

Prevalence and Identification of Major Tick Species of Small Ruminant in and Around Arba Minch, Ethiopia

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Abstract: Tick infestations are the major animal health constraints in small ruminant's production and contributing a great loss in their productivity. A cross-sectional study was conducted from November 2019-May 2020 to determine the prevalence and to identify major tick species of small ruminant in and around Arba Minch. A total of 384 small ruminants (213 caprine and 171 ovine) were examined thoroughly for the presence of tick. Identification of ticks was performed using stereomicro scope and classified into different genera and species based on standard tick identification keys. The overall prevalence of tick infestation in the study area was 28.1% (n = 108/384). The prevalence of tick infestations in caprine and ovine was found to be 26.8% (n = 57/213) and 29.8% (n = 51/171), respectively. Among anticipated risk factors only sex, body conditions and management of the small ruminants showed statistically significant associations ($p < 0.05$). Four species of ticks from each genera namely *Rhipicephalus* (*R. evertsi evertsi*, *R. pulculles*, *R. guilhoni* and *R. annulatus*), *Amblyomma* (*A. variegatum*, *A. gemma*, *A. coherence* and *A. lepidum*) and *Hyalomma* (*H. truncatum*, *H. marginatum*, *H. excavatum* and *H. rufipes*) were identified in this study. In addition, a total of 774 ticks were collected of which 520 and 254 were female and male, respectively. In conclusion, diverse species composition and prevalence of ticks were observed in Arba Minch which impliestick infestations are the major animal health constraints in small ruminant's production and contributing a great loss in their productivity. Therefore, appropriate acaricides should be applied to infested small ruminant and to decrease effect of infestations.

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INTRODUCTION

Ticks are one of the most economically important ecto-parasite of livestock because of direct and indirect effect on the host^[1]. They are considered as a major obstacle in the health and livestock productivity that cause considerable economic losses because of direct effects of blood sucking and indirectly as a vector of pathogens and toxins on the their host^[2]. Ticks are one of the most serious ecto-parasites in Ethiopia, since, they are voracious type of blood feeding behavior which resulting in lowered productivity^[3]. In addition, ticks are also used as a vector of human and animal diseases caused by protozoa, rickettsiae, bacteria, viruses and some helminthes^[4]. They ranked second to mosquitoes as vectors of life threatening or debilitating human and animal disease^[5].

In Ethiopia, there are 47 species of ticks found on livestock and most of them are belonging to genus *Amblyomma* (40%), *Boophilus* (21%), *Rhipicephalus* (37%), *Hyalomma* (1.5%) and *Haemaphysalis* (0.5%). Most of them have important role as a vector of various disease causing agents and they also damage hide and skin^[6, 7]. In Ethiopia, different researches have been conducted on tick infestations of small ruminants in different parts of country as reported by Abunna *et al.*^[8] in Bedelle, Abunna *et al.*^[9] in West Harergie, Fentahun *et al.*^[10] in Gondar town, Regessa^[11] Borena provinces, Ahmed etc. in Dire Dawa, Tesfaheywet and Muluneh^[12] in Ambo Ethiopia. Commonly, there has been a considerable presence of various species of ticks among small ruminants. Therefore, the objectives of this study were to determine the prevalence and identify species of ticks small ruminants.

MATERIALS AND METHODS

Study area: The study was conducted in and around town of Arba Minch and the site is located in Gamo zone of the South Nation, Nationalities and People Regional State of Ethiopia. Arba Minch is located at 505 km South of Addis Ababa and 275 km of Hawassa and it lies between 6 04' North latitude and 36 40' East longitude and an elevation of 1285 m above sea level. The average temperature in the area is 21.8°C and the precipitation averages 818 mm. The most resource full zone in southern region including two largest lakes (Abaya and Chamo), Nechisar national park, crocodile and different species of animals and plants^[13].

Study animal: The study was conducted in 384 small ruminants (171 sheep and 213 goats) of both sexes and various age groups reared under different management systems. All study animals sampled were indigenous breed and the age of the animal was classified as young (age ≤ 1 year) and adult (age > 1 year) and estimated by

using eruption pattern of the teeth additional to owner information^[14]. Body conditions of the small ruminant were also determined by palpating and observing the vertebrae of loin regions. Thus, the body conditions were classified as poor, medium and good^[15].

Study design: A cross sectional study design was used in this study.

Sample size determination and sampling methods: The sample size was determined based on formula described by Thrusfield^[16] with 95% confidence interval at 0.05 desired level of absolute of precision and by assuming the expected prevalence of 50%, since, there was no previous study conducted in this study area. The equation is as follow:

$$n = \frac{Z^2 P_{exp}(1-P_{exp})}{d^2}$$

Where:

n = Require sampling size

Pexp = Expected prevalence (50%)

d² = Desired absolute precision (0.05%)

Hence, based on the above formula and calculated result, a total of 384 sheep and goats were included in the study. Eight kebeles were purposively selected based on accessibility as well as availability of small ruminants (sheep and goats). The selected kebele's include Bere, Gurba, Waze, Chamo, Lante, Doyisa, Chano Doriga and Shelle Melak ebele and different number of animals were selected using simple random sampling techniques.

Study methodology: The selected animals were restrained properly, entire body surface was inspected from the head to the tail and all visible adult ticks were collected from their body part using hand or special forceps. Ticks collected from each animal and different site were put into pre-labeled universal sampling bottle containing 70% ethyl alcohol. Required information like the date of collection, age, sex, breed, body condition scores and management system of small ruminants was recorded. Then, samples were transported to Arba Minch University Agricultural Science laboratory for identification. Ticks were identified by using a stereomicro scope and classified into different genera and species based identification keys given by Walker *et al.*^[7]. All sheep and goats presented with any life stage of the tick(s) were considered as positive.

Statistical analysis: The collected data was entered into Microsoft Excel Spread Sheets; then it was imported and analyzed using Statistical Package for Social Sciences (SPSS Ver. 20 Chicago, IL, USA). Descriptive analysis like count and proportion was used to summarize the data. Chi-square test was used to evaluate association between hypothesized risk factors. The p<0.05 was considered as statistically significant.

Table 1: The prevalence of ticks in small ruminants and its association origin of animals

Risk factors /categories	No. of examined animals	No. of positive animals	Prevalence (%)	χ^2	p-values
Origin					
Bere	49	11	22.5	3.6	0.82
Gurba	44	12	27.3		
Chamo	45	14	31.1		
Doyisa	48	11	22.9		
Waze	49	15	30.6		
Lante	52	13	25.0		
C/Dorga	50	18	36.0		
S/Mela	47	14	29.8		
Total	384	108.0	28.1		

C/Dorga = Chano Doriga; S/Mela = Shelle Mela

Table 2: The prevalence of ticks in small ruminants and its association with potential risk factors

Risk factors/Categories	No. of examined animals	No. of positive animals	Prevalence (%)	χ^2	p-values
Species					
Ovine	171	51	29.8	0.4	0.29
Caprine	213	57	26.8		
Sex					
Female	210	78	31.1	18.6	0.00*
Male	174	30	17.2		
Age					
Young	97	30	30.9	0.5	0.28
Adult	287	78	27.2		
BCs					
Poor	68	36	52.9	73.8	0.00*
Medium	182	69	37.9		
Good	134	3	2.20		
Mgt					
Intensive	60	5	8.30	34.7	0.00*
Semi-intensive	112	18	16.1		
Extensive	212	85	40.1		
Total	384	108	28.1		

* = Statistically significant; Mgt = Management; BCs = Body Conditions

RESULTS AND DISCUSSION

Out of total 384 small ruminants examined, 108 were found infested by one or more tick species. Thus, the overall prevalence of tick infestation in small ruminants was 28.1%. Higher prevalence of tick infection were recorded in Chano Doriga (36.0%), Chamo (31.1%), Shelle Mela (29.8%) and 30.6% in Wazekebele while relatively lower prevalence of 22.5, 27.3, 22.9 and 25.0% were documented in Bere, Gurba, Doyisa and Lantekebele respectively (Table 1). Among risk factors, relatively higher prevalence of tick infestation was recorded in ovine (29.8%) as it compared with 26.8% in caprine but the variation was not statistically significant ($p>0.05$). The difference in prevalence of tick infestation was found statistically significant ($p<0.05$) between sex, age, body condition and managerial condition groups (Table 2).

Overall, a total of 774 ticks were collected from 171 ovine and 213caprine of which 520 were female and the rest 254 were male ticks. Upon identification, the ticks were classified into three genera and 12 species. The number of female *Rhipicephalus* spp. (n = 197), *Amblyomma* spp. (n = 177) and *Hyalomma* spp. (n = 146) ticks were higher as compared to lower 78, 111 and 65 counts of male ticks, respectively in each genera (Fig. 1). Among species of *Rhipicephalus* genera of

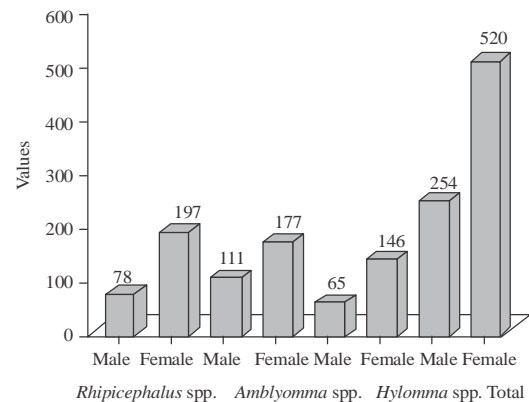


Fig. 1: The number of male and female ticks collected from small ruminants

ticks, *Rhipicephalus evertsi* species were found in higher number of ovine (n = 9) and caprine (n = 2). Both, *R. appendiculatus* and *R. guilhoni* were found in nine animals while, *R. annulatus* was found only in three ovine and two caprine. Similarly, eighteen small ruminants were found harboring *A. variegatum* species of tick and followed by *A. coherence*, *A. gemma* and *A. lepidum* with respective occurrence in twelve, nine and eight animals. On the other

Table 3: Species composition of ticks found in small ruminants and their attachment sites

Small ruminants				
Ticks				
Genera/species	Ovine	Caprine	Total	Attachment
<i>Rhipicephalus</i>				
<i>R. evertsi evertsi</i>	9	2	11	Shoulder, flank, anus, ears, perineum, ear and neck
<i>R. pulculles</i>	0	9	9	Chest, flank, shoulder, belly and ears
<i>R. guilhoni</i>	8	1	9	Belly, ears, neck and face
<i>R. annulatus</i>	3	2	5	Chest, belly and flank
<i>Amblyomma</i>				
<i>A. Variegatum</i>	7	11	18	Sternum, perineum, genitalia, udder, belly and tail
<i>A. gemma</i>	5	4	9	Leg, teat, sternum and genitalia
<i>A. coherence</i>	7	5	12	Ear, leg, sternum and genitalia
<i>A. lepidum</i>	2	6	8	Chest, udder and genitalia
<i>Hyalomma</i>				
<i>H. truncatum</i>	0	1	1	Leg, genitalia, tail, ear and perineum
<i>H. marginatum</i>	4	7	11	Ear, udder and perineum
<i>H. excavatum</i>	4	5	9	Perineum and udder
<i>H. rufipes</i>	2	4	6	Shoulder, ears, leg and perineum
Total	51	57	108	

hand, eleven animals (4 ovine and seven caprine) were harbored *H. marginatum* species of tick but only one caprine was infested by *H. truncatum* species (Table 3).

The overall prevalence of ticks in small ruminants was 28.1% and this finding is lower than previous reports by Ahmed, etc. in Dire Dawa, Abunna *et al.*^[8] in Bedelle, Abunna *et al.*^[9] in West Harergie of Ethiopia who reported 72.4, 76.5 and 89.7% tick occurrence, respectively. Similarly, species wise ovine (29.5%) and caprine (26.8%) infestations is fairly lower than the report 89.9% (ovine) and 87.5% (caprine) by Abunna *et al.*^[9]; 70.7% (ovine) and 73.9 (caprine) by Ahmed, etc., 69.9% (ovine) and 97.6% (caprine) in Borana by Eyob and Matios^[17]. On the other hand, the current finding is higher than previous report of 17.2% of by Tamerat *et al.*^[18] in Adami Tulu, East Shewa zone and Sertse and Wossene^[19] in North East Ethiopia (22.2%) and (3.4%) for ovine and caprine, respectively. The variation in the prevalence might be due to the geographical difference and season of the study period, frequent exposure to the same communal grazing land that favored the frequent contact and management system which includes the use of acaridae and other preventive measures under taken for tick control.

The prevalence of tick infestation was higher in females (31.1%) than in males (17.2 %) and the variation was statistically significant. This is in agreement with previous study conducted by Ahmed, etc. in Dire dawa and Abdisa *et al.*^[20] in Enderta, Tigray regional state who reported 79.0 in females and 64.8%) in males and 44.6% in females and 34.2 % in males, respectively. Although, the exact cause of higher prevalence of tick infestation in female animals cannot be explained but it can be assumed that some hormonal influences may be associated with this phenomenon. In fact, higher level of prolactin and progesterone hormones could make the females more

susceptible to any infection. Moreover, stress of production as pregnancy and lactation could also leads female animals more susceptible to infection^[21].

The infestation of ticks was statistically significant ($p < 0.05$) among different body condition of animals in which higher percentage of ticks in poor body conditioned animals (52.9%) as compared to medium body conditioned (37.9%) and good body conditioned animals (2.2%). This finding were in agreement with study conducted by Abdisa *et al.*^[20] in Enderta, Tigray regional state who reported 54, 31.6 and 25.8 in poor, medium and good body conditioned animals respectively. Similarly statistically significant and hogher prevalence of ticks was reported in poor (23.3%) as compared with medium (16.5%) and poor body condition (13.8%) animals in Eastern, Hararghe, Ethiopia^[22]. This higher infestation of ticks in animals with poor body condition could be due to high infestation of tick result poor body condition due to consumption of high amount of blood hence, poor body condition may reduce resistance to tick infestation and other diseases.

The management condition of small ruminants showed statistically significant associations with the presence of ticks. Higher prevalence was recorded in animals under extensive production system (40.1%) than those kept under intensive farming system (8.3%). This study was in agreement with study conducted by Tadesse and Sultan^[23] in North Shewa who recorded 75 and 25% under extensive and intensive production system, respectively. This finding was also in line with Ayana *et al.*^[24] in Gondar who reported 76.1% prevalence of ticks in extensive and 71.4% in intensive production system. This situation may be due to extensive farming animals move anywhere for feeding, staying and drinking and hence they are more susceptibility for tick infestation as compared with intensive production systems.

In the present study the most important tick species identified from ovine *R. evertise* evertise, *R. annulatus*, *R. pulculles*, *R. guilhoni*, *A. variegatum*, *A. gemma*, *A. coherence*, *A. lepidium*, *H. marginatum*, *H. excavatum* and *H. Rufipes* and tick species identified from caprine includes; *R. evertise*, *H. truncatum*, *R. annulatus*, *R. pulculles*, *R. guilhoni*, *R. evertise*, *A. variegatum*, *A. gemma*, *A. coherence*, *A. lepidum*, *H. marginatum*, *H. excavatum* and *H. Rufipes* similarly were reported in different areas of Ethiopia.

CONCLUSION

The present study revealed that ovine and caprine in study area (Ariba Minch) were highly infested with one or more *Rhipicephalus* spp., *Amblyomma* spp. and *Hyalomma* spp. of ticks and attached with different body parts. Among anticipated risk factor like sex, body conditions, species, age, breed, management and origin of small ruminants only sex, body conditions, management condition of small ruminants showed statistically significant associations with the presence of ticks. This higher prevalence of ticks in Arba Minch town and surrounding causes decrease in their production, growth rate and transmit various diseases in small ruminants. Ticks also damage hide and skin and pose considerable loss in the economy of Ethiopia. Thus, problem of ticks in small ruminants seems to be very important as they were widely distributed in all kebele participated in this study and application of appropriate acaricides should done to infested small ruminants.

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