

Identification of small ruminant external parasite species in Tanqua Abergelle and Kola Tembien districts of Tigray region, Northern Ethiopia

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Research article

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Abstract

Background Ecto-parasites are a major concern in sheep and goat flocks, wherever sheep and goat are kept. A study was carried out in the districts of Kola Tembien and Tanqua Abergelle from September 2014 to June 2017 with the objectives of identifying external parasites to their species level.

Methods A cross-sectional study design was conducted. Randomly selected sheep and goat was clinically examined for the presence of ecto-parasites or lesions and identified in National animal health diagnostic and investigation center (NAHDIC) by using taxonomical and entomological examination. About 237 live sheep and goats have been examined randomly for the presence of external parasites.

Results All identified species of external parasites were found in both species. Accordingly, eight species of external parasites have been identified with their prevalence as follows; *Amblyoma varigatum* (35.4%), *Ripicephalus parvus* (22.8%), *Ripicephalus praetexatus* (8.4%), *Ripicephalus pulchellus* (7.6%), *Ctenocephalides felis felis* (5.1%), *Linognathus africanus* (11.8%), *Ripicephalus evertsi* (2.5%), *Hayaloma truncatum* (6.5%). Both in sheep and goats, there was no significant difference between infestation of external parasites and the associated risk factors except for *Amblyoma varigatum* which was higher in Tanqua Abergelle (25.7%) than Kola Tembien (9.7%). The odd of infestation by *Amblyoma varigatum* in goat was 3.5 higher than in sheep.

Conclusions Our study revealed that eight species of external parasites has been found with a higher rate of infestation. Therefore, to minimize the prevalence of external parasites urgent and well coordinated external parasites control measures should be taken.

Background

Ethiopia is believed to have the largest livestock population in Africa [1, 2, 3]. An estimate indicates that the country is a home for about 30.7 million sheep and 30.2 million goats. 99.8% of the sheep and nearly all goat population of the country are local breeds [4]. The contribution of subsector the national Gross Domestic Product (GDP) is estimated to be 16.5% of and 35.6% of the agricultural GDP [5]. It also contributes 15% of export earnings and 30% of agricultural employment [6]. However, diseases have been the stumbling block against the full utilization of these resources for foreign currency through export of live animals, and skin [1].

Currently different causes of skin diseases in Ethiopia are accountable for considerable economic losses particularly to the skin export due to various defects, 65% of which occur in the pre- slaughter states directly related mostly to skin diseases causing often rejection because of poor quality [6].

Ectoparasites which includes mites, ticks, lice, fleas and flies parasitize a wider range of hosts (e.g. Ticks) while many of them are host specific (e.g. lice). Many ectoparasites are known to be vectors of pathogens which transmit different diseases to hosts while feeding, or occasionally it may also cause a great defect to and skins of different animal populations. This damaging of the skin is one of the

annoying effects on the animals induced by the ectoparasites. The existence of various ectoparasites and skin diseases affecting small ruminants are frequently reported from different parts of Ethiopia. These are demodicosis, sarcoptic and psoroptic manges, ticks and lice infestations [8, 9, 10]. The study area favors the development and propagation of ectoparasites which makes difficult to resist the annoying effect of these ectoparasites on the host and makes the control of ectoparasites difficult.

However, as the major predisposing factors and enormous economic losses caused by ectoparasites which necessitates detailed studies on their identification of species. So far limited efforts have been made to investigate an overall situation of ectoparasites of small ruminants in the study districts.

The objectives of this study were:

- To identify external parasites to their species level
- To determine the associated risk factors of external parasites
- To know the proportional defects of external parasites

Methods

Description of the study area

As shown in *figure 1*, the study was conducted in Kola Tembien (K. Tembien), and Tanqua Abergelle (T. Abergelle) districts for disease investigation and sample collection. The study districts are categorized as hot to warm sub-moist low lands sub-agro ecological zone of the region with an altitude of 1300–1500 meters above sea level and the mean annual rainfall ranging from 400 to 600mm, which is characterized by low, erratic and variable rainfall. The annual temperature ranges from 28 to 42 °C.

Study Population

The study was conducted from September 2014 to June 2017. Indigenous sheep and goats owned by farmers and managed under extensive management system were included.

Study design

A cross-sectional study was conducted on identification of external parasites of small ruminants to their species level.

The study of ectoparasites on sheep and goats involved districts, sheep, and goats as a sampling unit. About 237 live sheep and goats were examined for the presence of external parasites.

Clinical examination and sample collection methods

Randomly selected sheep and goat was clinically examined for the presence of ectoparasites or lesions. In line with the sample collection explanatory variables such as sex, age, body condition and species were recorded. Body condition score of the animals considered as poor and good was recorded by modifying the system described in [11] for sheep and [12] for goats. Poor body condition score was given to sheep and goats which were extremely thin and those with smooth and less prominent spinous process, transverse process in which finger can be pushed and moderate depth loin muscle. Good body condition score was given for sheep and goats in which the spinous process only sticks up very slightly; smooth, rounded and well covered transverse processes and those having full loin muscle and very fat.

Age categorization in to young (lamb/kid) and adult was performed as described by [11] for sheep and [12] for goats. Accordingly, sheep and goats less than one year was categorize as young and the rest as adult.

Sheep and goats found infested by parasites was considered positive. Ectoparasites such as ticks, lice and fleas were collected by hand from their attachment site and put into container and preserved with 70 % alcohol as described by [13]. The collected parasites were taken to National animal health diagnostic and investigation center (NAHDIC) and identified to species level by using taxonomical and entomological examination.

Data management and analysis

Descriptive statistics was used to analyse the frequency of the identified species of external parasites. The effects of different epidemiological risk factors such as age, districts, and body condition on prevalence of ectoparasites in sheep and goats were analyzed by multivariate regression analysis at p value of 0.05.

Results

4.1.1. Identification of species of external parasites

Eight different types of external parasites have been identified in NAHDIC by using taxonomical and entomological examination at species level. These are *Amblyoma varigatum*, *Hayaloma truncatum*, *Ripicephalus parvus*, *Ripicephalus praetexatus*, *Ripicephalus pulchellus*, *Ripicephalus evertsi*, *Ctenocephalides felis felis*, and *Linognatus africanus*, and their frequency is shown below in *Table 1*. The highest prevalence was observed with *Amblyoma varigatum* infestation (35.4%) following by *Ripicephalus parvus* (22.8) in both species and districts.

The lowest prevalence was observed in *R. evertsi* infestation with overall prevalence of 2.5% in both species and districts.

In our findings, mixed infestation of more than two external parasite species has been observed in a single animal. Accordingly, 44 goats out of 141 and 28 sheep out of 96 were found infested with two or more external parasite species.

As shown in *Table 2*, the higher infestation of external parasites in K. Tembien and T. Abergelle was by *R. parvus* (10.5%) and *A. varigatum* (25.7%) respectively. There was an observation of high external parasite infestation in T. Abergelle as compared with K. Tembien. This might be due to the high stress conditions such as heat, drought, and shortage of feed in T. Abergelle as compared to K. Temben district. With regard to species, there was an overall observation of higher infestation of external parasites in goat as compared to sheep. Therefore, higher infestation was by *A. varigatum* (27.4%) in goat and by *R. parvus* (12.2%) in sheep. According to sex, female animals have been infested more as compared to male animals. In our findings, all identified species of external parasites were found in both species.

In general, our findings found that *A. varigatum* and *R. parvus* has a higher distribution in both species of animals in the study districts. On the other hand, *R. evertsi* has the lowest prevalence in both districts and both species. The overall prevalence of identified external parasite species were not significantly associated with their respected risk factors except for *A. varigatum* at a confidence level of 95%.

As shown in *Table 3*, the prevalence of *A. varigatum* is significantly different across districts with P value 0.001. Accordingly, sheep and goats in T. Abergelle district were more likely infested with *A. varigatum* than K. Tembien district (AOR 2.75 (1.51, 4.98)). Additionally, the prevalence of *A. varigatum* was significantly ($p = 0.000$) higher in goat (27.4%) than sheep (8%). As a result, the odd of infestation in goat was 3.5 higher than in sheep. However, the prevalence of *A. varigatum* was not significantly different ($P > 0.05$) across sex, age and body condition scores.

Discussion

In our findings, eight species of external parasites has been identified with their prevalence of *A. varigatum*, *R. parvus*, *R. praetexatus*, *R. pulchellus*, *C. felis felis*, *L. africanus*, *R. evertsi*, and *H. truncatum* 35.4, 22.8, 8.9, 7.2, 5.1, 11.8, 2.5, and 6.5 percent respectively.

Tick infestations were the highest prevalence recorded in both species. [14] Has found that low prevalence of *A. varigatum* (24.5%), higher prevalence of *R. pulchellus* (34.1%), *R. evertsi evertsi* (22.1%), and *H. truncatum* (15.6%) in Diredawa districts as compared to our findings. A small prevalence of *A. varigatum* (2.3%) was also reported by [15] in Amhara regional state, Sekela district. On the other hand there was a highest *A. varigatum* infestation in goat (27.4%) in our findings as compared to the study conducted by [9] which was 7.5%. An abundance of *A. varigatum* (66.15%) has been reported by [16] in Wolmera district of Oromia, which is higher prevalence as compared to our findings. Such differences in prevalence may arise from differences in agro-climate, control measures practiced, management, and health care of sheep and goats in the study areas. Sheep and goat owners also noted seasonality in occurrence of ticks, which is related to the beginning of annual rain. Higher environmental temperature, humidity and prolonged sunlight favor the survival and reproduction of ticks in lowland areas [17].

In our study the overall prevalence of flea infestation (*C. felis felis*) in small ruminants were 5.1% which is smaller than the findings of [18] who have reported with a prevalence of 8.1% in eastern part of Amhara regional state. The previous *C. felis* infestation (11.1%) in Tigray region reported by [9] was higher than our findings. In our study area, the prevalence of *C. felis felis* in sheep and goat was 2.5% in each which was higher in Sheep (0.2%) and lower in goat (8.1%) as compared to a report of [18] in Eastern part of Amhara. According to [19] flea infestation is usually associated with close contact of animals with infested animals and also the same host.

Lice infestations with *Linognathus* species was the most prevalent external parasite recorded in sheep and goats in the study districts. According to [20] a higher prevalence of *Linognathus* species (28.3%) were found in Amhara regional state as compared to our findings. According to [9] the prevalence of *L. africanus* in sheep in three districts of Tigray region was 11.5%, which is higher than our findings (6.8%). Louse infestation may show some other underlying problem such as malnutrition and chronic diseases. The irritation caused by even a modest population of lice leads to scratching and rubbing, causing damage to the skin and severe infestation with *Linognathus* spp. may cause anemia [18].

Conclusions

Our study revealed that eight species of external parasites has been found with a higher rate of infestation. Favorable environmental conditions, poor level of farmers awareness and weak animal health extension services are believed to be the main factors for the wide distribution of external parasites in the study districts.

This study a wide spread occurrence of tick infestation in small ruminant was observed and six species of ticks grouped under three genera were identified. *Rhipicephalus evertsi*, *Hyalomma truncatum*, *Rhipicephalus pulchellus*, *Amblyomma variegatum*, *Rhipicephalus praetexatus*, *Rhipicephalus parvus* were among the tick species identified in the study area. The most important and abundant tick species identified in study area were *Amblyomma variegatum* and *Rhipicephalus parvus* in order of predominance.

By considering skin are very important source of foreign currency to Ethiopia, serious attention should be given to the high prevalence of external parasite infestation in the study districts.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

Data are available up on request.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable

Author's contribution

GA conducted data collection, analysis and full write up.

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Tables

Table 1. Overall frequency of external parasite species in the study districts

| Species | Frequency | Percent |
|------------------------------------|-----------|---------|
| <i>Amblyoma varigatum</i> | 84 | 35.4 |
| <i>Ripicephalus parvus</i> | 54 | 22.8 |
| <i>Ripicephalus praetexatus</i> | 21 | 8.9 |
| <i>Ripicephalus pulchellus</i> | 17 | 7.2 |
| <i>Hayaloma truncatum</i> | 15 | 6.5 |
| <i>Ripicephalus evertsi</i> | 6 | 2.5 |
| <i>Ctenocephalides felis felis</i> | 12 | 5.1 |
| <i>Linognathus africanus</i> | 28 | 11.8 |

Table 2. Prevalence of external parasite species across their associated risk factors in the study districts

| Variable | Prevalence of external parasites | | | | | | | |
|------------------|----------------------------------|------------------|-----------------------|----------------------|-----------------------|---------------------|-------------------|---------------------|
| | <i>A. varigatum</i> | <i>R. parvus</i> | <i>R. praetexatus</i> | <i>R. pulchellus</i> | <i>C. felis felis</i> | <i>L. africanus</i> | <i>R. evertsi</i> | <i>H. truncatum</i> |
| Districts | | | | | | | | |
| K. Tembien | 23 (9.7%) | 25 (10.5%) | 12 (5.1%) | 9 (3.8%) | 8 (3.4%) | 13 (5.5%) | 3 (1.3%) | 7 (3.0%) |
| T. Abergelle | 61 (25.7%) | 29 (12.2%) | 9 (3.8%) | 8 (3.4%) | 4 (1.7%) | 15 (6.3%) | 3 (1.3%) | 8 (3.4%) |
| Species | | | | | | | | |
| Sheep | 19 (8.0%) | 29 (12.2%) | 10 (4.2%) | 8 (3.4%) | 6 (2.5%) | 16 (6.8%) | 3 (1.3%) | 5 (2.1%) |
| Goat | 65 (27.4%) | 25 (10.5%) | 11 (4.6%) | 9 (3.8%) | 6 (2.5%) | 12 (5.1%) | 3 (1.3%) | 10 (4.2%) |
| Sex | | | | | | | | |
| Male | 35 (14.8%) | 24 (10.1%) | 7 (3%) | 8 (3.4%) | 6 (2.5%) | 12 (5.1%) | 0.0 | 8 (3.4%) |
| Female | 49 (20.7%) | 30 (12.7%) | 14 (5.9%) | 9 (3.8%) | 6 (2.5%) | 16 (6.8%) | 6 (2.5%) | 7 (3.0%) |

Table 3. Regression analysis of prevalence of *A. varigatum* with associated risk factors

| Variable | <i>A. varigatum</i> | | COR | AOR | P value |
|-----------------|---------------------|----------|-------------------|-------------------|---------|
| | Positive | Negative | | | |
| District | | | | | |
| K. Tembien | 23 | 77 | | | 0.001 |
| T. Abergelle | 61 | 76 | 0.37 (0.21, 0.66) | 2.75 (1.51, 4.98) | |
| Species | | | | | |
| Sheep | 19 | 77 | | | 0.000 |
| Goat | 65 | 76 | 0.23 (0.12, 0.53) | 3.53 (1.91, 6.53) | |

Figures

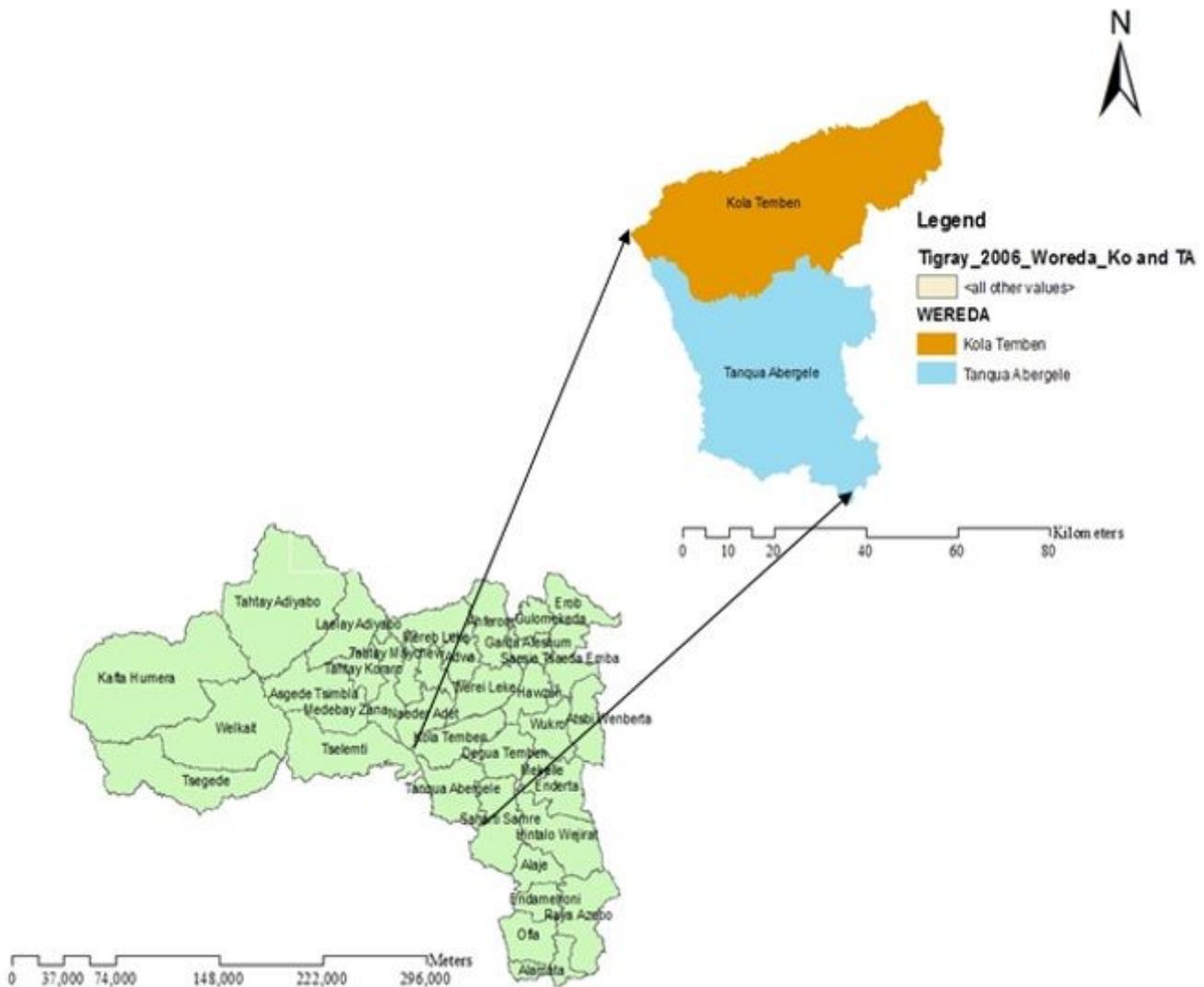


Figure 1

Topographic map of Tanqaua Abergelle and Kola Tembien districts