Survey of ticks (*Acari: Ixodidae*) infesting cattle in two districts of Somali Regional State, Ethiopia

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Abstract

A cross-sectional study aimed at determining the common tick species and their abundance in cattle was conducted in two districts of Somali regional state from October 2008 to March 2009. During the period, a total of 10,055 adult ticks (Ixodidae) were collected from 496 indigenous cattle. Out of the total tick count, 4304 were males and 5751 were females. Eight similar species of ticks that belong to four genera (Amblyomma, Boophilus, Rhipicephalus and Hyalomma) were identified in the two districts covered by the study with a significant (P<0.001) difference in the relative abundance of most tick species between the districts. R. pulchellus was the most abundant tick species in Fafem district (25.41%), followed by B. decoloratus (24.83%) with H. m. rufipes being the least abundant (2.28%). Conversely, the most abundant tick species in Awubere district was B. decoloratus (21.43%) and A. variegatum (4.2%) was the least. A significantly higher (P<0.0001) overall mean tick burden was seen in Awubere than Fafem district. The mean tick burden was found to be independent of age and sex of the animals (P>0.05). An overall male to female ratio of 0.75:1 was also determined showing the dominance of females. In conclusion, eight different species of ticks were found infesting cattle in the study area. Limited scope of awareness regarding the impact of ticks, lack of adequate veterinary infrastructures and absence of tick control strategy are the major factors accountable for the widespread existence of tick species in the area. For that reason, educating pastoral society on appropriate animal husbandry especially regarding to tick control and creating awareness on tick epidemiology would be imperative to minimize the effect of ticks and ultimately to improve the living standards of the pastoral society.

Keywords: Abundance, Awubere, Tick, Ethiopia, Ectoparasite, Blood Parasite, Epidemiology, Tick Borne Disease.

Introduction

Ticks are obligate, blood-feeding ectoparasites of vertebrates (particularly mammals and birds) (Wall and Shearer, 2001) belonging to the class Arachnida, Order Acari. Once they attach to a host for blood meal, ticks can result in diverse effects leading to significant losses due to tick worry, blood loss, damage to hides and skins and introduction of toxins (Morel, 1989). Moreover, ticks are responsible for transmission of tick-borne pathogens of various types and secondary attacks from other parasites (Estrada-Pena, 2001; Urquhart et al., 1996). Ticks also pose a considerable threat to human; being only second to mosquitoes in the variety and overall importance of the diseases they transmit (Estrada-Pena, 2001).

It has been estimated that 80% of the world's cattle are infested with ticks (Minjauw and McLeod, 2003) and the production of over 1000 million cattle and a similar number of sheep around the world is affected (Estrada-Pena, 2001). De Castro (1997) estimated that the annual global cost associated with tick and tick-borne diseases in cattle to range between 13.9 and 18.7 billion USD. In addition, ticks are a major hindrance to improving animal production in the tropical and sub-tropical regions of the world (Urquhart et al. 1996). According to Walker et al. (2003), ticks that are considered to be most important to the health of domestic animals in Africa comprise of 40 species.

In Ethiopia, several species of ticks belonging to genus Amblyomma, Boophilus, Rhipicephalus, Hyalomma and Haemaphysalis have been reported (Pegram et al., 1981; Walker et al., 2003). Tick and tick-borne diseases cause considerable losses to the livestock economy of Ethiopia, ranking third among the major parasitic diseases, after trypanosomosis and endoparasitism. The country's environmental condition and vegetation are highly conducive for ticks and tick-

Table 1: Genera and relative abundance of ticks identified from cattle in Fafem and Awubere districts

Genus of tick	Fafem	Awubere	Total	Relative abundance (%)
Amblyomma	1027	2243	3270	32.5
Boophilus 1025	1270	2295	22.8	
Rhipicephalus	1959	1845	3804	37.8
Hyalomma	117	569	686	6.8
Total	4128	5927	10,055	100

borne disease perpetuation (Pegram et al., 1981). However, current information on ticks infesting cattle in different agro-ecological zones of Somali regional state is limited. Hence, the current study aims at identifying tick species in cattle in two districts of Jijiga zone, Somali regional state and determining the relative abundance of each.

Materials and methods

Study area

The study was conducted from October 2008 to March 2009 in two districts (Fafem and Awubere) of Jijiga zone, Somali Regional state; eastern Ethiopia located at 42-48°E longitude and 3-9°N latitudes. Fafem is within the altitudinal range of 1000-1500 meters above sea level and receives a bimodal rainfall with an annual average of 800 mm; and the maximum and minimum annual temperature of 23.6°C and 10.1°C, respectively. The farming system practiced in the district is a mixed crop-livestock production type. The vegetation coverage comprises of natural pastures (herbaceous vegetation composed mainly of grasses and forbs) and browses (shrubs, tree, leaves and pods). The altitude of Awubere is 500 meters above sea level and the climate is dry and arid with erratic rainfall and a mean annual precipitation ranging between 200 and 400mm. The district is inhabited predominantly by pastoralists whose livelihood is mainly dependent on animal husbandry. Cattle are the most highly valued animals next to camel. Vegetation coverage of Awubere is characterized by bushy, spiny shrubs, grass and wood plant. Traditionally the grazing areas were divided into wet and dry season grazing areas and drought reserves. During extended drought, pastoralists migrate to distant places in search of feed and water. However, the scope and possibility for migration is becoming limited as the dry season grazing and drought reserve areas are gradually shrinking due to increasing animal population and lack of rotation system.

Study animals and sampling methods

The study animals include indigenous breeds of cattle selected from the two districts. A total of 496 cattle were selected by systemic random sampling technique for tick collection and identification. The sample size for this study was determined following the formula described by Thrusfield (1995). Accordingly, considering the expected prevalence of 67.7% based on previous studies and 5% absolute precision with 95% confidence interval, 496 cattle comprising of different age and sex groups were selected from the two districts by systematic random sampling technique. However, study villages or herds were selected purposively based on the accessibility and owner's willingness to cooperate for this work.

Tick collection and identification

Once after the selected cattle are restrained, adult ticks were collected from half-body regions into universal sample bottles containing 70% ethanol (Walker et al., 2003) and labeled. The body regions used for collections were head, dewlap, brisket, belly and back, udder/scrotum, anal/genital region, leg and tail (Kaiser et al., 1982). Ticks were removed from the host skin whilst retaining their good condition for identification using good quality steel forceps. The adult ticks collected from each body regions were kept in a separate sample bottles and then transported to Sebeta National Animal Health and Disease Investigation Center for identification. The number of ticks collected was doubled to determine the approximate tick load per animal.

Data analysis

The data collected from each study animal were recorded properly in a format prepared for this purpose. These data were uploaded into Microsoft Excel 2003 computer program and summarized by using tables. All statistical analyses were performed using EpiCalc 2000 version 1.02 (Joe Gilma & Mark Myatt 1998, Brixton Books). The differences in the relative proportions of tick species between districts were analyzed by using Chi-square test, whereas Student's t test was used to examine for differences in mean tick burden between districts, sexes and age groups. A P value less than 0.05 at 95 % confidence interval was considered for significance.

Results

A total of 10,055 ticks were collected from cattle in the two districts during the study period. Out of this, 4128 ticks were from cattle in Fafem while 5927 ticks were from Awubere. The ticks collected belong to four different genera i.e. Ambylomma, Boophilus, Rhipicephalus and Hyalomma (Table 1).

Table-2. Tick species identified in each study district and test for differences in their relative abundance between the districts using chi-square test

Species	Total Tick	Overall %	Fafem District		Awubere District		Differences in	P value
			Tick count	Percent	Tick count	Percent	districts	
Amblyomma gemma	1524	15.2	392	9.5	1132	19.1	174.37	0.000
Amblyomma lepidum	1323	13.2	461	11.2	862	14.5	24.04	0.000
Amblyomma variegatum	423	4.2	174	4.2	249	4.2	0	0.98
Boophilus decoloratus	2295	22.8	1025	24.8	1270	21.4	15.49	0.000
Rhipicephalus evertsi evertsi	1017	10.1	448	10.9	569	9.6	4.18	0.04
Rhipicephalus pulchellus	1617	16.1	1049	25.4	568	9.6	451.88	0.000
Rhipicephalus pravus	1170	11.6	462	11.2	708	12.0	1.37	0.242
Hyalomma marginatum rufipes	686	6.8	117	2.8	569	9.6	175.48	0.000
Total	100	55	4128	100	5927	100		

Cattle in both Fafem and Awubere districts were infested with eight identical species of ticks; however, with different levels of infestation. Statistical analysis revealed a significant difference (P<0.001) in the abundance of most tick species between the two districts except for *A. variegatum* (P=0.98) and *R. pravus* (P=0.242). *Rhipicephalus pulchellus* (25.41%) was the most abundant tick species identified in Fafem district followed by *Boophilus decoloratus* (24.83%) while *Hyalomma rufipes* was the least abundant (2.83%). On the contrary, the most abundant tick species in Awubere district was *B. decoloratus* (21.43%) followed by *Amblyomma gemma* (19.1%) and *A. variegatum* (4.2%) being the least (Table 2).

The results of statistical analysis of the association between mean tick burden and different risk factors are given in Table 3. Accordingly, a significant difference in mean tick burden was demonstrated between the two districts (P<0.001) where it was higher in Awubere than Fafem while the tick burden was found to be independent of sex and age of the animals (P>0.05).

Sex determination and count revealed that of the total ticks collected, 4304 were males while the rest 5751 were females with an overall male to female ratio of 0.75:1(Table 4).

Discussion

The current work revealed that the major genera of ticks infesting cattle in Fafem and Awubere districts of Somali regional state belong to *Rhipicephalus, Amblyomma, Boophilus* and *Hyalomma* in order of predominance. A closely similar result with greater frequency of Rhipicephalus species was reported by Zeleke and Bekele (2004) in camels in Errer valley of Eastern Ethiopia. In the present study eight identical species of ticks were identified in cattle of both districts; however, with different levels of infestation. Reports of similar composition for majority of these species were indicated by previous studies (Zeleke and Bekele, 2004; Sileshi et al., 2007; Abunna et al., 2009).

The presence of similar tick species in both districts may be due to unrestricted cattle movement from area to area, which is a common phenomenon in the region. However, *B. decoloratus* was the most abundant tick species in Awubere district followed by A. gemma. This is in agreement with the reports of Abunna et al. (2009) where the abundance of B. decoloratus followed by *R. pulchellus* was indicated in small ruminants in West Harrarghe Zone. On the other hand, R. pulchellus was found predominating in Fafem district. This finding is again in agreement with that of Zeleke and Bekele (2004) and further confirms that this species is widespread in Eastern part of Ethiopia.

Statistical analysis revealed significant differences in the relative abundance of most tick species between the two districts except for *A. variegatum* and *R. pravus*. Accordingly, *A. gemma*, *A. lepidum* and *H. rufipes* were found to be more abundant in Awubere than Fafem district, whereas *B.*

Table-3. Analysis of the association between mean tick burden and different study factors using t test

Factor	Cattle examined	Mean tick burden	Std. Dev.	t Test	P value
District					
Fafem	253	17.7	6.15		
Awubere	243	22.8	8.80	7.45	0.0000
Sex					
Female	254	19.7	7.85		
Male	242	20.8	8.08	-1.519	0.1294
Age					
<2 year	169	20.7	7.95		
>2 year	327	20.0	7.99	0.895	0.3714

Table-4. Count of ticks displayed by species and sex

Tick species	Count by sex		
	Male (M)	Female(F)	M: F ratio
Amblyomma gemma	511	1013	0.5:1
Amblyomma lepidum	626	697	0.9:1
Amblyomma variegatum	291	132	2.2:1
Boophilus decoloratus	810	1485	0.5:1
Rhipicephalus evertsi evertsi	394	623	0.6:1
Rhipicephalus pulchellus	861	756	1.1:1
Rhipicephalus pravus	584	586	1:1
Hyalomma.m. rufipes	227	459	0.5:1
Total	4304	5751	0.75:1

decoloratus, *R. evertsi evertsi*, and *R. pulchellus* were more dominant in Fafem than Awubere district. Such differences in the relative abundance of the tick species might be attributed to the ecological variations between the two districts. The most important ecological factors influencing the occurrence of ticks in a biotope include temperature and relative humidity (Morel, 1989; Latif and Walker, 2004). Even if the same factor affects the survival of all tick species to varying degrees, each species has its particular threshold temperature and moisture below those diapauses occurs in all in-stars. Obviously, field development periods will vary according to the temperature (FAO, 1984; Morel, 1989).

In the current study, the overall mean tick burden was significantly higher in Awubere than Fafem district. This may be due to vegetation coverage and seasonal dependant crop production in which the pastoralists in Fafem practice crop production which might have great impact on the area ecology than that of Awubere (pure pastoral area). Moreover, the practice of keeping large herds of cattle together in a single household in Awubere (in some cases even reaching about 72 heads) which often tend to move together for feeding and watering might have attributed to the finding of a significantly higher mean tick burden in the district.

With most of the tick species identified, females tend to dominate the fauna except that of *A. variegatum, R. pulchellus* and *R. pravus*. Similar report was indicated in the country by Abunna et al. (2009).

In light of this finding, it is possible to conclude that cattle in Fafem and Awubere districts are infested with different species of ticks despite the varying degrees of abundance which may be the result of vegetation coverage, climatic and host factors. The limited scope of awareness regarding the impact of ticks, lack of adequate veterinary infrastructures for access by pastoral society and absence of tick control strategy in the area the most important factors accountable for the widespread existence of tick species in the area. Therefore, educating pastoral society on appropriate animal husbandry especially regarding to tick control and creating awareness on tick epidemiology would be imperative to minimize the effect of ticks so as to improve the living standards of the pastoral society.

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