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ORIGINAL ARTICLE

Preliminary Survey on the Distribution of Ixodid Ticks in small ruminants of Dhas District of Borena pastoral area, Southern Rangelands of Ethiopia

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ABSTRACT
A survey was conducted to identify tick species and determine the prevalence of tick infestation in small ruminants of Dhas district of Borena pastoral area, southern rangelands of Ethiopia. Collection and identification of the ticks were undertaken from February 2013 to July 2013. All visible individual adult ticks were collected from the body of 248 goats and 136 sheep. The prevalence of tick infestation in goats and sheep was found to be 97.58% and 69.86%, respectively. In this study, five species of ticks which grouped under four genera were identified. The most abundant species found in this study were Boophilus decoloratus (41%), Rhipicephalus pulchellus (34.21%), Amblyomma gemma (14.07%) and Rhipicephalus evertsi evertsi (6.92%). Hyalomma dromedari (4.02%) was the minor species observed on goats. The difference in the prevalence of tick infestation between sheep and goats and age groups was statistically significant (P<0.05) but found to be not statistically significant between male and females (P>0.05). Moreover, with the exception of Amblyomma gemma and Hyalomma dromedari in all cases female ticks dominated males. Better success could be attained if an emphasis is being put on spraying small ruminants as per the current finding. Further studies on epidemiological occurrence and the influence of environment and tick related risk factors and of tick-borne diseases, as well as the involvement of wildlife species (as potential hosts) as well as related factors is recommended as these may provide a valuable basis for designing and launching an all-round control programme in the country.
***Keywords**: Dhas, Ixodid tick, Small ruminants, Southern rangelands of Ethiopia, Survey*

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INTRODUCTION

Small ruminants are important contributors to food production in Ethiopia, providing 35%of meat consumption and 14% of milk consumption [1]. Owing to their high fertility, short generation interval and adaptation even in harsh environments, sheep and goats are considered as investments and insurance to provide income to purchase food during seasons of crop failure and to meet seasonal purchases such as improved seed, fertilizer and medicine for rural households. However, due to several factors, the contribution from sheep and goats resource to either the national or the study area population income is significantly small. Diseases of various etiological origins are among the numerous factors responsible for poor production and productivity. Parasitic diseases are a global problem and considered as a major obstacle in the health and product performance of livestock. Among parasitic diseases, ticks and tick-borne diseases are major constraints to livestock improvement in many parts of the world especially in the tropics [2]. More than 60 species of ticks infesting both domestic and wild animals have been recorded in Ethiopia [3]. Among these, about 37 species are very wide spread and important parasites of livestock [4].

The economic impact of tick infestations is enormous worldwide. In Ethiopia, ticks and tick borne diseases cause considerable losses to the livestock economy, ranking third among the prevalent parasitic diseases, after trypanosomes and endoparasitism [5,6]. Ticks are directly or indirectly involved in causing substantial financial losses to livestock industry of Ethiopia accounts for 75% of the animal exports [5]. A

conservative estimate of 1 million birr loss annually was made through rejection and down-grading of hides and skins in Ethiopia.

In contrast to this huge economic loss caused by ticks, some of the communities in the Dhas district neglect ticks as animal, particularly sheep and goats, health problem and most of them have little knowledge about effect of tick on their small ruminants and the diseases transmitted to domestic animals by ticks. Moreover, ticks and TBDs of sheep and goats are less well studied than those of cattle. Nevertheless, small ruminants are able to acquire resistance to most tick species and principles of enzootic stability and the need to preserve it are similar to those in cattle. Even though different studies were done on camel ticks and cattle ticks in the Borena pastoral area, little attention was given to that of small ruminants. Therefore, the purpose of this study was to identify tick species and to determine their prevalence in different age and sex groups of small ruminants (sheep and goats) in Dhas district of Borena pastoral area, southern rangelands of Ethiopia.

MATERIAL AND METHODS

Description of study area

The study was conducted from February 2013 to July 2013 in Dhas districts of Borena Pastoral area, Southern rangelands of Ethiopia. Borena zone is one of the 17 zones of Oromia National Regional State administration. The zone comprises of mainly pastoral area and seldom Agro-pastoral areas. Dhas district is among the pastoral areas, and located at distance of 695 km from Addis Ababa, the capital city of Ethiopia.

The region has predominantly a semi-arid climate. The annual temperature varying between 21^{o}C and 38^{o}C with little seasonal variations and the rainfall ranges from 350mm to 900mm, with considerable spatial and temporal variability in quantities and distribution [7]. The study region is characterized by bimodal type rain with 60% occurring in the long rainy season (*Gena*) extending from mid-March to May and erratic short rain season (H*aggaya)* from mid-September through mid-November. The other seasons are the cool dry season (A*dolessa)* extending from June to August and the major dry season (B*onna*) from December to February [8].

Physiographically, the area is dominated by Savannah vegetation with mixtures of perennial herbaceous and woody vegetation, mainly of acacia species and thorny shrubs. Several native species of grasses and woody plants provide forage for livestock. Animal husbandry in the area is characterized by extensive livestock productions system and seasonal mobility. Goat is the dominant livestock species followed by cattle and sheep [7].

Study population

The study population for this study was constitutes of those indigenous breeds of sheep and goats kept under extensive traditional production management system in Borbor, Raro, Tukakelo and Meta-Arba localities of Dhas district, where large population of small ruminants were found. These animals depend on seasonal movement in search of their grazing and water sources. In addition to accessibility, willingness of owner was the point that to be took in to consideration to determine the study population.

Study design and sampling strategy

A cross-sectional study design was employed to address the objective of this work. The sample size was determined following the formula described by Thrusfield [9]. Accordingly, the expected prevalence of 50%, because as there was no current study conducted on the overall prevalence of tick infestation on small ruminant in the area, was considered. The desired sample size for the study was calculated using 95% confidence interval at 5% absolute precision. Therefore, a total of 384 ruminants comprising of 136 sheep and 248 goats were included in the sample. In the study proportional sampling strategy was used to determine the number of sheep and goats to be sampled. Thus, a greater number of goats were sampled because of their predominance in the study area. Different species of hosts (sheep and/or goat) were considered based on herd/flock size. In this study, four localities (peasant associations) namely, Borbor, Raro, Tukakelo and Meta-Arba; then herds/flocks were chosen purposively. The study animals were then systematically selected from the herds/flocks. For convenience, animals were divided into two age groups such as young (up to one year) and adult (older than one year).

Tick collection and identification

Once after the selected animals were restrained, all visible adult ticks were collected from whole body of sheep and goats. Ticks were removed carefully and gently by hand picking in a horizontal pull to the body surface. The collected ticks were preserved in separately labeled universal bottles and containing 80% ethyl alcohol and 15% water with 5% glycerin. Each label includes locality, identification code, and date of collection, attachment site, species, age and sex of the hosts [2]. Afterward, the specimens were then transported to Yabello Regional veterinary laboratory for further processing. The ticks were counted and

subsequently identified to genus and species level using hand lens and stereomicroscope within one to three weeks of collection. Ticks were identified according to standard taxonomic identification procedures described by Keirans and Robbins [10]; Okello-Onen *et al*. [11] and Walker *et al*. [2]. Results were then recorded in a special format prepared for this purpose.

Data analysis

All the collected data were entered into Microsoft Excel spreadsheet 2007 computer program and then displayed by using graphs and tables. All the statistical analyses were performed by using Statistical Package for Social Science (SPSS)-Version 19 for windows. Descriptive statistics like mean and percentages were calculated to display the status of ticks relative to some considered variables. Categorical data were analyzed by using Pearson's chi-square test. A P-value less than 0.05 at 95% confidence intervals was considered for significance.

RESULTS

Prevalence of tick infestations in small ruminants in Dhas district

Out of the total 384 small ruminants (136 sheep and 248 goats) examined, 337 (87.76%) were found to be infested with at least a single and/or different species of ticks. High rates of infestations were recorded both in sheep and goats and the corresponding percentage of infestation in goats and sheep was 97.58% and 69.86%, respectively (Table 1). The difference in prevalence of tick infestation was found statistically significant variation (P<0.05 between the two species (i.e., goats and sheep) and age groups, but not between sex groups.

Table 1: Overall prevalence of tick infestation in sheep and goats in Dhas district

Variables	Category	No.examined	No.infested	Prevalence (%)	X^2	P-value
Species	Sheep	136	95	69.86		
	Goats	248	242	97.58	13.25	0.026
Sex	Female	270	238	88.15		
	Male	114	99	86.84	1.38	0.84
Age	Adult	258	249	96.52		
	Young	126	88	69.84	8.26	0.008

Tick species and abundance

Overall, a total of 7,617 ticks were collected from 136 sheep and 248 goats. Up on identification, five different tick species of four genera were identified. Examined animals were considered to be positive for a given tick infestation when at least one tick was collected from them. Considering the relative abundance of each tick species as per the host species involved, *Boophilus decoloratus* was the most abundantly encountered with high burden followed by *Rhipicephalus pulchellus*, *Amblyomma gemma* and *Rhipicephalus evertsi evertsi* in sheep. Conversely, *Rhipicephalus pulchellus* was the most abundant followed by *B. decoloratus, Amblyomma gemma* and *Rhipicephalus evertsi evertsi* in goats. *Hyalomma dromedari* was the minor species observed in both species. All the tick species identified were found infesting both sheep and goats with possible detection of at least one tick. A significant (P<0.05) difference was observed in the proportion of each tick species between the two host species and age groups (Table 2). With the exception of *Amblyomma gemma* and *Hyalomma dromedari* in all cases female ticks dominated males (Table 3).

Table 2: Animal level prevalence of tick infestation in sheep and goats in the study area

Tick species	Sheep (n=136)	Goats (n=248)	Overall prevalence
	Positive (%)	Positive (%)	Positive (%)
Amblyomma gemma	13.24	27.42	22.41
Rhipicephalus pulchellus	68.38	89.52	82.00
Rhipicephalus evertsi evertsi	7.35	22.58	17.19
Hyalomma dromedari	2.94	14.52	10.42
Boophilus decoloratus	77.94	88.31	84.64

Table 3: Total tick count and Male:Female ratio in small ruminants during the study period

Tick species	Total tick count	Male tick count	Female tick count	M : F
Amblyomma gemma	1066 (14.07%)	920	146	1:6.3
Rhipicephalus pulchellus	2606 (34.21%)	832	1098	1:0.76
Rhipicephalus evertsi evertsi	533 (6.92%)	176	357	1:0.49
Hyalomma dromedari	306 (4.02%)	213	92	1:2.32
Boophilus decoloratus	3123 (41%)	48	3075	1:0.016

DISCUSSION

The current work disclosed that ixodid ticks are still widespread and most significant external parasites of small ruminants in Dhas district of Borena pastoral areas. Considerably higher proportion of animals (i.e. 69.86% sheep and 97.58% goats) was found to be infested with at least a single or more tick species. Though this study covered only a 6-month period (February to July), no apparent temporal (monthly) distribution was noticed in the pattern of infestation rates as it remained higher throughout. Either the species or age of the host involved has shown such a relationship too. In both host species kids have shown to harbour a relatively lower infestation. The finding of such a consistent infestation rates due to ticks in the area regardless of age, sex or species of host and month of collection could be attributed to the ecological factors conducive for the survival of developmental stages and multiplication. This fact has been apparently revealed as the period of this work coincides with major rainy season in the area (i.e. March to July). High humidity facilitates the growth and survival of ticks at all their different life stages [12, 13]. In addition, concentration of host species for each of the developmental instars to locate a new host must be satisfied as main requirement in the tick habitat [13]. Perhaps, it is also likely that livestock are not often being treated against ticks and thus continued to carry ticks at some time during their life contributing to the widespread occurrence.

The principal tick species infesting small ruminants in the study area comprise *Amblyomma gemma*, *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi*, *Rhipicephalus pulchellus* and *Hyalomma dromedari*. *Hyalomma dromedari* were less frequent. *Boophilus decoloratus* was the most abundant tick species. This finding is in line with the study of Abunna *et al*. [14] and Abera *et al*. [15]. Cattle are the main host of *Boophilus decoloratus* [16] but it also feeds on goats, sheep and equine. This may be why it happened to be most abundant species in goats and sheep in this study.

Rhipicephalus pulchellus was the second most abundant tick species in the area. A similar finding was also reported by Abunna *et al*. [14] where it was second abundant tick species in small ruminants at Miesso district, west Harergie area. Moreover, the occurrence of this species in and around the study area was also reported by other authors [17]. It is widely distributed and common on domestic livestock in Ethiopia [16, 18]. This further shows that the finding of this tick in the area is in line with its widespread occurrence in most parts of the country.

Hyalomma dromedari was the least frequently encountered ticks during the study period. It prefers to infest camel, but also sheep, goats, cattle and dogs. In Ethiopia, it is mainly collected from camel and though cattle may also harbour quite large infestations in Oromiya, Southern Nations Nationalities and Peoples, Afar and Gambella Regional States [18]. It occurs in arid and semi-arid areas and also in woodland, bush land as well as grassland with either trees or bushes present [19]. This could explain why only few *Hyalomma dromedari* ticks were collected in the current study area. The finding of such little counts in the current work could probably be attributed to unrestricted movement of camel and mixed livestock husbandry system of the region.

In this study, ticks species like *Rhipicephalus evertsi evertsi* is known to infest cattle, sheep and goats as well as wild herbivores [2]. Hence, the contribution of wildlife in the maintenance of ticks in the study area should acquire some attention as animals are under shared grazing in free range conditions.

In conclusion, small ruminants in Dhas district of Borena pastoral area and surrounding appear to be heavily infested with ixodid ticks belonging to five species with goats being the principal host animal species. The role of host species and age factors and the fact that little attention paid by livestock owners for treatment of small ruminants against ticks are suggested to result in the abundance of ticks. Therefore, better success could be attained if an emphasis is being put on spraying small ruminants as per the current finding. Further studies on epidemiological occurrence and the influence of environment and tick related risk factors and of tick-borne diseases, as well as the involvement of wildlife species (as potential hosts) as well as related factors is recommended as these may provide a valuable basis for designing and launching an all-round control programme in the country.

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