological analysis. Blood samples were collected from ear vein of sampled animals. The packed cell volume (PCV) and buffy coat technique were performed. From the examined animals, 12 animals (3.13%) were positive for trypanosomes. From the infected animals, 5(3.52%) and 7(2.89%) were sheep and goats respectively. Besides, the species of the parasite were identified by thin blood smear. Commonly occurred trypanosome species were *Trypanosoma congolense* (1.56%) followed by *Trypanosoma vivax* (1.04%) in both species. There were statistical significant variation ( $P < 0.05$ ) among body condition and the species of animals. Therefore, trypanosomosis is one of the major health problems for both sheep and goat in the study area. Strategic control and prevention of small ruminant (sheep and goat) Trypanosomosis should be warranted.

**Keyword:** *Arbaminch, Prevalence, Small ruminants, Trypanosomosis*

## 1. INTRODUCTION

Ethiopia is a home for about 65.35 million cattle, 50.5 million goats and 39.89 million sheep (CSA, 2020). The Livestock part contributed up to 40% of agricultural GDP, nearly 20% of total GDP, and 20% of national foreign exchange earnings in 2017 (FAO, 2019). In Ethiopia, the production of sheep and goat become attractive resources for development. They deliver both noticeable paybacks and informally uses (Endalew and Ayalew, 2016). However, the productivity of small ruminants is small due to various diseases in Ethiopia. Among the challenging diseases of small ruminant, trypanosomosis hamper health and productivity (Urquhart *et al.*, 1996).

In Ethiopia, *Trypanosoma vivax*, *Trypanosoma congolense* and *Trypanosoma brucei* were mostly occurring trypanosome species in cattle and shoaat (Getachew, 2005). Studies on small ruminant trypanosomosis revealed that the disease cause negative influence on sheep and goats wellbeing and productivity. Among these effects, the major deviations noted in sheep and goats were changes in hematological and hemoglobin level. Experimentally, abortion and stillbirth were also confirmed in sheep and goats (Batista *et al.*, 2009).

Furthermore, small ruminants have comparatively received less attention than other domestic animals (Odeniran and Ademola, 2018). Therefore, effective control activities are highly obligatory. Although there are many studies of trypanosomosis in Ethiopia, most of these were restricted to bovine species of animals which made only limited information, but in case of sheep and goat there was scarcity of information on the occurrence and associated risk factors of trypanosomes in Arbaminch, Southern Ethiopia. Moreover, knowing of the status of the trypanosomosis will simplify the best of appropriate control systems and serve to design advance prevention programs in the present study areas.

Therefore, the objectives of the present study were:

- ✓ To assess prevalence of trypanosomosis in sheep and goat
- ✓ To determine associated risk factors with the occurrence of the infection.

## **2. MATERIALS AND METHODS**

### **2.1. Study Area**

The study was conducted from November 2019 to February 2020 in and around Arbaminch Gamo zone which was located in the Southern rift valley of Ethiopia. The area has between 5° 57'N latitude and 37° 32'E longitude. The area has a sub-humid climate with a moderately hot temperature. The vegetation is dominantly occupied by wood-grass land (WGL) especially along the sides of grazing. The study area is 525 kilometers away from the capital city, Addis Ababa.

### **2.2. Study Design and Animals**

Cross-sectional study design was conducted from November 2019 to February 2020 in small ruminants (sheep and goat) in and around Arbaminch. The species, body condition score, age and sex of sheep and goat were included (Lemecha *et al.*, 2002; Nicholson and Butterworth, 1986).

### **2.3. Sampling Method and Determination of Sample Size**

A systematic random sampling technique was used to select 384 sheep and goat in the study area. The sample size were calculated by using the formula given by Thrusfield (2005) by fixing the confidence level at 95% and assuming expected prevalence of 50% as there was no previous studies in and around Arbaminch. Accordingly, the total sample size was 384.

### **2.4. Methodology**

Blood sample was collected from each animal by ear vein puncture using a sterile lancet in to a pair of heparinized micro hematocrit centrifuge capillary tubes (75 × 1.2 mm). Each tube was filled until about three quarters of its length and one end sealed with crystal seal (Hoare, 1972). The PCV and Buffy coat method were determined (Murray *et al.*, 1983). Moreover, wet smear was performed to check the motility of trypanosomes (Woo, 1987). Giemsa stained thin smears was done for confirmation of trypanosome species at 100 x magnification (Murray, 1977).

### **2.5. Data Analysis and Management**

The collected data was entered in to Microsoft excel sheet, coded appropriately and analyzed by STATA version 13 software package. Descriptive statistics was computed. Chi-square ( $\chi^2$ ) test was used to evaluate the association of different host related variables. P value < 0.05 was considered as significant level.

## **3. RESULT**

### **3.1. Parasitological examination**

The current finding revealed that the overall prevalence of trypanosomosis in sheep and goat was 3.13%. The proportion was 3.52% and 2.89% in sheep and goat respectively. The *T. vivax* in goat was 1.65% and no sheep were infected. Likewise, the prevalence of *T. congolense* was 2.81% and 0.82% in sheep and goats, respectively (Table 2) and the prevalence of *T. vivax* and *T. congolense* (mixed both) in sheep (0.70) and goats (0.41) were found positive (Table 1).

**Table 1:** Sheep and goat trypanosomosis in study area

Species	No. of animal examines	Positive	<i>T. vivax</i>	<i>T. congolense</i>	mixed	p-value
Ovine	142	5(3.52)	0	4(2.81)	1(0.70)	0.001
Caprine	242	7(2.89)	4(1.65)	2((0.82)	1(0.41)	
Overall	384	12 (3.13)	4(1.04)	6(1.56)	2 (0.52)	

### 3.1.1. Buffy coat examination

The trypanosome species identified 9(2.34%) in buffy coat blood smear. Of these *T. congolense*, *T. vivax*, and mixed infections were identified. The overall existence of *T. congolense* was 0.52% in sheep and goats. The occurrence of *T. vivax* was found to be 0.78% in goat. On the other hand, mixed infection was 0.26% in each species.

### 3.1.2. Wet smear examination

The present finding revealed that 3(0.78%) were positive for trypanosome species in wet smear (Table 2). The trypanosome identified by this technique was *T. congolense* and *T. vivax*. *T. congolense* and *T. vivax* were identified with the percentage of 0.26% and 0.26%, respectively in goat.

### 3.1.3. Thin smear examination

In this examination 10(2.6%) were positive and 374(97.4%) were negative (Table 2). The *T. congolense* (0.78%), *T. vivax* (0.26%), and mixed infections were identified in sheep and in goat. *T. vivax* was found to be 1.04% in goat.

**Table 2:** Prevalence of trypanosomes in thin, wet and buffy coat blood preparation

Activities	Result	No. of animal	Percent
Thin smear	Negative	374	97.40
	Positive	10	2.60
Wet smear	Negative	381	99.22
	Positive	3	0.78
Buffy coat	Negative	375	97.65

Positive	9	2.38
<b>Overall</b>	<b>12/384</b>	<b>100</b>

### 3.2. Hematological Finding

#### 3.2.1. Packed cell volume (PCV)

The overall mean PCV value of examined animals in the study area was 27.50 (Table 3). Mean PCVs for greater or equal to 24 are 301(28.9%) and less than 24 are 83(22.403%) were observed. The mean PCV value of the total positive sheep was 22.75 and non-infected sheep was 26. Similarly the mean PCV of infected and non-infected goats was 22.5 and 25.6 respectively.

**Table 3:** Mean PCV of sheep and goats

PCV	No. of animals examined	Prevalence rate	Mean PCV
<24	83	6 (7.22%)	22.403
≥24	301	6(1.99%)	28.90
Over all	384	12(3.13%)	27.50

### 3.3. Host Related Variables

Of the total animals examined the prevalence observed based on body condition was good 182(1.09%), medium 98(4.08%) and poor 104(5.76) (Table 4).

**Table 4:** The prevalence of trypanosomosis based on host related risk factors

Variable	No. of animals examined	%	Prevalence %	P-value
Age	Adult	267(69.53%)	8(2.99%)	0.872
	Young	117(30.46%)	4(3.41%)	
Sex	Female	267(69.53%)	10(3.74%)	0.143
	Male	117(30.46%)	2(1.70%)	
Body condition	Poor	104(27.08%)	6(5.76%)	0.000
	Medium	98(25.52%)	4(4.08%)	
	Good	182(47.39%)	2(1.09%)	
Total	384		12(3.13%)	

#### 4. Discussion

The current findings revealed that an overall prevalence (3.13%). The present finding inline with the previous report of (2.56%) by (Lelisa et al 2016) infected with trypanosomes in Metekel Zone, Benishangul Gumuz Region. This finding is lower than the previous report of (Kebede *et al.*, 2016) in small ruminants were found (8%) in Mareka District, Dawro Zone, Southwestern Ethiopia, as well as (6.8%) animals were infected with trypanosomosis by (Becha *et al.*, 2013), This finding also in agreement with (3.75%) report of Leta and Mesele (2010) in upper Didessa Valley, Ethiopia. But, the present finding is lower from previous report (9.14%) by Yaninet *et al.*, (2007) in Guinea Savanna Zone, North-Central Nigeria, as well as Daniel *et al.*(1994) reports a rate of 6 % in region of Northern Nigeria, (Kebede *et al.*, 2009) reports rate of 5.6% in Awi Zone, (Singh and Idris 2017) reports rate of 11.66% at Sokoto Central Abattoir. Therefore, the difference might be due to application of control actions and systematic treatment of sick animals.

The identified trypanasoma species present in study area were *T. vivax* 6 (1.56%), *T. congolense* 4(1.04%) and mixed 2(0.52%). The relative proportion of these species were and for *T. congolense*, *T. vivax* and both respectively. This finding was agreement with report by (Tadese and Megersa, 2010). Furthermore, the highest prevalence was detected in poor body condition followed by medium and good body condition. In this finding statistically insignificant difference or no association was obtained in the sex of animals females 9(4%) and males 3(1.45%) the finding also agree with the previous studies by (Mohammed, 1998, Hunduma, 2003, Junior, 2005). This study also showed that there was association among age groups with the prevalence rate. In the difference might be due to the feeding pattern difference among different age groups. In the study area shoat usually move around home this lessen contact with tsetse flies.

This study revealed that of the examined animals, overall mean PCV value of the trypanosome positive animals was 27.50. Both 94% of sheep and 25% of goats had PCV values below the normal range (27-45% for sheep and 24-38% for goats) described in (Radostits *et al.*, 2007).The sheep (24-45%) and goats (24-38%) indicated as normal PCV (Radostitset *al.*, 2000).

## 5. CONCLUSION AND RECOMMENDATIONS

Small ruminant (sheep and goat) trypanosomosis accounts an overall prevalence of 3.13%. The current finding revealed that trypanosomosis affects their health, production and productivity of the small ruminant. The major species of trypanosomes encountered were *T. congolense* and *T. vivax*.

Based on the above conclusion, the following recommendations are forwarded:

- Appropriate and practicable control measures should be established.
- Further studies in all seasons of the year need to be considered in the future.
- Strategic tsetse fly control is very crucial in order to avoid economic impacts due to trypanosomes where tsetse flies are heavily populated.

## 6. COMPUTE OF INTERESTS

There is no conflict of interest among the authors.

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