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By Mesfin Mekonnen Moliso, Tewodros Sadado Samago & Yemisrach Yonas Alaro
Areka Agricultural Research Centre

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Keywords: prevalence, tick infestation, wolaita, ethiopia.

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Study on the Prevalence of Ixodid Ticks of Domestic Ruminants in Three Selected Districts of Wolaita Zone, Southern Ethiopia

Mesfin Mekonnen Moliso ^α, Tewodros Sadado Samago ^σ & Yemisrach Yonas Alaro ^ρ

Abstract- A cross-sectional study was conducted from November 2010 to April 2011 with the objective of identifying the major ixodid tick species of domestic ruminants, estimating their prevalence and investigating their associated risk factors in SodoZuria, Damot Gale and Humbo districts of Wolaita zone, Southern Ethiopia. A total of 384 ruminants comprising 138 cattle, 130 sheep and 116 goats were examined in the study areas. An overall prevalence of tick infestation in the three study districts was 89.1% in cattle, 70 % in sheep and 32.8% in goats. The difference in the prevalence of tick infestation between the three species of ruminants was statistically significant ($P < 0.05$). There was a significant ($P < 0.05$) variation was observed in Damot Gale (95%) and lowest in Humbo (79%); however, such variation was not observed in sheep and goats ($P > 0.05$). In the present study, tick infestation was not associated with sex of the animal ($P > 0.05$) except for goats in which the prevalence was significantly ($p < 0.05$) higher in males than females. Similarly, the infestation was not significantly ($P > 0.05$) associated with the age of animals. In this study, six species of ixodid ticks which belong to three genera were identified in all the three ruminants. These are *Amblyomma variegatum*, *Amblyomma gemma*, *Amblyomma lepidium*, *Amblyomma cohaerence*, *Rhipicephalus evertsi evertsi* and *Boopophilus decoloratus*. The most prevalent tick species in cattle was *Boopophilus decoloratus* while in sheep and goats, *Rhipicephalus evertsi evertsi* was the dominant tick species. From the total 252 animals infested with different tick species, 89.7% ruminants were found to be infested with a single tick species while 10.3% ruminants were infested with two or three different tick species. In conclusion, this study has demonstrated that ticks are highly prevalent in domestic animals in the study areas and particularly cattle are more prone to tick infestation. Therefore, due attention should be given to control and prevent of ticks, since they could inflict huge economic losses by damaging hides and skins and transmitting tick-borne diseases to domestic animals.

Keywords: prevalence, tick infestation, wolaita, ethiopia.

I. INTRODUCTION

In Ethiopia the livestock subsector contributes 16% of the total GDP and over 30% of the agricultural GDP (1997). With an estimated 47.57% cattle, 26.12 million sheep, 21.71 million goats, 1.01 million camels and 7.73

Author α : Areka Agricultural Research Center, P. O. Box 79, Areka, Ethiopia. e-mail: mesfinareka@gmail.com

Author σ : Wolaita Zone livestock and Fishery Resource Department, Wolaita Sodo, Ethiopia. e-mail: tewodrossadado@gmail.com

Author ρ : Sodo Zuria District Livestock and Fishery Resource Office, Wolaita Sodo, Ethiopia. e-mail: misiryonas@gmail.com

million equines, the country has Africa's largest livestock population (CSA, 2008). However, the contribution from this huge livestock resource of the national income is disproportionately small due to several factors. 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. Ticks are very significant and harmful blood sucking external parasite of mammals, birds and reptiles throughout the world (Rajput *et al.*, 2006).

In Ethiopia, tick and tick borne diseases cause considerable losses to the livestock economy ranking third among the prevalently parasitic diseases after trypanosomes and endo parasites. Ticks are directly or indirectly involved in substantial financial losses to livestock industry of Ethiopia which accounts for 75% the animal exports (Pegram *et al.*, 1981). Tick bites can be directly debilitating to domestic animals causing mechanical damage, irritation, inflammation and hypersensitivity and, when present in large numbers, feeding may cause anemia and reduced productivity. The salivary secretion of some tick species may cause anemia and paralysis; however, more importantly when they attach and feed they are capable of transmitting a number of pathogenic viral, bacterial, rickettsial and protozoal diseases to livestock (Minjaw and Mclead, 2003; Drummond, 1983). Hence, ticks are one of the most significant groups of arthropod pests of veterinary interest (Wall and Shearer, 2001; Walker *et al.*, 2003). Moreover, ticks also predispose to secondary attacks from other parasites (Abera *et al.*, 2010).

In Ethiopia, ticks are common in all agro-ecological zones (Pegram *et al.*, 1981) and the major genera reported belong to *Amblyomma*, *Boopophilus*, *Haemaphysalis*, *Hyalomma* and *Rhipicephalus* (Pegram *et al.*, 1981; de Costoro, 1994). Moreover, it was also reported that different species of ticks comprising of *Rhipicephalus evertsi evertsi*, *Rhipicephalus muhsamae*, *Rhipicephalus practextatus*, *Rhipicephalus bergeoni*, *Rhipicephalus lunulatus*, *Haemaphysalis leachileachi*, *Haemaphysalis aciculifer*, *Haemaphysalis parmata*, *Amblyomma lepidum*, *Amblyomma variegatum*, *A. cohaerens*, *A. gemma*, *Hyalomma truncatum*, *Hyalomma marginatum rufipes*, *Argas persicus* and *Ixodes rarus*

occur in western Ethiopia (Abera *et al.*, 2010; de Costoro, 1994; G/Michael, 1993).

The objective of the present study were to identify the main ixodid tick species infesting domestic ruminants and to estimate the prevalence of ixodid tick infestation in bovine, ovine and caprine species in selected districts of Wolaita Zone, Southern Ethiopia.

II. MATERIALS AND METHODS

a) Study Area

The study was carried out in three districts of Wolaita zone, namely Sodo Zuria, Humbo and Damot Gale. Wolaita zone is in Southern Nations, Nationalities and People's Regional state at 390 km far from Addis Ababa. Geographically, Wolaita Sodo, the capital of Wolaita zone, is located at 6.4°-7.2°N latitude and 37.4°-38.2° E longitudes. The total land area covers 438,370 hectares, out of which 51.7% is cultivated and, 6.4% cultivable, 11.9% is grazing land 30% is others. The annual mean temperature ranges from 17.5-25.5°C and the area receives an average annual rainfall of 900-1400 mm. The rainfall pattern is bimodal, that is heavy rain from June to mid October and short rain from March to April. The area is characterized by tropical sub-humid climate and ever green forest type of vegetation. The main occupation of the rural population is mixed farming practice where by crop and livestock are managed hand in hand and together. The livestock populations of Wolaita zone were estimated to be 658,886 cattle, 59,233 sheep, 40,543 goats, 1,987 equines and 39,643 poultry. Livestock populations occupy a significant place in the farm economy. The most common crops that grown in the area are: wheat, inset, maize, barley and root crops. With the regard to the altitudes of the three districts, Damot Gale is a highland with an altitude about 2700 meters above sea level (*m.a.s.l.*), Sodo Zuria is a midland area that has got an altitude of 2016-2261 meters above sea level (*m.a.s.l.*) and Humbo is a lowland area with an altitude of 1480 *m.a.s.l.* (WZFED and CSA, 2003).

b) Study Population

The study population constitutes of those indigenous breeds of cattle, sheep, and goats, kept under the traditional management system. The animals depend on the grazing for their feed source with little supplementation of crop residues. All age groups and both sexes of animals were included in the study.

c) Study Design and Sampling Strategy

A cross-sectional study was employed to address the objective of this work. The sample size was determined following the formula described by Thrusfield (2005) for simple random sampling technique. Accordingly, considering the expected prevalence of 50% and 5% absolute precision and 95% confidence interval, a total 384 ruminants comprising of

138 cattle, 130 sheep and 116 goats were selected from the three study areas. The study animals were selected systematically at watering points and grazing areas.

d) Tick Collection and Identification

The animals selected for tick collection were properly restrained. The feeding adult ticks were collected from different body parts of animals including dewlap, brisket, back side, udder, vulva, an genital, foot and thigh. Tick samples were collected by hand picking method after examining the body parts of the animal for the presence of a tick (Alekaw, 2000). The collected ticks were preserved in universal bottles containing 70% ethyl alcohol as a preservative for each species of animals. Petri dishes, forceps, filter papers and stereo microscope were used for identification.

The ticks collected from different species of animals were placed in to a Petri dish and the adult ticks were spread on filter paper to absorb excess preservatives then, subsequently identified to genus and species level using standard stereo microscope based on tick identification keys adapted from Walker *et al.*, (2003) and Hoogstraal (1956) and available in Sodo Regional Laboratory.

III. DATA MANAGEMENT AND ANALYSIS

The data collected from the three species of ruminants were coded and entered into computer Microsoft excel spreadsheet. All statistical analysis was performed on STATA 9 software. The prevalence of tick infestation was computed as the number of animals infested divided by the number of animals examined multiplied by 100%. The association between the prevalence of tick infestation and the assumed risk factors such as species of animal, district, sex, and age was tested by Chi-square (χ^2) statistic. P-value <0.05 was considered for significance at 95% level of confidence.

IV. RESULTS

a) The Prevalence of Tick Infestation

Of the total 384 ruminants examined, 252 (65%) animals were found to be infested with one or more tick species. There was a significant difference ($P < 0.001$) in the prevalence of tick infestation between the different animal species. The highest prevalence was observed in bovine (89.1%) and the lowest in caprine (32.8%) (Table 1).

Table 1: The Overall Prevalence of Tick Infestation in Bovine, Ovine and Caprine Species

Animal Species	No. of Animals Examined	No. of Animals Infested	Prevalence (%)	χ ²	P-Value
Bovine	138	123	89.1		
Ovine	130	91	70		
Caprine	116	38	32.8	89.89	0.001
Total	384	252	65.5		

When the overall prevalence of tick infestation was analyzed on the study basis, a statistically significant difference (P<0.05) was seen between the different study area. The overall prevalence was the highest (71.8%) in Damot Gale district and the lowest (57%) was observed in Humbo district. However, this

difference was attributed only due to the differences in tick infestation of bovine species and the differences within infestation of ovine and caprine species across the three study areas was not significant (P>0.05) (Table 2).

Table 2: The Prevalence of Tick Infestation in Animals Examined based on Study Areas

Species of Animals	Study Districts						χ ²	P-Value
	Sodo Zuria		Damot Gale		Humbo			
	No.	Prevalence (%)	No.	Prevalence (%)	No.	Prevalence (%)		
Bovine	50	92	44	95	44	79	6.47	0.039
Ovine	46	65	58	72.4	26	73	0.82	
Caprine	36	36.1	29	34	29	29	0.53	
Overall	132	67	131	71.8	121	57	6.3	0.042

The overall prevalence of tick infestation observed in males and females were 63% and 67%, respectively. Although the prevalence was slightly higher in females, the difference was not statistically

significant (P >0.05) except for caprine species in which significantly (P <0.05) highland prevalence was observed in males than females (Table 3).

Table 3: Prevalence of Tick Infestation in Animals Examined based on Sex

Species of Animals	No. Examined		No. Infested		Prevalence (%)		Difference Between Sex	
	M	F	M	F	M	F	χ ²	P-value
Bovine	56	82	49	74	87.5	90.2	0.25	
Ovine	64	66	42	48	65.6	72.7	0.77	
Caprine	67	49	27	11	40.2	22.4	4.08	0.043
Total	187	197	118	133	63.1	67.5	0.82	

b) The Tick Species Identified

Three different genera of ticks were identified in the study area: *Amblyomma*, *Rhipicephalus* and *Boophilus*. Of these three genera, six species were identified in bovine, ovine and caprine. The most prevalent tick species in bovine was *Boophilus*

decoloratus (53.7%) while in ovine and caprine, *Rhipicephalus evertsi evertsi* was the most dominant tick species identified with a proportion of 42.9% and 32.25%, respectively. *Amblyomma gemma* was the least prevalent species in bovine while *Amblyomma lepidium* in ovine and caprine (Table 4).

Table 4: Ixodid Tick Species Identified in Bovine, Ovine and Caprine Expressed as Proportion in Relation to the Number of Animals Infested with in each Species

Ticks Species	Animal Species							
	Bovine (n=123)		Ovine (n=91)		Caprine (n=38)		Overall (n=252)	
	No.	Proportion	No.	Proportion	No.	Proportion	No.	Proportion
<i>A. variegatum</i>	20	16.3	18	19.8	9	23.7	47	18.7
<i>A. gemma</i>	2	1.6	7	7.7	4	10.5	13	5.15
<i>A. lepidium</i>	8	6.5	5	5.5	3	7.9	16	6.34
<i>A. cohaerence</i>	24	19.5	10	11	3	7.9	37	14.7
<i>R. evertsievertsi</i>	13	10.6	39	42.9	13	34.2	65	25.8
<i>B. decoloratus</i>	66	53.7	23	25.3	12	31.6	101	40

Out of total 252 animals infested with ticks, 89.7%, 9.9% and 0.4% were found to be affected with a single, two and three different tick species respectively. On animal species basis, 91.9% bovine, 87.91% ovine and 86.84% caprine were infested with a single tick

species while 8.1% bovine, 12.1% ovine and 10.52% caprine were infested with two tick species. Only 2.6% caprine were observed to be infested with three tick species (Table 5).

Table 5: The Number and Proportion of Animals Infested with One or More Tick Species

No. of Tick Species	Animal Species							
	Overall (n=252)		Bovine (n=123)		Ovine (n=91)		Caprine (n=38)	
	No.	Proportion	No.	Proportion	No.	Proportion	No.	Proportion
Animals Infested with a Single Tick Spp.	226	89.7	113	91.9	80	87.91	33	86.84
Animals Infested with Two Tick Spp.	25	9.9	10	8.1	11	12	4	10.52
Animals Infested with Three Tick Spp.	1	0.4					1	26

V. DISCUSSION

The problem of ticks in domestic ruminants of the study area seems to be very important as they are widely distributed. Poor management and poor level of awareness for cattle, sheep and goats owners regarding the effect of ticks are believed to have contributed to widespread occurrence of infestation. Considering these conditions, the present study was undertaken to identify the tick species found in Wolaita zone and to estimate their level of infestation in domestic ruminants. Higher proportion of the animals (65.6%) examined in the study area were infested with one or more species of ticks. There was a significant ($P < 0.001$) difference in the prevalence tick species among the three animal species. The highest prevalence was observed in cattle (89.1%) and the lowest in goats (32.8%). The present finding is relatively lower than that of previous study (Abera *et al.*, 2010) where 97.8% cattle, 89.9% sheep and 94.4% goats were reported to be infested in Bedelle district, Western Ethiopia. The prevalence of tick infestation observed in sheep and goats is also lower than previous report by Abunna *et al.*, (2009) who reported 89.9% and 87.5% in sheep and goats, respectively in Meisso district, Eastern Ethiopia. However, the present finding is considerable higher than that of Arega (2010) who reported the prevalence of 59.6% in cattle, 37.7% in sheep and 48% in goats in and around Kombolcha. Such difference in prevalence may arise from differences in agro-climate, management and health care provided to the animals in the study areas.

Tick is the most prevalent ecto-parasite in Ethiopia (Pegram *et al.*, 1981). In addition to the current study, the occurrence and importance of ticks in and around Wolaita area has also been reported by different scholars (Shiferaw and Abebe, 2005; Naser, 1985; G/Michael, 1993; Yacob *et al.*, 2008).

The observation of a significant difference in the prevalence of tick infestation between the different animal species is in agreement with the findings of

Abera *et al.*, (2010); however, contrary to the present study, the highest prevalence was reported in goats. On the other hand, the current study contradicts with that of Abunna *et al.*, (2009) who reported insignificant variation in tick infestation between sheep and goats.

The present study revealed a significant difference in the prevalence of tick infestation in cattle between the three districts ($P < 0.05$). This variation in prevalence might be the result of altitudinal differences between the areas. The highest prevalence in cattle (95%) was observed in Damot Gale which is a highland area while the lowest (79%) in Humbo district which is a lowland. It is stated that tick activity is influenced by rainfall, altitude, and atmospheric relative humidity (Pegram *et al.*, 1981). However, such differences were not observed in sheep and goats ($P > 0.05$). This result contradicts that of Arega (2010) who reported absence of variation in tick infestation in cattle and goats between different agro-ecologies.

In this study, the prevalence of tick infestation was significantly ($P > 0.05$) higher in male (40.2%) than female goats (22.4%). However, the association between tick infestation and sex was not significant in cattle and sheep ($P > 0.05$), although it tended to be higher in females than males. A previous work by Abunna *et al.*, (2009) has reported a significance difference between male and females in both sheep and goats but a higher prevalence was observed in females than males. Similar to the present study, another previous study by Abera *et al.*, (2010) did not find a significant difference between male and female animals across all the three ruminant species.

Six species of tick were identified in the domestic ruminants in the present study. *Boophilus decoloratus* was the most prevalent in cattle and the second most dominant in sheep and goats. *Rhipicephalus evertsi evertsi* was the dominant species in sheep and goats. The distribution and abundance of tick species infesting domestic animals in Ethiopia vary from area to area. Various studies in Ethiopia have

reported that *Amblyomma variegatum* is the most abundant tick in cattle (Morel, 1980; Pegram *et al.*, 1981; Tessema *et al.*, 2010). However, similar to the present study, *B. decoloratus* was reported to be the most abundant tick species in cattle in previous studies conducted in Wolaita (G/Michael, 1993; Shiferaw and Abebe, 2005). It is a one-host tick and a vector of an important tick-borne disease, babesiosis. All the tick species identified in cattle, sheep and goats belong to three genera: Boophilus, Rhipicephalus and Amblyomma. The same genera of ticks have also been reported in cattle, sheep and goats in Bedelle district (Abera *et al.*, 2010) and Wolaita (Yacob *et al.*, 1981). Contrary to the current finding, Abunna *et al.*, (2009) have reported that *R. evertsi evertsi* was the most abundant species in sheep and goats. However, in agreement with the present study, Abera *et al.*, (2010) have reported that *R. evertsieverts* was the dominant species in sheep.

VI. CONCLUSION AND RECOMMENDATIONS

The present has shown that ticks are very important ectoparasites in domestic ruminants affecting the majority of animals examined in the study area. A higher proportion of animals (32-89%) examined in the study areas were infested in one or more species of ticks. Moreover, six species of that belong to three genera were identified in all the three animal species. Among the tick species identified in the study areas *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi* and *Amblyomma variegatum* were the most prevalent. The observation such a high level of infestation and a wide variety of species clearly shows that ticks are threats for livestock production in the study areas because it is a well established fact that ticks cause great economic losses to livestock and adversely affect livestock host in several ways and parasitize a wide range of vertebrate hosts and transmit widely variety of pathogenic agents than any other groups of arthropods. On the other hand, the present study reminds that much more remains to be done to control ticks in the study area.

The present study has also demonstrated that cattle are more prone to tick infestation than sheep and goats and special attention should be given to cattle when tick control schemes are planned. Furthermore, it was observed that prevalence of tick infestation in cattle is dependent on altitude that is, the highest level of infestation was observed in animals from highland whereas, lowest in animals from lowland district.

Therefore in line with the aforementioned facts, the following measures are recommended that might help to reduce the high level of tick infestation in the study areas:

- First and foremost it is important to educate farmers on the problems of ticks, and the different control methods, which can be available in the areas.

- Application of acaricide aimed at reduction of tick population based on information about their prevalence on different agro-ecological zones should be encouraged.
- Special attention should also be given in awareness that there is high probability of the occurrence of tick-borne diseases in the study areas and supplement of basic drugs should be supplied.
- Further study is required to generate a complete data set on the epidemiology of tick infestation in the study areas and also to collect data on the occurrence of tick-borne diseases.

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