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A Study on Camels Ticks in and Around Dire Dawa, Eastern Ethiopia

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Abstract: A cross sectional study was carried out from September 2010 to March 2011 to assess the prevalence of tick infestation and identify the species that parasitize camels in and around Dire Dawa, Eastern Ethiopia. All visible adult tick specimens were collected from seven different predilection sites on camel. Out of 384 of examined animals 361(94%) were found to be infested by ticks. A total of 11774 adult ticks were collected, which belongs to seven different species of four genera and identified using direct stereo microscopy. The four genera of ticks identified during study period includes: *Rhipicephalus*, *Hyalomma*, *Ambylomma* and *Boophilus*. The most abundant tick species was *Rhipicephalus pulchellus* (46.78%), followed by *Hyalomma dromedarii* (26.85%), *Ambylomma gemma* (11.35%), *Hyalomma trancatum* (7.19%), *Hyalomma marginatum rufippes* (3.95%), *Ambylomma variegatum* (2.59%) and *Boophilus* decoloratus (1.24%). The highest infestation level of ticks was observed under tail (27.62%) and the lowest (1.24%) observed on the back or side of the animal's body region. This survey showed that infestation rate of ticks were 148 (90.2%) in males and 213 (96.8%) females camels. The infestation rate was varied significantly ($p<0.05$) between sex groups as well as between origin of the animals. However, there was no statistical significant difference observed ($p>0.05$) in prevalence of tick infestation between the age groups and among the body condition of the animals. Generally, this survey clearly indicated that prevalence of tick infestations were a core problem livestock production in the study area. Therefore, special attention should be given for programmed tick control campaign in the region.

Key words: Ambylomma · Boophilus · Rhipicephalus · Hyalomma · Prevalence

INTRODUCTION

Ethiopia is one of the largest camel populated countries in the world. In Africa, it ranks third next to Somalia and Sudan. Its ability to withstand torrid heat and extreme desiccation are of paramount importance in determining its distribution. The normal distribution of the camel is in the Africa and Asian subtropical dry areas [1]. About 1.06 million of camels found in Ethiopia, distributing in Southern, Eastern, North Eastern arid and semi arid regions of the country mainly in Borana, Ogaden and Afar region [2].

In Ethiopia, the one humped camel (*Camellus dromedaries*), which is an important livestock species in the pastoral economy because of its extraordinary ability to perform in arid and semi arid environments where there is scanty vegetation which is not accessible to other livestock. It is a multi-purpose animal uniquely adapted to arid and semi arid environments enabling nomadic people of the world to live in a difficult environment. It kept mainly for milk production, meat production, transportation and best of burden and as a draft animal for agriculture [3]. However, slow reproduction cycle, high calf mortality and other health problems are major constraints in decreasing camel herd population and productivity [4].

The presence of diversified environment and different agro climatic zones makes the country suitable for different kinds of livestock disease [5]. A wide range of internal and external parasitic disease found in domestic animal [6-7]. Among external parasites, Ticks are undoubtedly the most important economically ectoparasites of livestock on global scale [8, 9]. They are responsible for a great variety of livestock health problem. Apart from transmitting diseases: they also reduce milk, meat production and increase susceptibility to other diseases [10, 11]. According to Walker *et al.* [12] ticks are considered to be most important to the health of domestic

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animals in Africa comprise about seven genera. The most common tick affecting camel belongs to the genera: *Ambylomma*, *Hyalomma*, *Dermacentor* and *Rhipicephalus* (all hard ticks) or family Ixodidae [4].

Because of the direct and indirect effect on their host, ticks are considered to be not only a significant threat to successful livestock production, but also a seriously interfere with economy of the country [8]. Ticks considered as the most important vectors for infectious diseases worldwide and the interest in tick-borne diseases has increased in recent years [13]. Additionally, ticks are responsible for direct damage to livestock through their feeding habits. The damage manifested as hide damage, damage to udders, teats and scrotum, myiasis due to infestation of damaged sites by maggots and secondary microbial infections. In fact it may also lead to skin rejection at tannery factories [14, 15].

The problem is severe in developing countries where the resource for the control and eradication is very limited [3]. It is important to know the prevalence of the tick species involved on the transmission as well as their geographical distribution for the control of tick and tick borne diseases (TBDs) [16, 17]. Despite these facts, there was very little systematic research on ectoparasites of camels specifically on ticks in Ethiopia. Therefore, the objectives of this study were to determine the prevalence of tick infestation and identify the species that parasitize camel in and around Dire Dawa, Eastern Ethiopia.

MATERIALS AND METHODS

Study Area: The study was carried out from September 2010 to March 2011 in Dire Dawa Administrative Council (DDAC) which is situated in the Eastern Part of Ethiopia about 510 KM East of Addis Ababa. The area is located between 9°27□' and 9° 49' N latitude and 41°38' and 42°19' E longitude. The rainfall pattern of the area is characterized by small rainy season from February to May and high rainy season from July to September. The dry season extends from October to January. The mean annual rainfall in the study area varies from 550mm in the lowland Northern part to 850mm in the Southern mountain ranges. The monthly mean maximum temperature ranges from 28.1°C, to 34.6°C. Likewise, the monthly mean minimum temperature varies from 14.5°C in December to 21.6°C in June [18].

Study Animal and Population: This study was conducted on camels presented to the Dire Dawa Veterinary Clinic, Dire Dawa municipal abattoir and in twelve peasant associations (PAs) namely: Asaliso, Gedenser, Gudunfetah, Goladeg, Hulahulul, Marmarsa, Malka, Biyoawale, Bishanbehe, Kalicha, Ayale Gungun and Ilhammer. The total livestock population in the region estimated to be over 346,309 excluding pets. These are Cattle 60903, Sheep 67495, Goat 141899, Camel 15650, Donkey 16936 and Poultry 43426. Large proportion of livestock kept in the arid part of the region mainly by pastoral communities.

Study Design: A cross-sectional study was conducted to assess the prevalence of tick infestation and identify the common tick species in the area. Besides, favorable predilection site of the tick species, the relative tick burden and a possible risk factor such as age, sex, origin and body condition of the animal were considered.

Sampling and Sample Size Determination: The total number of camels required for study was calculated based on the formula given by Thrusfield [19] using simple random sampling method by taking 95% confidence level. The expected prevalence of camel ticks in Dire Dawa was 50%. Accordingly, the estimated sample size was 384 animals.

Study Methodology

Tick Collection Techniques: All visible attached adult ticks were collected carefully and gently removed exerting a horizontal pull to the body surface by rotating the tick not to damage the host by the tick's mouth parts and then the collected ticks were preserved in properly labeled plastic container containing 70% ethanol. The body region that used for ticks collections were: ear, under tail, sternum, nose, scrotum/ udder, ventral and dorsal surface of the body of the animals. The bottles were labeled with date, place, sex, age and site of the body and then transported to Dire Dawa regional libratory.

Tick Identification: The collected ticks from each container were placed onto Petri dishes and examined under stereomicroscope to identify to the species level using tick identification keys described by Onkello-Onen *et al.* [20] and Walker *et al*. [12]. Briefly, the main identification features of the ticks are color, size, shape of mouthparts, scutum, anal groove, festoon, punctation and legs.

Data Management and Analysis: Data obtained in this survey was entered in MS Excel work sheet and analyzed using SPSS version 16.0 for windows software.

Simple descriptive statistical analysis was used to analyze distributions of tick species and its attachment site. Relative prevalence of ticks was calculated by dividing the numbers of ticks species / genera by the total number of ticks. Chi-square test was applied to compare the infection rate with regard to sex groups and age groups. Whereas kruskal-wallis test was used to analyze and compare prevalence of tick infestation in relation with place of origins and body condition of the animals and a 95% confidence level and 5% absolute precision was used to determine whether there was significance difference between measured parameters.

RESULTS

Of a total 384 examined camels, 361(94. 0%) were found to be infested by ticks. Out of 164 male and 220 females camel examined, 148 (90.2%) and 213 (96.8%) were harbored different ticks species, respectively. The difference in tick infestation rate between sex groups was statistically significant ($p< 0.05$). The prevalence of tick infestation in adult (94.1 %) was almost similar to that of the young (93.8%) animals. There was not statistically significant ($p> 0.05$) variation detected between age groups. In fact, the number of adult camels examined higher than that of young, which perhaps have a significant impact on the prevalence of tick infestation. According to body condition scoring, camels were grouped into three namely 189 good, 144 medium and 50 poor, with prevalence of 176 (93.1%), 135 (93.8 %) and 51(98.0%), respectively. Even though poor body condition's camels showed slightly high number of ticks infestation rate during tick collection period. However, statistically significant ($p >0.05$) variation in infestation rate was not observed among body condition of camels (Table 1).

This survey was conducted on camels presented to the Dire Dawa Veterinary Clinic, Dire Dawa municipal abattoir and in twelve peasant associations (PAs). Among those twelve PAs, 100% ticks' infestations were recorded in five of them namely: Aseliso, Gudunfetah Gedenser, Hulahulul and Biya Awale. Contrast, infestation rate of ticks in Dire Dawa veterinary clinic and Bishanbehe was 81.8% and 83.3%, respectively, in fact, it was slightly lower as compared to the prevalence other sites in which was statistical a significance difference was observed in tick infestation between origin of the animals ($p<0.05$) (Table 2).

Generally, from the total of 11,774 collected adult ticks, four genera and seven species of ticks were identified in which (46.78%) *Rhipicephalus* was the most dominate followed by (37.99%) *Hyalomma,* (13.94%) *Amblyomma* and then (1.24%) *Boophilus*. Specifically the identified species were *Rhipicephalus pulchellus*, *Hyalomma dromedarii, Hyalomma truncatum, Hyalomma marginatum rufipes*), *Amblyomma variegatum, Amblyomma gemma* and *Boophilus decoloratus*) (Table 3 & 4). This survey clearly figured out that every tick species prefers different attachment sites. Among those ticks attachment site, under tail (27.62%) was the most preferred sites followed by ear (19.09%), sternum (15.84%), udder/scrotum (12.90%), ventral (12.28%), nose (10.99%) and then back/side (1.24%) (Table 5).

DISCUSSION

Camels represent a vital contribution to food security and human welfare in vulnerable households of the dry areas. They are important for milk and meat productions, transportation, draft power and house hold income generations. Despite such fact this survey demonstrated some of the constraint to utilize livestock productions. Of a total 384 examined camels, 361(94. 0%) were found to be infested by ticks. This finding was higher than the previous report by Eyerusalem [21] in Dire Dawa, who reported 58.3 % of tick infestation. This discrepancy might be due to application of acaricides during the study period, which of course have an impact on prevalence of tick, On the top of that, this survey included around 12 peasant association where as the previous report was only from five PAs. Regarding host sex groups, the prevalence of tick species in female camels 213 (96.8%) was slightly higher than to that of 148 (90.2%) male. The difference in tick infestation rate between host sex groups was statistically significant ($p< 0.05$). This could be attributed by high population of female camels reared for milk production in pastoral area, which may reduce the number of male examined in the population and male animals mainly used for transportation and hence they are in close supervision by their owner for tick infestation where as female animals mostly dwelling around grazing areas (shrubs) that create easy access for ticks. This study had clearly figured out that the prevalence of tick infestation in adult ($\geq$ 3 year) was almost similar to that of the young (< 3 year) animal. This finding was almost comparable with that of Eyerusalem [21] report.

Table 1: Prevalence of tick infestation based on sex, age and body condition categories

Parameters	No. of examined	No. of infested (%)	X^2	P-value
Sex groups				
Male	164	148(90.2)	7.21	0.007
Female	220	213(96.8)		
Age groups				
≥ 3 year	287	270(94.1)	0.09	0.95
< 3 year	97	91 (93.8)		
Body conditions				
Good	189	176(93.1)	1.74	0.417
Medium	144	135(93.8)		
Poor	51	50(98.0)		
Total	384	361(94. 0)		

Table 2: Prevalence of tick infestation based on place of origin.

Place of origin	No. of examined	No. of positive (%)	X^2	p-value
Aseliso	37	37(100.0)		
Gudunfetah	30	30(100.0)		
Goladeg	27	26(96.3)		
Gedenser	34	34(100.0)		
Dire Dawa Vet. clinic	33	27(81.8)		
Hulahulu	33	33(100.0)	26.26	0.016
Melka	32	29(90.6)		
Marmarsa	23	22(90.6)		
Kalicha	25	23(92.0)		
Biya Awale	22	22(100.0)		
Ayale Gungun	29	27(93.1)		
Ilhammer	16	14(87.5)		
Bishan behe	18	15(83.3)		
Dire Dawa abattoir	25	22(88.0)		
Total	384	361(94.0)		

Table 3: Distribution of camel ticks genera in study area

Names of genera	Total No. of ticks	Relative prevalence of ticks
Rhipicephalus	5509	46.78%
Hyalomma	4475	37.99%
Ambylomma	1643	13.94%
Boophilus	147	1.24%
Total	11774	

Table 4: Ticks species, sex ratio and percent of abundance

Tick species	No. of male ticks	No. of female ticks	Total No. ticks	Male to Female ratio	Relative prevalence
Ambylomma gemma	962	375	1337	2.56	11.35 %
Ambylomma.varigatum	211	95	306	2.22	2.59 %
Boophilus decoloratus	13	134	147	0.09	1.24 %
Hyalomma dromedarii	2435	727	3162	3.34	26.85 %
Hyalomma m. rufipes	312	154	466	2	3.95 %
Hyalomma trancatum	657	190	847	3.45	7.19 %
Rhipicephalus pulchellus	4096	1413	5509	2.89	46.78 %
Total	8686	3088	11774		

Table 5: Distribution of ticks species and proportion in different attachment site

Predilection site	Species of tick with their respective attachment sites							Total No. of ticks	Relative prevalence
	R. pulchelus	*H. dromedarii*	*H. trancatum*	*H. rufipes*	*A. gemma*	*A. variegatum*	*B. decoloratus*		
Under tail	1981	588	178	111	320	75	-	3253	27.62%
Ear	1122	864	165	97	-	-	-	2248	19.09%
Nose	473	576	152	93	-	-	-	1294	10.99%
Sternum	845	402	120	63	353	83	-	1866	15.84%
Scrotal/udder	524	424	120	49	323	80	-	1520	12.90%
Ventral	564	308	112	53	341	68	-	1446	12.28%
Back /side	-	-	-	-	-	-	147	147	1.24%
Total	5509	3162	847	466	1337	306	147	11774	

This might be due to young animals mostly dwelling around the home and have access to contact with other species of animals, therefore, the chance of getting tick infestation almost similar to that of adult camels. Even though poor body condition animals showed slightly high number of ticks infestation rate but such prevalence difference was not statistical significant ($p>0.05$)among body condition of camels. A trial was made to determine ticks distribution between animal origins and the finding indicated that statistically a significant difference was observed in infestation rate ($p<0.05$) between origins of the animal. This difference may be justified by the presence and absence of ectoparasite eradication campaign involvement in different part of the region during tick collection period and agro-ecological conditions of the origins.

Over 60 tick species are known to exist in Ethiopia [10]. In this study, about 11,774 ticks were collected from14 different sites in and around Dire Dawa of which four genera of ticks (*Rhipicephalus*, *Hyalomma*, *Ambylomma* and *Boophilus* and seven species namely *R. pulchellus*, *H. dromedarii*, *H. truncatum*, *H.m. rufipes*, *A. gemma* and *B. decoloratus*. Except *H.m. rufipes*, this result was in agreement with the finding of Zelake and Bekele [22] on assessment of camel tick species and their seasonal population dynamics in Eastern Ethiopia. *R. pulchelus* was the most abundant of tick species recorded on camel reported by different Authors in Eastern Ethiopia [22-25]. In this study, *R. pulchellus* was accounted for prevalence of 46.8% that agrees with the finding of Abeba [24] prevalence of ectoparasite of camel in Eastern Ethiopia and conradict with the finding of Eyerusalem [21] with a prevalence of 50% and 27 %, respectively. This species also commonly found among the cattle herd in the same areas [23]. The reason why this tick species found to be the most abundant is may be due to its geographical distribution in savanna, steppe and desert climatic regions [12]. *H. dromedarii* (26.85 %) was the second most abundant tick species found on camel in the study areas. This result agreed with the finding of (20.44 %) Abebe [24] and there was slight different with finding of Eyarusalem [21] who reported 15.36% prevalence. However, much greater than the finding of Bekele [25] epidemiological study of camel disease in Borana low land and Zelake and Bekele [22] with prevalence of 1.2 % and 3.87 %, respectively. This difference might arise due to agr-ecological and geographical difference.

A. gemma (11.35%) was among most abundant ticks species found in the study area. This finding was in consistent with the finding of Eyarusalem [21] and Bekele [25] who reported 13.6% and 15.0%, respectively. In contrast, it was greater than the finding of Abebe [24], Zelalem [26] and Zeleke and Bekele [22] who reported 5.7 9%, 7.1 % and 4.10 %, respectively. *A. gemma*, which has long mouth parts are more important in inflicting udder damage and is of a risk factor for mastitis in camel [25]. This species confined to a semi arid land of Harar province [27] however, *A. variegatum* is among the least abundant ticks species in the study areas which accounts about 2.59%.This finding was comparable with the finding of Zeleke and Bekele [22] who reported 3.21%. This tick's species requires moisture and warm for its survival [10]. The ulcer caused by this tick species become favorable site for secondary bacterial infection like *Dermatophylus congolensis*. *A. variegatum* has a great economic importance on cattle, because it has association with heart water (Cowdrosis) [12, 20].

H. truncatum, accounted for a prevalence of 7.19% in the study, which was greater than the finding of Zeleke and Bekele [22] who found only 1%. Several researchers reported the distribution of this species in drier areas throughout the country [28]. Certain species of these ticks have a toxin in their saliva that cause the skin disease known as sweating sickness particularly in calves [12] where as *H. m. rufipes* represented with prevalence of 3.95 %. This species is most common in most arid of parts of tropical Africa receiving 250 mm – 650 mm annual rain

fall [28] and it is not found in abundant on camel [6]. *B. decoloratus* was the least abundant ticks in the study areas. It accounts only 1.24 % of the total coverage. This lower number may be associated with climate factor that is abundant in wetter high-land and sub-high lands receiving more than 800 mm rain fall annually [27] and the regional distribution of the tick was similar to *A. variegatum* [29] and similar result was reported by Abunna *et al.* [30]. Concerning ticks predilections sites, the attachment site for ticks is related to the possibility of penetration by their hypostome. Ticks with short hypostome like *Rhipicephalus* attach to the thin skin (ear, head, under tail, margin of anus) whereas long mouthed ticks (*Ambylomma* and *Hyalomma*) can attach at the ticker skin (ventral, sternum and udder) [31].

In conclusion, high prevalence tick infestation indicates lack of programmed tick control on camel in the study areas. In fact the knowledge of behavior of tick or the host animal is pre-requisite for any measure of control and eradication the parasites. Therefore, Control strategy should be instituted immediately taking into account the loss due to ticks and further study should consider in the seasonality of ticks distribution, potential tick born disease and control strategies.

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