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A Cross Sectional Study on the Prevalence and Identification of Major Ixodid Tick Parasites of Cattle in Gondar Town, North West Ethiopia

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ABSTRACT

A cross- sectional study was conducted from November, 2015 to April, 2016 in Gondar town with the objective to estimate the prevalence of ticks, to investigate their genera and assessing association with the different risk factors such as breed, sex, age, body condition scores, and management system. Adult ticks were collected from 384 cattle from local and cross-breed cattle. Out of the total of 384 cattle examined, 287(74.7%) were found to be infested by one or more genera of tick parasites. A total of 919 adult ticks, which belongs to four genera of ticks were collected and identified using stereomicroscopy. In this study *Rhipicephalus, Hyalomma, Amblyomma, and Boophilus* were identified as 27%, 26%, 25.3%, and 21.7% respectively. The prevalence of male and female animals was found to be 136 (68%) and 151 (82.06%) respectively. According to their management variation animals kept in extensive and intensive farming system were infested with 207 (76.1%) and 80 (71.4%) respectively. The prevalence in local and cross breed was 180 (77.58%) and 107 (70.39%) respectively. The prevalence in young and adult animals was found to be 104 (72.3%) and 183 (76.25%) respectively. Based on their body condition score of animals, poor 176 (75.8%), medium 71 (80.68%) and good body condition 40 (62.5%). In this study there was statistically significant association of infestation rate with the sex of the animals ($P<0.05$) and $x^2=10.042$. Special attention should be given to the control and prevention of ticks.

Keywords: Cattle, Gondar, Ixodid, Prevalence, Tick

Livestock production in many parts of the world is constrained by several factors. Ectoparasite particularly ticks have considerable impact on the animals either directly or by transmission of tick borne disease. Ticks and tick borne disease affects 90% of the world cattle population and are widely distributed throughout the world, particularly in tropical and subtropical Countries (Decastro, 1997). The Ethiopian livestock contribute about 18.8% of the total GDP (FAO, 2003). Among livestock, cattle are primary source of for the people and the government of Ethiopia (ILRI, 1999). The countries environmental condition and vegetation are highly conducive for ticks and TBDs perpetuation (Pegram *et al*., 1981).

The study done for assessments of major factors that cause skin rejection at Modjo export tannery, Ethiopia, revealed that ectoparasites play a key role in the rejection of skin. Parasitic disease is a global problem and considered as the major obstacle in the health and product performance of the livestock. Tick is a very significant and harmful blood sucking parasite of mammals, birds and reptiles throughout the world (Rajput *et al*., 2006).

Ticks are arachnids in the sub class acari which are relatively large and long lived parasite. They are blood feeding external parasites. Ticks are classified into two families, Argarisidae or soft ticks and Ixodidae or hard ticks which differ considerably by their structure. More than 28 species of ticks are distributed in Ethiopia. There are four stages in the life cycle of ticks: egg, larva, nymph, and adult. They maintain their parasite existence by feeding on vertebrate host. Tick bites can be directly

debilitating to domestic animals causing mechanical damage, irritations, inflammations and hypersensitivity. When ticks are present in large numbers, it is feeding may cause anemia and reduction of productivity (George *et al.*, 2004).Complex of problems related to ticks and tick-borne diseases of cattle created a demand for methods to control ticks and reduce losses of cattle production and productivity. Control of tick infestations and the transmission of tick-borne diseases remain a challenge for the cattle industry in tropical and subtropical areas of the world. Tick control is a priority for many countries in tropical and subtropical regions. Tick and tick born disease causes loss of livestock economy of Ethiopia and ranks third among major parasitic disease after *Trypanosomiasis* and endoparasite (Lodos *et al.*, 2000). Hence present research project were used to estimate the prevalence of ticks and to investigate their genera in Gondar town and to assess their distribution associated with different risk factors.

MATERIAL AND METHODS

Study Area

A cross sectional study was conducted from October 2015 to April, 2016 in Gondar city, the capital of North Gondar zone in Amhara regional state. It has 209.27 km^2 (80.80 sq mi) total area and located 738 km northwest of the capital city, Addis Ababa. It is situated between 12°36'N and 33°28'E at an altitude of about 2300 m above sea level (m. a. s. l) with an average temperature of 20°C and an average annual rainfall of 1800 mm. Being a highland area, the city is spread on different mountains, slopes and in valleys and has three small rivers, many streams and a lake. The population size of Gondar town is about 358,257. The livestock population in the area comprises of cattle (8,202), goat (2,590), sheep (2,695), horse (1,065) and donkey (9001) (CSA, 2013).

Study design and Sampling Methods

A cross sectional study was conducted from November, 2015 to April, 2016 to estimate the prevalence of tick infestation and to investigate the genera of tick in Gondar town. The study animals were selected by using simple random sampling method from animals that were brought to university of Gondar veterinary clinic and cattle kept under individual households.

Study Population

Study population consists of cattle that were brought to university of Gondar veterinary clinic for different reasons and cattle kept under individual households were the target population. Cattle were categorized into groups according to Aiello and Mays (1998) young and adult, sex (male and female), breed (local and cross) and Ferguson (2011) divide the body condition score as (poor, medium and good).

Sample Size Determination

The sample size required for this study was determined according to Thrusfield (1995). Since there is no documented information about for the prevalence of tick infestation in the study area, it is possible to take 50% prevalence for sample size determination. The other determinants considered in sample size determination have been 95% confidence interval and 5% desired absolute precision. Hence the sample size is estimated as:

$$N = \frac{1.96^2 \, p_{\exp}\left(1 - p_{\exp}\right)}{d^2}$$

Where, N = required sample size

P_{exp}= expected prevalence

d^2 = desired absolute precision

$$n = \frac{(1.96)^2 \, 0.5(1-0.5)}{(0.05)^2} = 384$$

From the confidence interval d = 5% = 0.05

Using the above formula, the minimum sample size would be about 384.

Tick Collection and Identification

After the selected animals were restrained properly, entire body surface was inspected and all visible adult ticks were collected from their body part using by hand or using special forceps holding at the basis of capitulum and gently removed by exerting a horizontal pull to the body surface

and by slightly rotating the tick so as not to lose the mouth part of tick. Collection of tick was done on tail, udder, brisket, dewlap, vulva, ears, scrotum, flank, legs and anus area. Ticks collected from each animal and each site were put in universal sampling bottle containing 70% ethyl alcohol that had been pre-labeled. Required information like the date of collection, age, sex, breed, body condition scores and management system of the hosts were recorded. The samples transported to Gondar University Veterinary parasitology laboratory for identification. They were identified by using a stereomicroscope according to standard identification keys given by (Walker *et al.*, 2003).

Data Management and Analysis

The data obtained from this survey were entered in Microsoft worksheet excels. Then descriptive statistics was used to analyze the data using statistical package for social sciences (SPSS) software version 20.0. Chi-Square test (χ^2) with computed p-value of less than 0.05 was used to estimate the statistical significance association of tick infestation rate with sex, breeds, ages, management and body condition score.

RESULTS

In this study a total of 384 animals were examined. Among these 232 animals were local and 152 were cross breeds. The overall prevalence percentage was calculated by dividing the number of positive samples by the total sample size and multiplied by 100. The overall prevalence of the tick is 74.7% (287/384). The prevalence of ticks in local breed was higher than that of cross breed and in young animals had lower infestation than adult. Based on their sex variation it was found to be lowered prevalence in males than in female animals. Based on their body condition score variation, medium score animals showed higher prevalence than poor and good body condition. According to their management variation, animals kept in under extensive system revealed higher prevalence than under intensive farming system. In this study all risk factors did not reveal statistically significant association with the tick infestation, except that statistically significant association of infestation rate was noticed with the sex of the animals (P<0.05) and x^2=10.042 (Table 4).

The total number ticks collected in the study period were 919 ticks (504 male and female 415 ticks), from different body regions of animal. From the collected tick, *Rhipicephalus*, *Hyalomma*, *Amblyomma, and Boophilus* were identified (Table 1) and with respective predilection sites (Table 2).

Table 1: Distribution of tick genera of cattle in the study area

Genera of ticks	Prevalence (%)
Rhipicephalus	27
Hyalomma	26
Amblyomma	25.3
Boophilus	21.7
Total	100

Table 2: Proportion and distribution of tick within their predilection site

Genera of ticks	Number of ticks	Predilection site
Rhipicephalus	248	ear, udder, tail, vulva, anus
Hyalomma	240	udder, scrotum, tail, anus
Amblyomma	232	scrotum, udder, brisket, dewlap, vulva
Boophilus	199	dewlap, ears, scrotum, flank, legs, brisket

Table 3: Distribution and sex ratio of tick genera

Genera of ticks	Sex		Male to Female ratio	Total
	Male	female		
Rhipicephalus	148	**100**	**1.48:1**	**248**
Hyalomma	**130**	**110**	1.18:1	**240**
Amblyomma	128	104	1.2:1	232
Boophilus	98	101	0.97:1	199
Total	504	415	1.2:1	919

Table 4: Prevalence of tick on different risk factors

Risk factors	Animals examined	No. Animals positive	Prevalence (%)	P value	X^2
Breed					
Local	232	180	77.58	0.195	1.679
Cross	152	107	70.39		
Age					
Adult	240	183	76.25	0.379	0.379

Young	144	104	72.3		
Sex					
Male	200	136	68	0.002	10.042
Female	184	151	82.06		
Body condition score					
Poor	232	176	75.8		
Medium	88	71	80.68	0.315	2.313
Good	64	40	62.5		
Management					
Extensive	272	207	76.1	0.267	1.23
Intensive	112	80	71.4		

DISCUSSION

In the present study the total prevalence of tick was found to be 74.7%. This finding is greater than the reports of Kassa and Yalew (2012) with a prevalence of 33.21% in Haramaya district and Tesfahey wet and Simeon (2013) a prevalence of 16.0% in Benchi Maji Zone of the Southern Nations and nationalities of Ethiopia. In contrast to this Nigatu and Teshome (2012) were reported a higher prevalence of ticks (89.4%) from Western Amhara Region. The percentage variation in the present studies could be due to the distribution of ticks influenced by rainfall, altitude and atmospheric relative humidity.

Rhipicephalus, *Hyalomma*, *Amblyomma* and *Boophilus* were the four important genera of ticks identified with total prevalence 27%, 26%, 25.3%, and 21.7% respectively. The prevalence of Genus *Rhipicephalus* tick was greater in this study which is in agrees with studies of Kassa and Yalew (2012), Tamiru and Abebaw (2010), Bossena and Abdu (2012) and Sileshe *et al.* (2007) with a prevalence of 47.16, 60.1, 45 and 40% respectively, but higher than present studies. According to Morel (1980) native distribution of *Rhipicephalus* is likely to be connected with middle height dry savannas and steppes association with abundant ruminant population. In addition Pergam *et al.* (1981) stated that tick has species no apparent preference for particular altitude, rain fall or season which might contribute its wide distribution.

The proportion of tick infestation was higher in adult animals as compared to the younger one. However there was no statistically significant difference ($p > 0.05$). This finding is also in agreement with the finding of Gashew (2010); Tiki and Addis (2011), who were reported a higher proportion of tick infestation in adult cattle than younger. This might be associated with less contact of young animals with other herds of animals which can be source of transmission. Many of adult cattle graze in the pasture and forest, and the probability for exposure to tick infestation is increasing (Ramsi *et al.*, 2007).

Local breeds 180 (77.58%) were affected more than the cross breeds 107 (70.39%) but with no statistical significance differences ($p>0.05$). Similar study revealed that the prevalence of tick infestation in local breeds was high with a prevalence of 56.9% (n=293) whilst in cross breeds, the prevalence was 30.4% (n=228) in earlier study of (Tiki and Addis, 2011). In addition Kassa and Yalew (2012) who reported that the prevalence of tick infestation was not significantly higher in local breed cattle (58.18%) than cross breed ones (10.55%). But it was contrasting the earlier studies of Tamiru and Abebaw (2010) who reported that the prevalence of ticks was higher in the cross breeds than local breeds. The results of the present study might be attributed to differences in management systems and lack of control measures against tick on local cattle breeds. Furthermore, it can be assumed that it might be due to lack of interest of farmers about local cattle as well as taking more care to cross breed than local cattle (Tadesse and Sultan, 2014).

Female animals were to be found more affected than male animals (in male 68% and in female it was 86.06%) with statistical significance ($P<0.05$ and $X^2 = 10.042$). This result is in agreement with the results of Tesfahe wet and Simeon (2013) who recorded that the prevalence of parasite infestation in male and female animals was 25.0% and 39.1%, respectively and also agree with the overall prevalence of Kassa and Yalew (2012) 31.11% and 35.19% male and female respectively. This might be due to the fact that most of the time males enter to feed lot and thus they have less accessibility to be infested with tick. Feedlot animals are most likely with reduced tick infestation since the environment is not suitable for the free living stages of tick (Jonsson, 2004).

The prevalence of ticks was concerning with their body conditions of animals (80.68%) in medium, (75.8%) in poor and (62.5%) in good body condition scores. It reveals that not statistically significance association where the p-value is greater than 0.05 and chi-square 2.313. This finding was in agree with finding indicated in Bossena and

Abdu (2012) who recorded that the significantly higher prevalence was seen in animals with medium (44.5%), poor body condition (9.89%)and good body condition (4.9%). In additions, this present study was agreement with the earlier study of Wasihun and Doda (2013) who reported that the proportion of tick infestation was higher in medium body conditioned (79.8%) as compared to poor body conditioned (67.9%) and good body conditioned animals (58.0%). This might be due to the fact that medium body scored animals are exposed to any kind of diseases when grazing on the field, and poor body conditioned animals were kept at home due to their inability to walk long distant areas, so that they become less infested than medium sized animals but, the well fed animals are very resistant to any kind of diseases when they grazed in the field or are kept at home (Tadesse and Sultan, 2014).

Cattle tick infestation was insignificantly ($p>0.05$) higher in cattle kept under extensive production system (76.1%) than those kept under intensive farming system (71.4 %). This is present study was in agree with earlier finding of Tadesse and Sultan (2014) who recorded prevalence of tick infestation in under extensive production as 75.0% (n=288) and under intensive farming system 25.0% (n=96). This situation might be due to regular washing of barns and animals, regular treatment of animals with acaricides which will reduce the susceptibility of tick infestation in intensive farming animals where as extensive farming cattle move anywhere for feeding, staying and drinking, and hence susceptibility of tick infestation is higher.

Male to female ratio of identified tick species in the study indicated that, males were found to be dominant except for *Boophilus* (0.97:1). The finding agrees with that of Tamiru and Abebaw (2010) who observed dominant males with exception of *Boophilus* (0.4:1). The reason behind for the dominance of male than females could be due to the fact that fully engorged female tick drop off to the ground to lay eggs while male tend to remain permanently attached to the host up to several months they continue feeding and mating with other females on the host before dropping off and hence males normally remains on the host longer than female (Tadesse and Sultan, 2014).

In the present studies revealed that Genus *Amblyomma* prefers scrotum, udder, brisket, dewlap and vulva region which was agreement with finding of Sileshi *et al*. (2007). The attachment sites of *Rhipicephalus* were ear, udder, tail, and vulva and anus region which is in agreement with the finding of (Sileshi *et al*., 2007).

In the present study showed that the preferred the attachment sites for *Boophilus* were dewlap, ears, scrotum, flank, legs, brisket region which is in agreement with the finding of Sileshi *et al*. (2007) and according to Tessema and Gashaw (2010) *Boophilus* prefers dewlap, head and back region. Each tick has their own predilection sites on their host. Ticks are known to be distributed in different parts of the host body and the factors such as host density, seasonal and inaccessibility for grooming determine attachment sites for tick (Solomon and Kassa, 2001).

CONCLUSION

This study was conducted to assess the prevalence and the identifications of the genera of tick in Gondar town. The most important genera identified during this study period were *Rhipicephalus*, *Hyalomma*, *Amblyomma* and *Boophilus*. Among the genera of tick identified *Rhipicephalus* was relatively the more abundant tick species which followed by *Hyalomma* tick and the least one was *Boophilus*.. The control methods necessary for tick and TBDs were acaricides treatment, appropriate livestock management, evaluation.

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