

Prevalence of Tick Infestation in Cattle in and Around Jimma Town

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ABSTRACT

A cross sectional study was conducted from November 2018 to April 2019 in and around Jimma town to determine the prevalence of tick infestation, to identify different types of tick species and their preferred site on cattle's body and host related risk factors. A total of 384 cattle were randomly selected and examined for the presence of tick. Out of the total examined 300(78.1%) were infested by one or more tick species. Of the risk factors considered the prevalence of tick infestation was not significantly different ($P>0.05$) among different breeds of cattle and the kebele's the animals were sampled. However, statistically significant variation infestation rate ($P< 0.05$) was observed in line with sex, age and body condition score of the animals. As a result, infestation rate in animals with poor body condition score (96.4%), male (78.9%) and old (95%) was found to be higher when compared with lower prevalence rates in each risk factor's counterpart as good body condition score (37.6%), female (68.4%) and young (62.1%) respectively. About 2,125 adult ticks were collected from the total sample and identified to genera level as *Amblyoma*, *Boophilus* and *Rhipicephalus* and species level as *Amblyoma cohaerens* (38.02%), *Amblyoma variegatum* (35.01%), *Boophilus decoloratus* (21.32%), *Rhipicephalus evertsi evertsi* (2.96%) and *Amblyoma gemma* (2.68%). Among this *Amblyoma cohaerens* (38.02%) and *Amblyoma gemma* (2.68%) were highly and least abundant respectively. Highest and lowest male to female ratio of 2.45:1 and 0.535:1 for *Amblyoma cohaerens* and *Boophilus decoloratus* was identified by the study. The favorable predilection sites of the ticks were also detected by the study with *Amblyomma* species found dwelling at the brisket, udder/scrotum and groin/belly; *Boophilus decoloratus* at neck/dewlap, udder/scrotum, groin/belly, leg and ear and *Rhipicephalus eversti evertsi* at under tail and ano genital. As a conclusion, this study revealed high prevalence of tick infestation may be due to lack of community awareness about tick and tick borne disease and their control method which is expected to reveal the exiting gap in the study area to avoid the problem and may help to undergo further research work. Therefore, it is recommended to minimize the problem primarily by creating awareness about appropriate and strategic control measures of tick infestation.

Keywords: Cattle, Jimma town, Predilection site, Prevalence, Tick Species.

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LIST OF ABBREVIATIONS

AAU: Addis Ababa University; CSA: Central Statistical Agency; DVM: Doctor of Veterinary Medicine; FAO: Food and Agriculture Organizations; FVM: Faculty of Veterinary Medicine; OIE: Office International des Epizootics; SPSS: Statistical Package for Social Science.

INTRODUCTION

Ethiopia represents various climatic zones and livestock production systems in tropical Africa [1]. Ethiopia possess huge number of livestock populations with an estimated 57.83 million cattle, 29.33 millions of sheep, 29.11 millions of goats, 1.16 millions of camels, 9.86 millions of equines and 56.87 millions of chickens which represent an immense economic potential [2]. Despite the large population of animals, livestock productivity in Ethiopia is low and even below the average for most countries in Eastern and sub Saharan African countries. This is due to prevailing animal diseases, poor nutrition, reproduction insufficiency and management constraint [3].

Ticks are obligate, blood feeding ectoparasites of vertebrates, particularly mammals and birds Ticks are most numerous, particularly in tropical and sub-tropical regions, and their impact on animal healthy and production is greatest in these regions. Ticks are the being responsible for severe economic losses in livestock. The major losses, however, caused by ticks are due to their ability to transmit protozoan, rickettsial and bacterial diseases of livestock, which are of great economic importance world-wide [4].

Numerous studies have been conducted on tick and tick borne diseases of ruminants in various parts of Ethiopia and several species of ticks belonging to genus *Amblyomma*, *Boophilus*, *Rhipicephalus*, *Hyalomma* and *Haemaphysalis* have been reported. Among these tick genera, the main ticks found in Ethiopia are *Amblyomma* (40%), *Boophilus* (21%), *Haemaphysalis* (0.5%), *Hyalomma* (1.5%), and *Rhipicephalus* (37%) [5].

Ticks are common in all agro-ecological zones of Ethiopia. Even though different studies were done on cattle ticks and other domestic animals in the south western part of the country little attention was given to tick infestation on cattle in the study area. Moreover, there was not specific study conducted on tick infestation on cattle in and around Jimma town.

Therefore, the objectives of this study are:

- To determine the prevalence of tick infestation in cattle and
- To identify the different types of tick species infesting cattle

MATERIALS AND METHODS

Study Area

The study was conducted in and around Jimma town, which is located at 352km south west of Addis Ababa. From this area six Kebles were selected namely Seto semaro, Bosa kito, Ifabula, Merewa, Qophe and Amenu. Geographically, town is lie between a latitude of 7°41'N and longitude of 36°50'E and it receives a bimodal rain fall with an average annual rain fall of 1530mm. The mean annual maximum and minimum temperature ranges from 25°C 30°C and 7°C 12°C, respectively. Jimma zone has a livestock population of 2, 016, 823 cattle, 288, 411goats, 942, 908 sheep and 74574 horses, 49, 489donkey, 28, 371 mules and 1,139, 735 poultry [6].

Study population

A total of 384 cattles were randomly selected based on different risk factors such as age, breed, sex and body condition score from in and around Jimma town and examined for the presence of ticks. The age of the cattle was grouped into young (1 to 2 year), adult (3 to 7 years) and old (> 8 years) according to Gatenby R [7]. While body condition score was grouped into poor, medium and good according to Nicholson M and Butterworth T [8].

Study Design

A cross sectional study was conducted from November 2017 to May 2018 in cattle to study the prevalence of ticks and identification of the major tick's species which were found in the study area.

Sample Size Determination

Simple random sampling method was used for sampling and using 95% confidence interval and 0.05 desired level of precision, the sample size was determined by formula given by Thrusfield M [9]. There was no documented information about the prevalence of tick in the study area; it is possible to take 50% prevalence. In this study the sample size was calculated using 50% prevalence with 5% desired level of precision and 95% of confidence interval.

$$n = (1.96)^2 P (1-P) / d^2$$

Where,

n = required sample size

P = Expected prevalence

d = Required precision

To calculate the total sample size, the following parameters will be used: 95% Level of Confidence (CL), 5% desired level of precision and with the assumption of 50% expected prevalence of tick in cattle, the sample sizes were determined as, n = 384.

Tick Collection and Identification Methods

Before collection of ticks the animals were restrain properly and the entire body surface of the animals were examined thoroughly for the presence of any tick and all visible adult ticks were collected from half body of the animal. The ticks were removed carefully and gently in a horizontal pull to the body surface by using forceps at main body sites namely: under tail, neck, brisket, scrotum, udder, ear, leg, dewlap and ano genital during the study period. Adult ticks were collected from each of main body sites preserved with pre filled 70% ethyl alcohol in universal bottles separately which labeled with date of collection, site of collection, sex, breed, age, body condition score and Keble until identification is done. The collected ticks were transported to the parasitology laboratory of Jimma Univeresity School of veterinary medicine for identification and counting. Ticks were identified in to genus and species level by using stereomicroscope according to standard identification keys by Walker A, et al. [10].

Data Analysis

All the collected data in study period were entered into Microsoft Excel sheet and analyzed by using statistical

package for social science (SPSS) software version 20. Descriptive statistics like percentage was used to express prevalence and 95% of confidence interval while Chi Square test (χ^2) with computed p value <0.05 was used to assess the statistical significance association between tick infestation with risk factors (sex, breeds, ages, and body condition score).

RESULT

The Prevalence of tick infestation

In this study a total of 384 cattle were examined for tick infestation. Out of the total, 300 were positive for one or more genera or species of tick and the overall prevalence was 78.1%. The overall prevalence of tick infestation in the present study revealed that the occurrence of tick in both sex of animals was significantly different with ($p= 0.000$). Higher tick prevalence was recorded in Amenu kebele (83.6) and lower prevalence in Gute (75.6%) with no statistically significant difference ($p> 0.05$) and prevalence of tick infestation between breed was not significantly different ($p>0.05$). Tick infestation of animals with age and different body conditions showed significant difference ($p= 0.05$) (Table1).

Table 1. The overall prevalence of tick infestation with different risk factors

Variable	No. examined	No. positive	Prevalence (%)	χ^2	P-value
Sex Male	229	193	84.3	12.5742	0.000
Female	155	107	69		
Age Young	161	100	62.1	41.9608	0.000
Adult	203	181	89.2		
Old	20	19	95		
Breed Local	326	251	77	1.6159	0.204
Cross	58	49	84.5		
BCS Good	101	38	37.6	133.8146	0.000
Medium	145	129	89		
Poor	138	133	96.4		
Kebele Amenu	67	56	83.6	1.9948	0.850
Bosa kito	65	52	80		
Ifabula	46	36	78.3		
Merewa	66	50	75.8		
Qophe	62	47	75.8		
Seto semaro	78	59	75.6		
Total	384	300	78.1		

Tick genera in the study area

A total 2125 ticks were collected among which three genera of ticks were identified such as Ambylomma, Boophilus

and Rhipicephalus. Ambylomma was the most abundant/ highly prevalent (75.72%) and Rhipicephalus was the least prevalent (2.96%) tick genus (Table 2).

Table 2. Prevalence of tick based on genera level

Genus	Total tick count	Prevalence (%)
Ambylomma	1609	75.72
Boophilus	453	21.32
Rhipicephalus	63	2.96
Total	2125	100

Tick species

From the study five species of ticks were identified with *Amblyoma coharens* being the most prevalent (38.02%) and *Amblyoma gemma* (2.68%) the least prevalent tick

species. In this study the species level of the male to female ratio was *B. decoloratus* (0.535:1), *A. variegatum* (2.34:1), *A. coharens* (2.45:1), *R. evertsi evertsi* (2:1) and *Amblyoma gemma* (1.85:1).

Table 3. Prevalence and sex ratio of identified tick species

Tick species	Total count	Male	Female	M:F	Prevalence (%)
Amblyoma coharens	808	574	234	2.45:1	38.02
Amblyomma variegatum	744	521	223	2.34:1	35.01
Boophilus decoloratus	453	158	295	0.535:1	21.32
Amblyoma gemma	57	37	20	1.85:1	2.68
Rhipicephalus evertsi evertsi	63	42	21	2:1	2.96
Total	2125	1469	656	2.24:1	100

Distribution of tick species and their predilection site

The most favorable predilection sites for *B. decoloratus* were neck/dewlap; for *A. variegatum* was udder/scrotum,

Amblyomma coharens was udder/scrotum, *Amblyomma gemma* was udder/scrotum; and for *Rhipicephalus evertsi evertsi* was under tail (Table 4).

Table 4. Distribution of tick species on different body parts of animal

Predilection site	Tick species				
	A. coharens	A. variegatum	A. gemma	B. decoloratus	R. evertsi evertsi
Under tail	38(4.7)	-	-	10(2.2)	38(60.32)
Ano-genital	-	-	-	-	21(33.3)
Brisket	139(17.2)	254(34.14)	8(14.03)	-	-
Udder/scrotum	414(51.24)	265(35.62)	27(47.37)	-	-
Neck/dewlap	-	-	-	198(43.7)	-
Leg	-	-	-	115(25.4)	-
Ear	-	-	-	82(18.1)	-
Groin/belly	217(26.86)	225(30.24)	22(38.6)	48(10.6)	4(6.35)
Total	808	744	57	453	63

DISCUSSION

In present study, the overall prevalence of tick infestation in and around Jimma town was 78.1% with identified three thick genera and five tick species. The current finding was in agreement with Kibruyesfa and Achuna [11] who reported 77.6% at Kimbibit District, North Shoa. The current result less than previously reported by Alemu G, et al. [12] in Dembia district, Northern Ethiopia, Regassa A [13] in Borena province of southern Oromia and Nigatu and Teshome [14] in western Amhara with overall prevalence of 81.25%, 82% and 89.4 respectively. However, the prevalence of ticks in the current study is greater than the reports of Tesfahewet and Simeon [15] in Benchi Maji Zone, Southern Ethiopia, Tiki and Addis [16] at Holetta, Central Ethiopia and Yalew A, et al. [17] in Haramaya district, Eastern Ethiopia with overall prevalence of 26%, 25.6% and 33.21% respectively. This difference could be due to the difference in the agro climatic condition of the study areas, since tick activity was influenced by rainfall, altitude and atmospheric relative humidity according to Pegram R, et al. [18].

The current study revealed that, the tick prevalence in different breeds of cattle was not statistically significant difference ($p>0.05$). The present study tick infestation in local breeds (77%) were lower than cross breed (84.5%). This result was in agreement with Belay and Eneyew [19] who reported 90.5% in cross breeds and 73.5% in local breeds. This reason due to lack of extensive management system, long distance grazing and environmental factor which local breed highly resistance than cross breed cattle [20]. This study was disagreed with Belew and Mekonnen [21] who reported the prevalence of tick infestation was higher in cross breeds (15.83%) than local breeds (44.96%).

In this study, the body condition of animals was statistically higher significant differed with ($p<0.05$) and animals with poor body condition (96.4%) were highly infested as compared with good body condition animals (37.6%). This finding concurs with the previous authors such as Bilkis M, et al. [22], Wolde and Mohamed [23], Nateneal T, et al. [24], Bossena and Abdu [25] in Assosa town. This can be due to poor management and low immunity associated with inadequate nutrition. The poor body conditioned animals had reduced resistance to tick infestation and lack of enough body potential to build resistance and they exposed to any kinds of disease when grazing on the field [18]. The high infestation of tick results poor body condition due to consumption of high amount of blood and fluid by those ticks [26].

During the study period, the prevalence of tick infestation was higher in male animals (84.3%) than compared to female (69%) animals. The association of tick infestation

between sexes of animal were statistically higher significant different ($p<0.05$). This study line with reports Adem A, et al. [27] who reported the tick infestation in males (78.9%) higher than in females (68.4%). This difference may be associated with female animals which were kept properly in the house with the good management system for dairy purpose and confined for breeding purpose and less expose to tick infestation whereas, male animals grazing on field all day and moved from place to place in search of food may be exposed to tick infestation. During grazing time, the male animals highly infested by tick because of the larvae of tick are known to climb blades of grasses and shrubs to attach themselves to passing male animals [28]. This result was disagreed with previously studied authors [29] the tick infestations in female animals (66.23%) were highly infested than male animals (56.65%).

Regarding tick infestation in relation to its age group, the older animals were highly infested than young animals and the age group of animals were statistically higher significant different ($p<0.05$). This finding was in agreement with reports Tessema and Gashaw [30] who reported the tick infestation higher in older animal than younger animals. This may be due to outdoor management and long distant movement of old animals to search for food and water exposed to tick infestation, whereas young animals spend most of their time around homesteads [31].

In the current study, the prevalence of identified tick species were *A. cohaerens* (38.02%), *A. varigatum* (35.01%), *B. decoloratus* (21.32%), *R. evertsi evertsi* (2.96%) and *Ambyloma gemma* (2.68%). In this study the most abundant tick species in and around Jimma town was *A. cohaerens* (38.02). The *A. cohaerens* was the most abundant in western, Ethiopia, where the climate is humid for much of the year it is the most abundant tick on cattle [24]. This result was lower than that of Seid B [32] from Mezan Teferi who reported 50.5%.

The second most abundant tick species in the study area was found to be *A. variegatum* (35.01%). This result higher prevalence than that of Tadesse F, et al. [33] 18.1% in Mizan Teferi. However, this result lowers prevalence than that of Nibret M, et al. [34] from Chilga District who reported 49.2% and 51.19% respectively. This difference may be due to agro-ecological differences in the study sites which may probably favors the survival of ticks, livestock management systems including the use of insecticides and other preventives measures. The *A. variegatum* causes the greatest damage to hides and skins because of its long mouth part, which renders the commodity valueless on world market if the infestation was high [35].

Boophilus decoloratus was third most abundant thick in and around Jimma town (21.32%). This result concurs with

Endazie A [29] from Bahir Dar who reported 20.9%. This result was lower than previous finding of Alemu G, et al. [12] who reported 40.86%. This might be due to *B. decoloratus* has been abundant in wetter highlands and sub-highlands receiving more than 800 mm rainfall annually according to Pegram R, et al. [18]. Also it is the commonest and widest spread tick in Ethiopia, collected in all administrative regions except in the Afar region [36].

In current study, male to female sex ratio revealed that the numbers of male ticks were higher than the number of females. This result was line with the previous report of Abdisa R [37] and Bedaso M, et al. [38] who reported the same result. This is due to fully engorged female tick drops off to the ground to lay eggs while male tends to remain on the host up to several months to continue feeding and mating and take less food than females [39]. Also The females of *B. decoloratus* outnumbered males in this study probably due to small size of male which may not be seen during collection according to Huruma G, et al. [40].

Rhipicephalus evertsi evertsi was the fourth common and abundant tick species (2.96%). This result was lower prevalence than that of Tamiru T [41] from Asella who reported 26.8%. The native distribution of *R. evertsi-evertsi* in Ethiopia seems to be connected with middle height dry Savannas and steppes, in association with zebra and ruminant and it is widely distributed throughout Ethiopia [21]. On the other hand, *Ambyloma gemma* was the least abundant tick species in the study area with prevalence of 2.68%. This due to *A. gemma* is confined to semi-arid lands due to humidity of highland which is not favourable to their survival and widely distributed in woodland, bush land, wooded and grassland in arid and semi-arid area between altitude 500 and 1750 m above sea level [42].

With regard to predilection site of ticks, this study showed that different tick species prefers different attachment site. In this study *A. gemma* found to be higher on udder/scrotum was 47.37% and lower on brisket was 14.03%, *R. evertsi evertsi* higher on under tail was 60.32% and lower on groin/belly was 6.35%, *B. decoloratus* higher on neck/dewlap was 43.7% and on under tail was 2.2%, *A. variegatum* higher on udder/scrotum was 35.62% and lower on groin/belly was 30.24% and *A. cohearens* higher on udder/scrotum was 51.24% and lower on under tail was 4.7%. *Bophilus decoloratus* on under tail was 2.2% this result line with Belay and Eneyew [19] from sude woreda. Depending on the tick, site preference on the host depends on the accessibility for attachment, to get blood and protection to overcome the environment damage that inhibits its existence and

grooming activity of the host. Tick location on the host is lined to the possibility of penetration by hypostome. The short hypostome ticks like *Rhipicephalus* usually prefer upper body parts including nape of neck and margin of anus and under tail while long hypostome ticks like *Amblyomma* attaches to lower parts of the animal body [40,43-68].

CONCLUSION AND RECOMMENDATIONS

The present study showed high prevalence of tick species in and around Jimma town. The most important and abundant identified tick species in the study area were *Abyomma cohaerence*, *Amblyomma variegatum*, *Boophilus decoloratus*, *Rhipicephalus evertsi evertsi* and *Ambyloma gemma*. This study assured that the ticks are potential problems of the study area which may cause a significant side impact on body weight gain, hide and skin production, and overall productivity of cattle. With this finding it is possible to conclude that the problem is a serious issue in the subject area and needs a curious attention and follow-up to minimize or otherwise to alleviate the problem. Therefore, for this purpose the study forwarded the following recommendation measures:

- Awareness should be created for animal owners about tick and tick born disease and their control methods
- Application of effective use of acaricides regularly.
- Appropriate and integrated control methods of ticks should be used in order to minimize the high prevalence of tick.
- The government, stakeholder and veterinarians should work together in order to minimize tick infestation and their impact in the study area.

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