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Prevalence of Ixodid Ticks of Cattle in Jardega Jarte District, Horro Guduru Zone, Oromia, Ethiopia

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Abstract: A cross section study was conducted from October 2016 to April 2017in and around Jardega Jarte town with the objectives of determining the prevalence and risk factors associated with tick infestations and to identify different tick genera, species and their predilection sites. Out of the 384 cattle examined, 334 (87%) were found with being infested by one or more tick species. About 1878 ticks were collected and the collected ticks were identified to genera and species level. Three genera; namely *Amblyomma*, *Rhipicephalus* and *Hyalomma* and five species were identified of, which *Rhipicephalus(Boophilus)decoloratus* was the most abundant tick species comprising of 25.5 % of the total collection and the least abundant tick species was *Hyalommarufipes* (6.2%). The association of the prevalence of tick infestation by different risk factors was assessed to be statistically insignificant between sexes, age and body condition of cattle. Male animals were not significantly infested than females, which were 36.0% and 51.0%, respectively.Medium and good body condition animals were infested by ticks than poor body conditioned cattle, which were 31.0%, 30.7% and 25.3%, respectively. However, there was no statistically significant variation between the age groups; adult cattle wereinfested than the old and young age group, which was 46.9%, 30.7% and 9.4% respectively.In line with this, we recommend further study to assess the ecological, managementand host related factors influencing, tick infestation, thereby appropriated control measure should be put in place.

Key words: Tick · Cattle · Ixodid tick · Prevalence

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa, approximately 53.99 million cattle. This livestock sector has been contributingconsiderable portion to the economy of the country and still promising to rally round the economic developmentof the country [1]. In Ethiopia, livestock production remains crucial and represents a major asset amongresource-poor small holder farmer by providing milk, meat and skin, manure and traction force [2]. The contributionof livestock to the national economy particularly with regard to foreign currency earnings is through explorationof live animal, meat and skin and hides [3].

Poor health and productivity of animal due to disease has considerably become the major stumbling block tothe potential of livestock industry [4]. Now a day parasitism represents a major obstacle to development and utilizationof animal resource. In Ethiopia, ectoparasites in ruminant cause serious economic losses to small holderfarmers, the tanning industry and country as a while through mortality of animals, decreased production, downgradingand rejection of skin and hide [5]. From the ectoparasites, ticks are ranked as the most economicallyimportant of livestock in tropics including sub-Saharan Africa [6].

Ticks are small, wingless ectoparasitic arachnid arthropods that are cosmopolitan and prevalent in warmerclimates [7]. Ticks cause substantial losses in cattle production, in terms of diseases, reduced productivity andfertility and often death and are economically the most important ecto-parasites of cattle [8]. Huruma *et al.* [9] indicates thatdifferent ticks have different predilection sites on the host's body. Ticks suck blood; damage hides and skins introducetoxins and predispose cattle to myiasis and dermatophilosis [10].

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Furthermore, they reduce bodyweight gains and milk yield, in addition to creating sites for secondary invasion by pathogenic organisms [11]. More significantly; ticks transmit diseases from infected cattle to healthy ones. Ticks transmit a greater varietyof pathogenic micro-organism than any other arthropod vector group and are among the most important vectorsof diseases affecting animals [10].

According to-Gebre, Nigist and Kassa [12] ticks which are considered to be most important to health of domestic animal in Africacomprise about seven genera. Among these genera, the main tick genera found in Ethiopia include *Amblyomma,* subgenus *Rhipicephalus* (*Boophilus*), *Haemaphysalis*, *Hyalomma* and *Rhipicephalus*. The genus *Amblyomma* and *Rhipicephalus are* predominating in many parts of country, *Hyalomma and* sub genus *Rhipicephalus* (*Boophilus*) also have significant role [13].

Due to economic and veterinary importance of ticks, their control and transmission of tick born diseases remain challenge for the cattle industry of the world and it is a priority formany country in tropical and subtropical regions [14]. In Ethiopia, there are about 47 species of ticks found onlivestock and most of them have importance as vector and disease causing agent and also have damaging effecton skin and hide production [15].

Although different tick species are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of tick species in different parts of the country; it has not been yet enough to have the country wide distribution figures and their burden. Thus, the current study is designed in and around Jardega Jarte town with the following objectives.

- To determine the prevalence and associated risk factors with tick infestations,
- To identify different tick genera and their species in the study area

MATERIALS AND METHODS

Study Area: This study was conducted in and around Jardega Jarte town, Horro Guduru wollega Zone, Oromia Regional State. Jardega Jarte is one of the districts found in Horro Guduru Wollega Zone. Today this district is sub-divided into peasant associations for administrative purposes. Alibo is the capital town, about 54 km from the zonal capital Shambu and 367 km from Finfinne. Horro Guduru Wollega zone is located between 09°29′N and 37°26′E, at an altitude of approximately 2296 m.a.s.l, with a uni-modal rainfall ranging between 1200mm-1800mm [16]. The rainy season occurs from April to mid-October where maximum rain is received in months of June, July and August. Maximum temperature of 23-27°C are reached from January to March and minimum temperature of 7-15°C are normal from October to November [1].

Study Population: Three hundred Eight four local breeds were purposively selected and examined for the distribution and abundance of tick species. All cattle sampled for this study were kept under extensive management system which varies with age, sex and body condition.

Study Design: A cross sectional study was conducted on the prevalence and risk factors associated with tick infestations and to identify different tick genera and their species. The age of cattle were grouped as young (< 1 year), adult (1 to 3 years) and Old (> 3 years) [18].

Sampling Methods and Determination of Sampling Size: The cattle were selected by simple random sampling method and multistage sampling strategy was used to determine appropriate sample size. The sample size was determined by using the formula given in Thrust field [19]. The expected prevalence of Ixodidae ticks of cattle in and around Jardega Jarte town was assumed as 50%. The parameters used were 95% confidence interval and 5% desired level of precision. By substituting these values in the formula, the sample size taken was n = 384.

Study Methodology: Firstly, the selected study animal was properly restrained and all tick samples were collected from half the body regions. Ticks were removed carefully and gently in a horizontal pull to the body surface. The collected ticks were preserved in universal bottles containing 70% ethanol and labeled with respect to predilection site, age, sex and date of collection, then transported to Wollega University, Veterinary parasitology Laboratory for counting and identification. The ticks were counted and subsequently identified to genus and species level by using stereomicroscope, according to standard identification keys given by Walker *et al*. [12].

Data Analysis: Data was analyzed by using (SPSS) statistical package for windows version 20 to get data of descriptive statistics. Furthermore, prevalence of each species of ticks was seen together with that of risk factors (Sex, body condition score and age).

RESULTS

Distribution of Tick in the Different Kebeles (PA) in the Study Area: The prevalence of tick infestation within different kebeles (PA) in and around Jardega Jarte town in current study out of 87% positive animals, Iro 90.9%), Sute Kata Ali (91.1%), Sombokumi (90.8%), Alibo 01 (80.3%) and Alibo 02 (79.2%).Presence of great variation among kebeles is due to different geography and management (Table 1).

Prevalence and Distribution of Tick Genera and Species Genera: A total of 1878 ticks were collected from different body part of tick-infested cattle. From examined cattle 334 (87%) were infested by tick. In general, hree Ixodidae tick genera and five species were identified from the study area. From identified genera; *Rhipicephalus* (*Boophilus*) (58%) (1090/1878) was the most abundant and widely distributed genus followed by genus, *Amblyomma* (26.4%) (496/1878). However, *Hyalomma* (15.5%) (292/1878) was found to be the least abundant genera (Table 2).

Distributions of Tick Species on the Animal: From the collected tick, four genera were identified, such as *Amblyomma*, *Rhipicephalus* and *Hyalomma.* Five species of ticks were identified; *R.* (*B.*) *decoloratus* was the most abundant tick species comprising of (25.5%) of the total collection. Multi specieswhich were (22.2%) and the second most abundant tick species of the whole collection. The third and the fourth widely distribute tick species was *Rhipicephalusevertsi* and *Amblyomma variegatum*, which was accounted for 12.6% and 10.7% of the total collection respectively and the fifth was *Amblyomma cohaerence* (9.6%), the sixth and least abundant tick was *Hyalommarufipes* (6.2%) (Table 3).

Risk Factor

Body Condition Score: Body conditions of the animals were also considered during examination and animals were divided into three body condition scores as shown in the below table. These are, good, medium and poor. Out of 384 animals examined 134 animals were in good body condition, out of which 118 (30.7%) animals were positive for tick infestation, 137 animals were in medium body condition and out of these 119 (30.99%) animals were positive for tick infestation and the rest 113 animals were poor body condition state and out of these 97 (25.26%) animals were positive for tick infestation. These result shows that body condition have no significant relation with tick infestation that poor body condition animal less affected by tick than medium body condition animal and good body condition animal (Table 4).

Table 1: Prevalence and distribution of tick in the different kebeles (PA) in study area

Origin (kebele)	No. of animal	No. Positive Animal	Prevalence (%)
Alibo 01	71	55	80.3
Alibo 02	48	38	79.2
Iro	110	100	90.9
Sute Kata Ali	90	82	91.1
Sombokumi	65	59	90.8
Total	384	334	87

Table 2: Distribution of tick genera

Genus	Percentage of total tick genera
Amblyomma	26.4 % (496/1878)
Rhipicephalus	58% (1090/1878)
Hyalomma	15.5 % (292/1878)

Table 3: Distribution of tick species on the animal

Tick species	Total Anim. Examined	No. positive animal	Prevalence (%)
Amblyomma cohaerence	49	37	9.6
Amblyomma variegatum	31	24	10.7
Rhipicephalus everetsi	66	47	12.2
Rhipicephalus(B.) decoloratus	103	98	25.5
Hyalomma rufipes	43	41	6.2
Multi Species*	92	87	22.7
Total	384	334	87

*= more than one species of tick presented

Table 4: The relation between tick species and body condition

	Tick species identified																							
	A. varigatum					*A. cohaerence*			*R.(B.) decoloratu*			*R. evertsi*			*H.rufipes*			Multi species		
Risk factors	Total animal			+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%
BCS	Case Processing Summary																							
			N	Marginal Percentage																				
	PA/NA	0	50	13.0%																				
		1	334	87.0%																				
	Age	0	39	10.2%																				
		1	211	54.9%																				
		2	134	34.9%																				
	Sex	0	223	58.1%																				
		1	161	41.9%																				
	BCS	0	134	34.9%																				
		1	137	35.7%																				
		2	113	29.4%																				
	Valid		384	100.0%																				
	Missing		0																					
	Total		384																					
	Subpopulation		18[a]																					
	a. The dependent variable has only one value observed in 5 (27.8%) subpopulations.																							
Good	134			10	2.6	134	17	4.4	134	14	3.6	134	16	4.2	134	28	7.3	134	33	8.6				
Medium	137			9	2.3	137	13	3.4	137	18	4.7	137	17	4.4	137	33	8.6	137	29	7.6				
Poor	113			5	1.3	113	7	1.8	113	9	2.3	113	14	3.6	113	37	9.6	113	25	6.5				
	384			24	6.2	384	37	9.6	384	41	10.7	384	47	12.2	384	98	25.5	384	87	22				

BCS=Body Condition Score

Table 5: The relation between tick species and sex

	Tick species identified																			
	A. *varigatum*			*A. cohaerence*			*R.(B.) decoloratu*			*R. evertsi*			*H. rufipes*			Multi species		
Risk factors	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+veanimall	%
Sex																		
Female	223	11	2.9	223	22	5.7	223	25	6.5	223	25	6.5	223	59	15.4	223	54	14.1
Male	161	13	3.4	161	15	3.9	161	16	4.2	161	22	5.7	161	39	10.2	161	33	8.6
Total	384	24	6.2	384	37	9.6	384	41	10.7	384	47	12.2	384	98	25.5	384	87	22.7

Table 6: The relation between tick species and age

	Tick species identified																	
	A. *varigatum*			*A. cohaerance*			*R.(B) decoloratus*			*R. evertsi*			*H.rufipes*			Multi species		
Risk factors	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	Total animal	+ve animal	%	animal	+ve animal	%
Age																		
Young	39	2	0.5	39	6	1.6	39	6	1.6	39	4	1.0	39	7	1.8	39	11	2.9
Adult	211	16	4.2	211	15	3.9	211	26	6.8	211	26	6.8	211	53	13.8	211	44	11.5
Old	134	6	1.6	134	16	4.2	134	9	2.3	134	17	4.4	134	38	9.9	134	32	8.3
Total	384	24	6.2	384	37	9.6	384	41	10.7	384	47	12.2	384	98	25.5	384	87	22.7

Table 7: Prevalence of ixodid ticks in relation to host risk factors

Risk Factors		Animal tested	Number of positive animal (%)	P=value	OR (95%)	95% CI
BCS	Good	134	118(30.7)	0.617	0.827	0.451-1.936
	Medium	137	119(31.0)	0.856	0.935	0. 447-1.913
	Poor	113	97(25.3)	-	-	-
Age	Young	39	36(9.4)	0.466	0.619	0.170-2.249
	Adult	211	180(46.9)	0.461	1.277	0.667-2.443
	Old	134	118(30.7)	-	-	-
Sex	Female	223	196(51.0)	0.584	0.846	0.4641-0.541
	Male	161	138.(36.0)	-	-	-
Total		384	334(87)			

BSC = Body Condition OR = Odd Ratio CI = Confidence Interval

Sex: Comparison was made on the prevalence of female and male. Out of animals sampled, the majority or 51.0% were Females while about 36.0% of them were males. The tick prevalence was 51% and 36% in Female and male respectively. However, there was no statistical (P>0.05) significance between the two sexes (Table 5).

Age: Analysis of age was prevalence of tick indicated that the difference in prevalence among the three age groups were relatively high in adult (Table 5) than the young and old groups with no statistically significant variation (P > 0.05) (Table 6).

Risk Factor: Comparison was made on the prevalence of female and male. Out of animals sampled, the majority or 36.0% were females while about 51.0% of them were males. The tick prevalence was 36.0 % and 51.0 % in female and male respectively. However, there was no statistic al (p>0.05) significance between the two sexes. The body condition score of the cattle population was found to be variable among tick infestation rate. Accordingly, tick prevalence of medium body condition cattle (31.0%) was more than that of cattle having good (30.7%) and poor body (25.3%) condition.

Analysis of age was prevalence of tick indicated that the difference in prevalence among the three age groups were relatively high in adult than the old and young groups with no statistically significant variation (Table 7).

DISCUSSION

In Ethiopia, the distribution of the most tick species, vary greatly from one area to another area. In this survey, a total 1878 ticks were collected from a total of 334local zebu breeds. The present study showed 87% of tick prevalence. This finding is agreement with the findings of Nigatu and Teshome [20], who reported an overall prevalence of (89.4%). However, it is different from the findings of Belew and Mekonnen[21] who reported an overall prevalence of 33.21%.This difference could be due to the difference in the agro climatic condition of the study areas.

Three genera of hard ticks were identified, namely *Amblyomma* (26.4%), *Rhipicephalus* (58%), *Hyalomma* (15.5%) and five species of ticks namely *A. variegatum* (10.7%)*, A. cohaerence* (9.6%), *R.evertsi* (12.2%)*, R.(B.) Decoloratus* (25.5%), *H. rufipes* (6.2%) and multi species (22.2%) were identified in the study area. *Rhipicephalus (B.)Decoloratus* was the most abundant of all tick species comprising 25.5% of the collected ticks in the study sites.This result is agreed with Sileshi*et al*. [22] who reported that *R.* (*B.) decolaratus* is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions except in the Afar region. This is also in line with Tamiru [23] in Asela and Teshome*et al*. [24] reported the highest prevalence of *R.* (*B.) decolaratus* (80%) in the study areas. *R. evertsi* was found to be the second most abundant (12.2%) tick species in this study, which is comparable with the findings of Solomon *et al*. [25], Tagegn *et al.* [26] and Morka *et al.* [27]. Hoogstral [28] determined its wide distribution throughout the Ethiopian faunal region. Pegram *et al.* [29] reported that this species had not zones or seasons; and it is also known to convey tick paralysis in Harar Ethiopia. According to Sileshi *et al.* [22], *R. evertsi* was collected throughout their study period, with the peak of abundance in January coinciding with the beginning of the rainy season and they also added that the discovery of this tick in that area was in line with its widespread occurrence in most parts of the country. The occurrence of this species in and around Wolaita zone was also reported by Dessie and Getachew [30].

Amblyomma varigatum was the third widespread tick species of the cattle in the current study area (10.7%). This result disagreed with different reports done by other

authors in different parts of Ethiopia such as Tessema and Gashaw [31] in Asela, Belew and Mekonnen [21] in Holeta. Fanos *et al*. [32] in Mizan Teferi, Seyoum [33], Mehair [34] in Awassa. Morka *et al.* [27] in and around Diga town who as reported. *A. varigatum* as the first most abundant tick species in their study areas. The difference in result was due to the geographical location where *A. varigatum* was found in highest number in the highland and high rainfall. The study conducted in Wolaita zone by Dessie and Getachew [30] and in Sebeta town. By Gurmessa *et al*. [35] showed that *A. varigatum* was the second abundant tick species at highland and midland and the first abundant in the lowland during wet period. This variation may be due to the change in environmental conditions, with the result of global warming that highly affect the ecology of ticks.

Amblyomma cohaerence was the fourth abundant tick species (9.6%) in the study area. This result has agreement with the report stated by Feseha [36], Surafel and Amsalu [37] and Pawlos and Derese [38] as *A. cohaerens* is abundant in areas where climate is humid most of the year. De Castro [39] also reported that this tick species is most common in Western Ethiopia. Regardless of its prevalence and place of collection, the presence of *A. cohaerens* in different parts of Ethiopia has been reported by various researchers [40] in Western Ethiopia, Surafel [41] in Tigray and Mekonnen *et al*. [42] in central Ethiopia. It has also been reported as prevalent in many other parts of the country such as Rift valley [43], Pegram *et al.* [29] and in high land areas of Harar and Diredawa district [44]. According to Dessie and Getachew [30] *A. cohaerence* was also the fourth abundant tick species in the Wolaita zone with significant seasonal distribution variation at highland and lowland. This result was also similar with the reports of Belew and Mekonnen [21] in Holeta and Tessema and Gashaw [31] in Asela.

Hyalomma rufipes was the least abundant tick collected with 6.2% of the total counts. This result was similar with the finding of Tessema and Gashaw [31] in Asela (2.5%), Belew and Mekonnen [21] in Holeta (1.86%), Tegegn *et al.* [26] in Bishoftu (4.7%), Hussen [45] in Bako, Tamiru [23] in Assela and Tiki and Addis (46) in and around Holeta also reported a prevalence of 1.2, 2.5 and 1.86% respectively. The low prevalence of this tick species in this study area as stated could be due to the fact that *H. rufipes* is mostly found in arid parts of tropical Africa that receive about 250-650mm annual rain fall [28] and rare in western and central high land of the country. In Ethiopia altitude is often between 1000 to 2500m above sea level and this makes the presence of this parasite to be very rare [29].Ticks are known to be distributed in different parts of the host's body. In this study, the main infestation site of ticks in the body of hosts was dewlap, head, Ear, udder/scrotum, under tail/anus, perineum and belly. A variety of factors such as host density, interaction between tick species, time and season and inaccessibility for grooming determined the attachment site of the ticks on the skins [25]. The predilection sites found in this study were in line with those reported by Seyoum[47] and Behailu[48] in their study conducted in North Wollo zone and Asela, respectively.

In this study, different animal related risk factors were studied to determine whether there is a significant variation in tick infestation between and among different groups of animals with suspected risk factors. With regard to predilection site for attachment, different tick species show different site preferences. *R.evertsi* and *H. rufipes* are found on udder and scrotum.The proportion of tick infestation was higher in adult animals as compared to young and old animals. However, there was no statistically significant association ($p > 0.05$) and the higher proportion may be due to outdoor management and long distant movement of adult animals to search for food and water compared to younger and older animals, so the chance of exposure is higher. This finding was also in agreement with the finding of Yakhchali and Hasanzadehzarza [49] who reported tick infestation were higher in adults (60.8%) than in youngest (20%) in Oshnavich. Feseha [37], Meaza *et al*. [50] and Tessema and Gashaw [31] also stated that a higher proportion in adults cattle than youngest. The prevalence of all tick species was higher in female animal than male animals. There was no statistically significant association ($P > 0.05$) in the infestation rate between sex groups, where higher infestation was recorded in females (51.0%) compared to males (36.0%). This variation may be associated with male animals, which were kept properly with good management system for ploughing or draughting purpose whereas female animals grazing on field all day may be exposed to tick infestation.

In this study, the occurrence of tick infestation in three different body condition (Poor, medium and good) of animals shows the highest prevalence in medium body conditions (41.8%), followed by good body conditions (29.2%) and (14.2%) in poor body condition. This was due to the fact that medium body scored animals have reduced resistance and are exposed to any kind of disease when grazing on the field and poor body conditioned animals were kept at home due to their inability to walk long distant areas, so they become less infested than medium

and good sized animals but the well fed animals were very resistant to any kind of diseases when they grazed in the field or are kept at home.

CONCLUSION

The study indicated that there was high burden of ticks in the study area that almost all sampled animals can have ticks on their body. Variable information on tick species distribution and dynamics are very essential to assess the economic loss encountered due to tick infestation and also to identify the appropriate measure of tick control. The important and abundant tick species investigated in the study area were *R. (B.)decolaratus, R. evertsi, A. varigatum, A. cohaerence* and *H. rufipes*. However, the attention given to controlling the infestation had not been sufficient. In light of the above conclusion the following recommendations are forwarded:

- Tick control program (application of acaricides) should be continued with an increasing frequency of application in wet months.
- More attention should be given to the selection of resistance cattle breeds and types and good performance with regards to production of local breeds.
- Appropriate pasture management in communal grazing area is important.

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