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Prevalence and associated risk factors of tick infestation on cattle in selected Kebeles of Damot Woyde Woreda, Wolaita zone, Southern Ethiopia.

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Abstract

A cross sectional study was conducted from December 2018 to June 2019 in five selected kebeles of Damot Woyde Woreda (Bedessa, Tora Wulisho, Mayo Ofore, Mayo Kote and Adecha) of wolayta Zone, Southern Nation Nationalities and Peoples Region, Southern Ethiopia. The objectives of the study were to determine the prevalence of tick infestation in Damot Woyde Woreda of five selected kebeles and to identify the type of ticks and their respective prevalence in the study areas. A total of 384 cattle (279 Local and 105 Cross breeds) were randomly selected and examined for the presence of tick infestation. Out of the total examined animals 325(84.6%) were found to be infested by one or more tick species. Four genera of ticks*: Amblyomma, Boophilus* (recently *Rhipicephalus*), *Rhipicephalus* and *Hyalomma* were identified. *Amblyomma* was the most dominant tick genera 39.7% (n=129) while *Hyalomma* 13.8% (45) was the least recorded genera in the study areas. Within the tick species identified, *B. decolorotus* was the most abundant tick species found in the present study 31.4% (n=102) followed by *A. verigatum 17.2%*, *R. evertsi evertsi* 15.1%, *H. marginatum* 13.8%, *A. lepidum* 11.4% and *A. cohaerence* 11.1%. The sex wise prevalence of tick infestation was higher in female (89.9%) and lower in male (78.9%). Breed, age, body condition score and months are risk factors. Tick infestation was higher during April while, it was lowest during December. Therefore, it is recommended that it's better to develop the best control strategies of tick.

Keywords: Cattle, Demot Woyde, kebele, Prevalence, Tick.

Introduction

Ethiopia has the largest livestock population in Africa, but the contribution for the economic aspect of the country is still lowest amount and disease can be considered as a major constrain. Livestock plays an important role in providing export commodities, such as meat, live animals, hides and skins to earn foreign exchange to the country. In mixing crop livestock farming system at the highlands parts of the country, livestock mainly used for drought power, milk production and as source of manure (Kidane 2001). Even though the livestock sub sector contributes much to the national economy, its development is hampered by different constraints. The most important constraints to cattle productions are widespread endemic diseases including parasitic infestation (ectoparasites and endoparasites), poor veterinary service and lack of attention from government. Ticks are ectoparasites of livestock, which are classified (together with mites) in the order Acari (Solomon, 2005).

Ticks are the most important ectoparasites of livestock in tropical and sub-tropical areas. Ticks are cosmopolitan in distribution, but occur principally in

tropical and subtropical regions (Soulsby, 1982). All ticks are obligate ectoparasites of vertebrates. They have three pairs legs in larvae and four pairs of legs as nymphs and adults and the body is divided into the capitulum and the opisthosoma There are at least 840 tick species in two major families, namely the Ixodidae and Argasidae ,(Jongejan, F. and G. Uilenberg, G.1994).

Several genera of tick are *Ambylomma, Haemaphysalis, Boophilus, Hyalomma* and *Rhipicephalus* have been identified in Ethiopia (Morel, 1980). In Ethiopia, ticks are responsible for severe economic losses both through the direct effects of blood sucking and indirectly as vectors of pathogens and toxins. Ticks are blood sucking ectoparasites of mammals, birds and reptiles worldwide, with approximately 850 species been described (Bishop *et al*., 2008). The lifecycle of ticks (both Ixodids and Argasids) undergo four stages in their development; eggs, 6-legged larva, 8-legged nymph and adult (Minjauw and McLeod, 2003).

However, the major losses caused by ticks are due to the ability to transmit protozoan, rickettsial and viral diseases of livestock, which are of great economic importance world-wide (Nejash, 2016). From health constraints livestock are highly affected by ectoparasites mainly ticks and tick borne disease which is a directly affect the socio-economic development of poor farmers in the area. Additionally the absence of well-established research regarding socio-economic and public health implication of tick and tick borne disease in the farm have a negative impact on food security, animal product and byproducts (William, 2001). The impact of ticks and tick borne diseases on the individual and national economics warrants application of appropriate tick control strategies on priority basis (Bansal, 2005). Ticks are mainly control by conventional acaricides. But these acaricides have undesirable effects on host organisms and the environment. Problems like environmental contamination, residues in food and feed, high costs, residual in milk and meat, development of acaricides resistance in tick stimulated research on new safe methods for tick control. And there are associated risk factors which facilitate the occurrences of tick infestation in cattle such as age, sex, nutritional factors and rearing system (Habeeb, 2010).

Therefore, the objectives of this study are:

- To determine the prevalence of tick infestation in study area and
- To identify the type of ticks and their respective prevalence.

Materials and Methods

Study Area:

Damot Woide Woreda has a total area of 26,550 hectors and lies an elevation ranging from 1001-2500 meters above sea level and found on latitude of 6.68-6.96 and longitude of 37.8- 38.84. Damot Woide Woreda has 23 peasants association with a total population of 125,812 (DWWANR, 2018). It was located about 406 km from Addis Ababa. Regarding the agro ecology of the woreda out of the total land size 35% is lowland and 65% midland. The annual mean temperature 17.6-25 c^o and annual mean rainfall ranges 1001-1400 mm. The livestock population was cattle (165,879), sheep (85,841), goat (95,478), equine (7,943) and poultry (105,171). (DWWLFD, 2019).

Study Population:

The study population was cattle with different age, sex, breed and body condition scores found in the five selected kebeles. The animals are managed with extensive management system and depend on grazing throughout the year for their feed sources with little supplementation of crop residues.

Sample Size Determination:

The required sample size was estimated by considering 50% prevalence. Thus, the sample size was calculated according to Thrusfield using 95% confidence interval and 5% absolute precision (Thrusfield, 2005). This is calculated by using the following formula:

$$n = \frac{1.96x^2 Pexp\ \ (1 - Pexp)}{d2}$$

Where,
n = required sample size
P_{exp} = Expected prevalence
d^2 = Desired absolute precision (5%)
Based on this formula, the total number of 384 cattle were randomly selected and assessed for tick infestations.

Study Design:

A cross-sectional study was carried out from December 2018 to June 2019 in five randomly selected kebeles of Damot Woyde Woreda.

Data Collection Methods:

All the selected animals as sampling unit were checked for any tick infestation. The entire body surface of the animal was examined thoroughly for the presence of any tick and all visible adult ticks were collected from half-body on alternative sides. Ticks were removed carefully and gently in a horizontal pull to the body surface. The collected ticks were preserved in universal bottles containing 70% ethyl alcohol and labeled with the animal identification and predication site, age, sex, and data of collection. The specimens were transported to the Bedessa veterinary clinic for counting and identification. Ticks were counted and subsequently identified to genus and species level by using stereomicroscope, according to standard identification keys given by Latif and Walker (2004) and Walker *et al*. (2003). During examination of the selected animals for tick infestation, the age, sex, body condition score, breed and Kebele of the sampled animals were recorded on a special format designed for this purpose. During the study, distribution of tick and total count of each tick genera were done.

Data Management and Analysis:

All the data collected were entered on Microsoft Excel spreadsheet and it was analyzed by using statistical package for social science (SPSS) Version 20. Descriptive statistics was used to determine the prevalence of tick infestation in cattle and small ruminants. The overall prevalence of tick was determined by dividing the number of positive animals by total sample size and was expressed as percentage**.**

Results

From the total 384 examined cattle, 84.6% (325/384) were found to be infested by one or more of six species of ticks in the study area. Examined animals were considered to be positive for a given tick infestation when at least one tick was collected from them. A total of 325 cattle were found infected by ticks of different species from 384 examined cattle (Table 2). The prevalence of tick genera in cattle in the study area was stated in table 1. Accordingly, the ticks were classified into four genera and six species. Tick genera recorded in the present study were: *Amblyomma, Boophilus, Rhipicephalus* and *Hyalomma* with the prevalence of 39.7%, 31.4%, 15.1% and 13.8% respectively.

Table 1: *prevalence of tick genera in cattle*

Tick genera	Positive	Prevalence (%)
Ambyloma	129	39.7
Rhiphocephalus	49	15.1
Boophilus	102	31.4
Hyaloma	45	13.8
Total	**325**	**100**

The differences between tick prevalence in cattle per each risk factor categories as well as their associations are summarized in Table 2. The result indicated that the prevalence of tick infestation was found higher in cross breed (90.5%) than local breed of cattle (82.5%). A higher infestation rate of ticks was also observed in adult cattle (93.8%) than young (73.7%). Similarly, body condition score was associated with tick infestation where higher prevalence was observed in poor scored (92.2%) and medium body scored cattle (82.5%) than good body conditioned animals (80.6%).

Table 2: *Risk factors and tick infestations in cattle*

Risk factors		No of animals examined	positive	Prevalence (%)
Breed	Local	279	230	82.5
	Cross	105	95	90.5
Sex	Male	185	146	78.9
	Female	199	179	89.9
Age	Adult	209	196	93.8
	Young	175	129	73.7
BCS	Good	98	79	80.6
	Medium	183	151	82.5
	Poor	103	95	92.2
Kebele	Bedessa	75	69	92
	T/ Wulisho	95	78	82.1
	M/Ofore	79	65	82.3
	M/Kote	67	54	80.6
	Adecha	68	59	86.8
Overall		384	325	84.6

Where: BCS is body condition scoring

Among the tick species identified, three species (*A. varigatum, A. coherence* and *A. lepidum*) were recorded under the genus *Amblyomma*, one species (*R (B). decoloratus*) was from the genus *Rhipicephalus* (formerly *Boophilus*), one species (*R. evertsi evertsi*) from the genus *Rhipicephalus* and one species (*H.marginatum*) from the genus *Hyalomma* (Table 3). B. decolorotus was the dominant abundantly encountered with high burden followed by *Amblyomma varigatum, R. everesti everesti, H. marginalum, A. lepidum* and *A. coherence*. However, *A. lepidum* and *A. coherence* were the least recorded species ticks on cattle (Table 3).

Table 3*: prevalence of tick species in cattle*

Tick species	Positive	Prevalence (%)
A. verigatum	56	17.2
A. coherence	36	11.1
B. decolorotus	102	31.4
R. everesti everesti	49	15.1
A. lepidum	37	11.4
H. marginalum	45	13.8
Total	**325**	**100**

Where: *A is ambyloma, B is boophilus, R is rhiphocephalus and H is hyaloma*

Monthly variation was also noted in tick infestation rate. Higher prevalence was recorded in April; followed by May, march, June, February, January and December in descending order (Table 4). Among considered factors, sex was also associated with tick infestation rate in the present study area with the prevalence of in 89.9%female and 78.9% in male(Table 2).

Table 4: *prevalence of Tick infestations in cattle during the study Months*

Months	Positive	Prevalence (%)
December	14	4.3
January	20	6.2
February	25	7.7
March	63	19.4
April	95	29.2
May	80	24.6
June	28	8.6
Total	**325**	**100**

Distribution of Tick Species and Their Predilection Sites: The distribution of each species of ticks on the host's body is also summarized (Table 5). Ticks were widely distributed in different parts of the host body such as scrotum/udder, groin, dewlap, under-tail, belly, legs/hoof and neck. Groin and dewlap were the sites of most ticks collected followed by Scrotum/udder, belly, under tail, neck and leg/ interdigit. Neck and legs/interdigit were the least preferred sites by ticks. The most favorable predilection sites for *Amblyomma* species were the udder/scrotum and groin. Moreover, *Boophilus decoloratus* was preferred dewlap, groin, and Scrotum/udder, but least number of ticks were also present on the rest of the body. *Rhipicephalus evertsi evertsi* was also preferred more commonly at groin and dewlap and *Hyaloma* species of ticks more collected from groin and scrotum/udder.

Table 5: *Distribution of tick and their predilation sites*

Predilation site	Ambyloma	Rhiphocephalus	Boophilus	Hyaloma	Positive	Prevalence (%)
Scrotum/udder	29	-	16	23	68	20.9
Groin	48	18	20	14	100	30.8
Dewlap	27	15	34	8	84	25.8
Belly	25	10	8	-	43	13.2
Under tail	-	-	13	-	13	4
Leg/ interdigit	-	6	-	-	6	1.8
Neck	-	-	11	-	11	3.4
Total	**129**	**49**	**102**	**45**	**325**	**100**

Discussion

The distribution and abundance of tick species infesting cattle in Ethiopia vary greatly from one area to another area and also depends on several environmental and climatic factors such as annual rainfall, atmospheric temperature, relative humidity, vegetation cover, altitude and host availability (Pawlos and Deresse, 2013).

This study on prevalence and associated risk factors of tick infestation on cattle in selected kebeles of Damot Woide Woreda shows that out of 384 cattle, 325 were harboring at list by one species of tick with the overall prevalence in the study area was 84.6%. This finding is in agreement with the reports of Abebe *et al* (2010) with overall prevalence of 81.5% at Bedele district western Ethiopia.

However, the prevalence of ticks in the current study is higher than the reports of (Kassa and Yalew, 2012) with prevalence of 33.21% in Haramaya district and (Tesfahewet and Simeon, 2013) with the prevalence of 16% in Benchi Maji Zone of the Southern Nations and Nationalities of Ethiopia. And less than (Nigusse and Besazenaw, 2016) were reported a higher prevalence of (89.4%) from Western Amhara Region. The higher result of the present study may due to the awareness of people to the modern production system of livestocks, less awareness on application acaricides and different methods of prevention and control strategies.

The identified tick ganera in our study area includes *Amblyomma, Boophilus* (recently *Rhipicephalus), Rhipicephalus and Hyalomma. Amblyomma* (39.7%) was the most abundant and widely distributed ticks in the study period, which agrees with the report of Bimrew et al. (2015) with the prevalence of 37.5% in Dangila District, Northwest Ethiopia. The observation of high tick counts on cattle in the present study area is most probably attributed to the vast and seasonal availability of grazing land and unrestricted cattle movement from place to place (Rahmeto *et al.*, 2010). From the study breeds, high prevalence of tick infestation occurs in cross breeds with the prevalence of (90.5%) and lower prevalence in local breeds with the prevalence of (82.4%). This higher prevalence in the cross breed may be due to cross breed animals are genetically less resistance for any disease conditions than local breed animals and less grooming activity of cross breeds.

From the study animals in the study period, in poor body condition cattle higher number of tick infestation was observed (92.2%), it was agreed with Belay and Enyew, (2016), they reported prevalence of 100% in Sude district, Arsi Zone, Ethiopia. Because poor body conditioned animals had reduced resistance to tick infestation and they exposed tick infestation during grazing on the field than medium (82.5%) and good (80.6%) body conditioned animals.

The proportion of tick infestation was higher in adult (93.8%) cattle as compared to young cattle (73.7%). This higher proportion may be due to outdoor management and long distance movement of adult cattle in searching for feed and water as compared to younger cattle.

From the study sex, high prevalence of tick infestation occurs in female animals with the prevalence of (89.9%) and lower prevalence in male animals with the prevalence of (78.9%). This may be due to female animals have less immunity than male animals.

Among the study months (from December, 2018 to June 2019), higher number of tick infestation was observed in April (29.2%), followed by May (24.6%) and March (19.4%). However, in January (6.2%) and December (4.3%) the recorded number of ticks infestation was lower. This is in agrees with the report of (Natnael *et al.,* 2015). This is due to that the tick infestation is higher in wet season than dry season.

The dry season results in lower relative humidity and higher environmental temperature which influences the mortality of ticks due to dessication (Mesele *et al.*, 2010).

Conclusion and Recommendations

The study on the Prevalence and Associated Risk Factors of Tick Infestation on Cattle in the study area considered as an aid of improving tick control. Among ectoparasites, tick cause the greatest economic loss in livestock production either by transmitting a wide variety of tick-borne diseases or by affecting health of the animal as well as the quality of hides and skins. The study further presents the tick species identified in their veterinary value; the most important and abundant tick species belongs *to B. decoloratus, A.vergatum and R. everesti everesti*. Of these *B. decoloratus* is the abundantly distributed tick through the period of study due to conductive environmental factors prevailing in the area.

Based on the above conclusion, the following recommendations are forwarded:

- ❖ Awareness creation and improved management systems should be practiced by the stakeholders.
- ❖ Identifying tick resistance cattle breed is essential to minimize tick infestation problems in the study area.
- ❖ Further studies in the distribution of pattern of tick and factors responsible for their distribution should be conducted.
- ❖ tick-borne disease assessment and surveillances in the study area should also be conducted and
- ❖ Seasonal pasture treatment and appropriate tick control program should also be implemented in the area.

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