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Research Article

Identification of Tick Species and Bovine Tick Infestation in Dire Dawa Administration, Eastern Ethiopia

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ABSTRACT

A cross-sectional study was conducted from November 2018 to April 2019 to determine the prevalence and to identify the common hard tick species infesting cattle in the Dire Dawa Administration, Eastern Ethiopia. A total of 384 cattle were selected randomly and examined for the presence of the tick. Of the total animals examined 63.01% were found to be infested by one or more tick species. A total of 1,136 adult ticks were collected from infested animals during the study period, five tick species from three genera were identified. The identified tick species were included: Amblyomma gemma (6.33%), Amblyomma variegatum (42.43%), Rhipicephalus evertsi evertis (11.27%), Rhipicephalus Pullchelus (21.65%), and Rhipicephalus (Boophilus) decoloratus (18.31%) with their respective prevalence. The most prevalent species was A. variegatum (42.42%) followed by R. Pullchelus (21.65%) and the least prevalent were A. gemma (6.33%). Tick infestation was significantly ($P \leq 0.003$, OR=1.690) higher in female animals (71.5%) than males (59.4%). Tick infestation was no significant variation ($p>0.05$) among age group; however, it was higher in adult cattle (75%) followed by old cattle (69.6%), and the least prevalence was recorded in young cattle (56.1%). The prevalence of tick infestation was significantly ($P \leq 0.038$, OR=1.500) higher in the local breed (73.1%) than crossbreed (44.3%). Likewise, tick infestation was also significantly ($P \leq 0.002$, OR=1.047) highest in poor (79.7%) followed by medium (70.1%) and lowest in good body condition (47.5%) cattle; it also significantly ($P \leq 0.000$, OR=2.795) higher tick infestation was recorded in field grazing than house feeding. In general, high tick infestation was recorded in the study area. The economic impact of ticks and tick-borne diseases is huge in our country and also in Dire Dawa Administration. Therefore, effective and sustainable control strategies of ticks are essential to minimize economic loss due to tick and tick-borne diseases. Further seasonal investigation of tick infestation should be conducted by other scholars and organizations.

Keywords: Tick; Identification; Body condition; Prevalence; Dire dawa

INTRODUCTION

Ethiopia has the largest livestock population in Africa. An estimate indicates that the country is a home for about 57.8 million cattle, 28.89 million sheep, and 29.7 million goats [1]. Livestock production is an important integral component of the Ethiopian agricultural production system and plays an imperative role in the development of the country's economy and for food and nutritional security. The subsector contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP [2]. Despite the large animal population, productivity in Ethiopia is low and even below the average for most countries in eastern and sub-Saharan African countries, due to poor nutrition, reproduction insufficiency, management constraints, and prevailing animal diseases [3].

Now a day, Parasitism represents a major obstacle to the development and utilization of the animal resource. In Ethiopia ectoparasites in ruminant causes serious economic losses to smallholder farmers, the tanning industry, and the country as a while through the mortality of animals, decreased production, downgrading, and rejection of skin and hide [4]. From the

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ectoparasites, ticks were ranked as the most economically important of livestock in tropics including sub-Saharan Africa, which causes substantial losses in cattle production, in terms of diseases, reduced productivity and fertility, and often death and economically the most important ectoparasites of cattle [5].

Ticks are obligate blood-feeding ectoparasites of vertebrates particularly mammals, birds, and reptiles throughout the world. They are cosmopolitan in distribution but occur principally in tropical and subtropical regions with a warm and humid climate that are suitable to undergo metamorphosis. Approximately 850 species have been described worldwide [6]. Two well-established families of ticks, the Ixodidae (hard tick) and the Argasidae (soft ticks) are important vectors for disease-causing agents to humans and animals throughout the world. Over 79 different species of ticks are found in eastern Africa, but many of these appear to be of little or no economic importance [7].

Ticks transmit the wide varieties of pathogens including bacteria, rickettsia, protozoa, and viruses. The major cattle tick-borne diseases in Ethiopia are anaplasmosis, babesiosis, cowdrosis, and theileriosis [8]. Ticks also cause nonspecific symptoms like anemia, dermatitis, toxicosis, and paralysis [9].

Ticks are common in all agro-ecological zones of Ethiopia [10]. Many reports by [11] in Hararghe, [12] in Asella, [13] in Awassa, [14] in Mizan Teferi, and [15] in Jimma indicated that Amblyomma tick species are widely distributed in Ethiopia with the highest prevalence rate. Rhipicephalus is also predominant genera and has been reported with the highest prevalence in Gamo Gofa [16], and Southern Sidamo [17]. Although Amblyomma and Rhipicephalus ticks are predominating in many parts of the country, Boophilus and Hyalomma ticks also have a significant role. The population changes of the tick are influenced by climatic changes, which affect the rate of tick population on the ground, host resistance, and natural enemies [9].

Due to the economic and veterinary importance of ticks and tick-borne diseases study are directed toward determining the magnitude of infestation and the type of species involved which are pre-request in planning control toward these parasites. Moreover, species-level identification will assist the diagnosis of different tick borne diseases and their respective control programs. Even though several researchers have reported the distribution and abundance of different tick species in different parts of Ethiopia, no current information was found regarding tick infestation in cattle in Dire Dawa District.

Therefore, the objective of this paper is:

- To determine the prevalence of tick infestation and associated risk factors in cattle of the Study Area.
- To identify the common bovine hard tick species in Dire Dawa district.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Dire Dawa Administration. Dire Dawa administrative is located in the Eastern part of d Ethiopia, which is about 515 km far from Addis Ababa, and situated approximately between 9°27' and 9°49' N latitude and 41°38' and 42°19' E longitude and in rests at an elevation ranging between 950-1250 meters above sea level (mas l). The rainfall pattern of the area is characterized by a small rainy season from February to May and relatively long rainy season from July to September with the mean annual rainfall ranging from 550 to 850 mm. The climatic condition seems to be greatly influenced by its topography. The area has a monthly mean minimum and maximum temperature of 18.5°C to 34.6°C. The entire territory of the town rests at an elevation ranging between 950 m in the North East to 2260 m in the South West. Due to the narrow altitudinal ranges using the 1500 m contour as a line of separation, two agro-ecological zones, the low land (below 1500 m) and midland (above 1500 m) have been recognized [18]. The Dire Dawa administrative composed of 9 urban and 38 rural kebeles administrations.

Study population and animals

The study animals were both local and cross breeds managed under an extensive and intensive production system. During the study period sex, age, body condition, breed, and management of the animal were included. The host-related factors like age and body condition were classified for the convenience of the study. The age of the cattle was grouped into young (1 to 2 years), adult (3 to 7 years), and old (less than 8 years) according to [19] and by asking the owner. While the body condition score was grouped into poor, medium, and good according to [20]. The total livestock population in Dire Dawa administrative council is estimated to be about 522,485 including 209,725 goats, 56,537 sheep, 72,070 cattle, 16,374 equine, 67,692 camels, and 100,087 poultry. A large proportion of livestock is kept in the arid part of the region mainly by the pastoral community [21].

Study design

A cross-sectional study design was conducted from November 2018 to April 2019 to address the objectives of the study.

Sampling method and sample size determination

The study was conducted in Dire Dawa administrative; the study area was selected purposively based on the previous study, animal population and ecology. The administrative comprises four clusters, of this cluster two (Biyo Awale and Wahel) were selected using simple randomly. From each cluster using simple randomly two kebeles (Ija Aneni and Biyo Awale from Biyo Awale cluster, Wahel and Jalo Balina from Wahel cluster) were included in the study. However, from each kebeles based on the willingness and animal management PAs were selected, from the selected PAs each sampling unit was selected systemic randomly. The name of the attendants and their respective sampled animals will be recorded to avoid a risk of repeated sampling.

Since there was no previous study conducted on an infestation of ticks in cattle in the area, the sample size was determined by assuming a 50% prevalence of tick infestation in the area. The desired sample for the study was calculated by setting a 95%

confidence level at 5% absolute precision [22]. Therefore, sample size (n) was determined by the formula:

$n=(z^2p\ (1-p))/d^2$

Where n=required sample size, P=expected prevalence and d2=Desired absolute precision. Z=Constant from normal distribution table at a given confidence level. Accordingly, the sample size (n) in this case was determined as follows:

n=((1.96) ^2 x 0.5(1-0.5))/((0.05)²)=384

Therefore, a total of 384 cattle were included in the study.

Study methodology and identification of ticks

After the selected animals were restrained properly, the 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 the 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 [23]. Collection of tick was done on the tail, udder, brisket, neck dewlap, vulva, ears, scrotum, flank, axillae, and anus area following the procedure suggested by [24]. The required information like the date of collection, age, sex, breed, body condition scores, and management system of the hosts was recorded. Ticks collected from each animal and each site were put in a universal sampling bottle containing 70% ethyl alcohol for preservation, which are labeled according to the site of collection and transported to Hamaraya University Veterinary Parasitology Laboratory for the ticks were counted and subsequently identified to genus and species level by using a stereomicroscope.

The identification procedure required both fieldwork and laboratory identification of collected adult tick samples. The collected ticks were identified using a stereomicroscope and classified to different genera levels based on size, mouthparts, the color of the body, leg color, position, and presence or absence of punctuations on the body. Furthermore, different tick morphology such as the shape of the scutum, leg color, body, festoon, and ventral plates was considered for species-level identification according to [25-34].

Data analysis

The raw data obtained from the selected area and laboratory examination were inserted into a Microsoft Excel spreadsheet to create a database. The collected data were analyzed using the SPSS version 20.0 software program. Descriptive statistics were used to summarize tick species identified. Chi-square test was used to evaluate the association between hypothesized risk factors like age, sex, body condition score, management and species, and tick infestation status of the animal. Likewise, to evaluate the degree of association between tick infestation and risk factors logistic regression was implemented p-value of <0.05 was considered as significant.

RESULTS

The overall prevalence of tick infestation

Out of the total sample of 384 cattle, 242 were found to be infested by one or more tick species an overall prevalence of 63.02 (Figure 1). A total of 1,136 adult ixodid ticks were collected from different body regions of 242 cattle that were found to be positive for tick infestation and consequently sampled. Generally, three Ixodidae tick genera and five species were identified from the study area (Table 1). The genera Ambylomma (48.76%), Rhipicephalus (32.92%), and Rh (Boophilus) (18.31%) were abundant in this study area. Regarding tick species infestation, Ambylomma varigatum was the most abundant tick species, representing 42.43%, of the total tick's infestation in Dire Dawa administration, followed by Rhipicephalus pulchlus (21.65%), Rhipicephalus (Boophilus decoloratus) (18.31%), Rhipicephalus eversi (11.27%) and Ambylomma gemma (6.33%) was the least abundant Ixodid species respectively in the study area (Table 1).

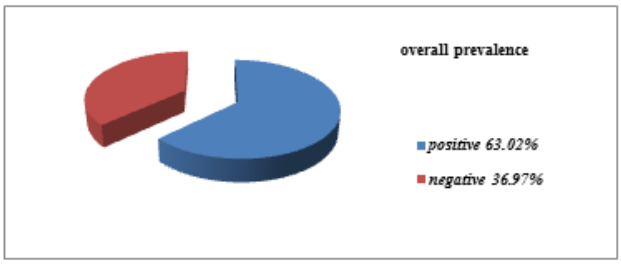

Figure 1: Prevalence of Hard tick in dire dawa.

Tick species	No. of positive animal	No. of adult tick	Percentage (%)
Ambylomma gemma	19	72	6.33
Ambylomma varigatum	121	482	42.43
Rhipicephalus eversi eversi	26	128	11.27
Rhipicephalus pulchlus	64	246	21.65
Boophilus decoloratus	56	208	18.31
Total	242	1,136	100

Table 1: Infestation of tick species in the study.

Prevalence of tick infestation associated with risk factor

A comparison was made on the prevalence of tick infestation on the groups of age category that the difference in prevalence among the three age groups. There were relatively highest in

adult age (66.28%) than old (64.71%) and the young (57.26%) groups. However, there was no significant variation between the infestation of tick (P>0.05) among age groups show in Table 2.

A comparison was also made on the prevalence of female and male. Out of examined animals sampled, the majority was 275 (71.62%) were females while about 127 (33.07%) of them were males. The tick prevalence was 68.10% and 52.75% in females and males respectively. Higher tick infestation was recorded in female animals than males. Sex wise prevalence indicated statistically significant variation (P ≤ 0.00) with $\chi 2$=8.580, OR=1.690 (Table 2).

Regarding body condition of the cattle's, out of 384 animals examined, This result shows that body condition have significant (P ≤ 0.022, $\chi 2$=7.660) relation with tick infestation that highest in poor body condition (72.31%) than medium (59.64%) and good body condition (55.70) shows in Table 2. The study revealed that the prevalence of tick infestation in Local breeds was 65.87% recorded and the prevalence of tick infestation in Crossbreed was found to be 53.85 %. There was a significant difference (P ≤ 0.038) in the prevalence of tick infestation among the two breeds of animals with $\chi 2$=4.308 and OR=1.500 (Table 2). The study revealed that the prevalence of tick infestation among management systems was statically significant (p ≤ 0.000), which shows that higher in field grazing 71.98% than house feeding 44.88% with $\chi 2$=26.761, OR=2.795, (Table 2).

variables	Categories	N	n	Prevalence (%)	2	p value	OR CI 5% Lower - upper
Age	Young	124	71	57.26	2.671	0.263	-
	Adult	175	116	66.28			0.685(0.370-1.269)
	Old	85	55	64.71			1.252(0.692-2.264)
Sex	Female	257	175	68.10	8.580	0.003	-
	Male	127	67	52.75			1.690(1.066-2.579)
BCs	Poor	130	94	72.31	7.660	0.022	-
	Medium	166	99	59.64			1.903(1.037-3.491)
	Good	88	49	55.70			1.047(0.596-1.841)
Breed	Local	293	193	65.87	4.308	0.038	-
	Cross	91	49	53.85			1.500(0.892-2.522)
Manag-ement	Field grazing	257	185	71.98	26.791	0.000	-
	House feeding	127	57	44.88			2.795(1.764-4.428)
Kebele	Ijaaneni	102	61	59.80	2.330	0.507	
	Biyoawale	93	64	68.81			
	Wahel	94	56	59.57			
	Jalobalina	95	61	64.21			
Total		384	242	63.02			

Table 2: Prevalence of Tick's Infestation Based on Age, Sex, Body Condition, Breed, Management, and kebele (PAs).

Note: BCs=Body condition, N=no of examined animals, n=no of positive animals, OR=Odd Ratio, and CI=Confidence interval

The infestation and identified tick species

Tick species: Out of the two genera reported five species of ticks were identified; the sex ratio of tick shows male were highest than female in A.gemma followed by A. varigatum, R. everts evertus and R.pulchelus was the least except Rh. (B. decolorutus) as shown in Table 3.

Tick species	Total count	Male	Female	M:F ratio	Percentage (%)
Ambylomma gemma	72	54	18	3:1	6.33
Ambylomma varigatum	482	360	122	2.95:1	42.43
Rhipicephalus eversi eversi	128	94	34	2.76:1	11.27

Rhipicephalus pulchelus	246	178	68	2.62:1	21.65
Rh(Boophilus decoloratus)	208	72	136	0.5:1	18.31

Table 3: Sex ratio and prevalence of identified tick species.

Tick types and types of infestation: out of examined animal 242 were found to be infested by one or more tick species with an overall prevalence of 63.02%. From this 206 was infested by single, 28 by two, and 8 by three species of the tick as shown in Table 4.

Ticks are known to be distributed in different parts of the host body. In this study, ticks were collected from different parts of the animal and the preference of tick infestation differs from site to site. The scrotum and udder, highly infested by A.variegatum followed by A.gemma, under the tail, axial, belly, neck region, dewlap and back, head, vulva, and anus were the sites from which most of the ticks were collected as shown in Table 5.

c

Types of infestation	**Tick species**	**No of positive animal**	**Prevalence (%)**
Infested by	*A.varigatum*	91	23.80
single species	*A.gemma*	19	4.94
	R. eversi eversi	23	5.98
	R.pulchlus	38	9.89
	Rh(B. decoloratus)	35	9.11
Infested by	*A.varigatum +R.pulchlus*	12	3.125
two species	*R. eversi eversi +R.pulchlus*	3	0.78
	A.varigatum+Rh. (B. decoloratus)	10	2.60
	B. decoloratus +R.pulchlus	3	0.78
Infested by three species	*A.varigatum +R.pulchlus + R(B. decoloratus)*	8	2.08
Total		242	63.02

Table 4: Distribution of tick species on the animal.

	Tick species				
Attachment site	*A.varigatum* Count (%)	*A.gemma* Count (%)	*R. eversi eversi* Count (%)	*R.pulchlus* Count (%)	*R(B. decoloratus)* Count (%)
Udder / scrotum	195(66.78)	41(14.04)	14(4.80)	28(9.59)	14(4.04)
Head region	-	-	32(21.91)	94 (64.38)	20(13.67)
Neck/ dewlap	89(41.78	5(2.34)	24(11.26)	47(22.06)	48(22.53)
Ano-vulva	112(52.58)	8(3.75)	27(12.67)	33(15.49)	32(15.02)
Back/ flunk/ grion	18(18.75)	3(3.12)	-	9(9.37)	66(68.75)
Tail/ under tail	-	-	31(49.20)	32(50.79)	-
Axillae	70(60.86)	15(13.04)	-	2(1.73)	28(24.34)
Total	482	72	128	246	208

Table 5: Distribution of tick species among predilection site.

DISCUSSION

Different tick species are widely distributed in Ethiopia and several researchers reported the distribution and abundance of tick species in different parts of the country (9; 25). The present study revealed that the overall prevalence of tick infestation in Dire Dawa was 63.02%. This finding was in agreement with Mohammed et al., (2018) who reported 61.5% in Hetosa District, East Arsi Zone, Eastern Ethiopia, (26) who reported 61% at SNNP region of Ethiopia and (27) who reported 59.4%at Fitche, Selale, North Shewa, Ethiopia. However, it is higher than the finding of (28) at Holeta, central Ethiopia, and

that of (29) from Bench Maji zone, southwest Ethiopia with an overall prevalence of 25.6%, and 27.3%, respectively.

Besides, various researchers' works have proven to find a high prevalence of tick infestation than the present study including the reports of (30) in Bahir Dar, and (31) in Northwest Ethiopia, with an overall prevalence of 74% and 81.5%, respectively. This difference could be due to the variation in the agro-climatic condition of the study areas since tick activity was influenced by rainfall, altitude, and atmospheric relative humidity (10) and management system including the use of acaricide and other preventive measures.

The present study showed that Amblyomma, Rhipicephalus, and Rh. (Boophilus) with a total prevalence of 48.76%, 32.92%, and 18.31% respectively at the genera level. Therefore, the predominant isolated tick's species were A. Varigatum 42.43%, followed R.pullchelus 21.65%, Rh(B. decolaratusis), the third predominant with an isolation rate of 18.31%. However, R. Evertsi and A. gemma was the least isolated which accounts for 11.27% and 6.33% respectively, were identified in the study area.

The most abundant tick species was A. variegatum (42.43%). This result was almost in line with reports of (32) in Holeta district (45.49%), (33) in Hetosa District (39.3%) and [34] in Asela town (48.2%) who reported A. varigatum as the first most abundant tick species in their study areas. However, it was the least abundant tick species; in the Oromiya region, Bedele district reported with the prevalence of 6.5% [35] which agreed with reports of, 4.7% [36] and 4.2% [25]. The difference could be due to the difference in the agro-climatic condition of the study areas because tick activity is influenced by rainfall, altitude, and atmospheric relative humidity according to [10].

Ambylomma variegatum is the most common tick species infesting cattle and it is widely distributed cattle ticks in Ethiopia and has great economic importance because it is an efficient vector of Cowdria ruminantum, the causative agent of cowdriosis or heart-water in cattle [37]. A. variegatum also causes the greatest damage to hides and skin because of its long mouthparts which downgrade the value of these products on the world market if the infestation is high [38] and trauma caused by tick-bite becomes a favorable site for secondary bacterial infection.

Rhipicephalus Pullchelus was found to be the second most abundant tick species with a prevalence of 21.65%. This finding was related to the report of [25] which was 49.31% in Guba-koricha District in West Hararghe zone, east Ethiopia. This result was higher than with the results of Wallaga, who reported infestation of 6.97% in and around Debre Zeit. R. Pullchelus is a tick of savanna, steppe, and desert climatic region. In Ethiopia it was mainly collected in the eastern part of the country predominating in eastern Oromia, eastern Amhara, eastern Tigray, eastern and southern south nations, nationalities, and people region, Afar, Harar, Somali and Dire Dawa.

Rhipicephalus (Boophilus decolaratusis) was found to be the third most abundant tick species in this study (18.31%). The result of this study was slightly in line with the reports of Mohammed et al., (2018) in Hetosa District 19.5%, [39] in and around Haramaya town (26.3%), [34] in Asella (22%), and [40] in Chilga District (18.22%). Other findings revealed Rh. (B.decoloratus) was the most abundant tick of cattle [30,31] who reported with a prevalence of 40.86 and 47.93% respectively. On the other hand, [41] reported a lower prevalence (1.60%) at Borenaranch. This might be due to the management differences as the ranch has had its own tick control measures on relative basis that reduces tick burden on study animals. Rh. (B. decoloratus) is abundant in wetter highlands and sub-highlands receiving more than 800 mm rainfall annually [10].

Rhipicephalus eversi was the fourth most abundant tick species in the present with the prevalence of 11.27%, which is in agreement with reports of [31] in Northwest Ethiopia (11.51%) and [33] in Hetosa District, east Arsi, eastern Ethiopia (11.2%). The current finding was lower than that of [42]; (21.5%) in Bako, western Ethiopia, [32] (29.3%) in and around Holetta, and [43] (30.5%) in and around Asossa. The native distribution of R.evertsi evertsi in Ethiopia seems to be connected with middle-high dry savannas and steppes, in association with zebra and ruminant and it is widely distributed throughout Ethiopia [32] reported that this species had not shown specific preferences for a particular altitude, rainfall zones, or seasons.

Ambylomma gemma was the least tick species identified in the area (6.33%). This result in line with a report of 8.3% from Mizan [44] and lower than [45] finding at Borena Pastoral (23.64%), but the current finding is greater than the previous result of [46] in Jimma and [47] in Gursum district, East Hararghe Zone of Oromia, Both of them reported A. gemma with the prevalence of (0.69%). A. gemma was associated with dry types of vegetation or semi-arid rangelands and in lowland areas [3, 45-48]. It is widely distributed in woodland, bushland, wooded, and grassland in the arid and semi-arid area between altitude 500 to 1750 m above sea level and receiving 350 to 750 mm annual rainfall [37].

During the study period, the prevalence of tick infestation was not significantly associated ($P<0.05$) with the age group of cattle. However, adults (66.28%) and old (64.71%) are more susceptible than young [26]. The current finding agrees with that of and [28]. These may be due to outdoor management and of long-distance movement of adult animals to search feed and water as compared to young cattle, this practice naturally minimizes the chance of exposure of young to ticks [49].

Current finding indicated that sex-wise statistically significant variation ($P \leq 0.003$) was recorded. Female animals were 1.690 times higher at risk of infestation with a tick. This finding is in agreement with the results of [50]. This might be because most of the time males are more managed and focused separately for the market price than females and retained in-house for feeding is common in Hararghe area. This means that male animals enter the feedlot thus they have less accessibility to be infested with a tick. Feedlot animals are most likely with reduced tick infestation since the environment is not suitable for the free-living stages of tick [51]. The female animal is grazing in groups as their behavior is less aggressive than males; this increases the chance of tick transmission between female animals. Stresses of production such as pregnancy and lactation make the female

animals more susceptible to tick infestation as their immunity can be decreased.

A statistically significant difference (P ≤ 0.022) on tick infestation was recorded in different body conditioned animals of the study area. The highest prevalence of tick infestation was observed in animals with poor body condition and lowest in cattle having good body condition. This finding was in line with the work of [52]. This may be due to the fact that poorly conditioned animals had the least resistance to tick infestation and lack enough body potential to build resistance whereas over-conditioned animals showed reasonable combat to the infestation according to [53]. Alternatively, tick infestation might be a cause for poor body condition; hence high prevalence was computed in this group of cattle.

Tick infestation was significantly higher (P ≤ 0.0380) in local breeds 1.500 times greater as compared with crossbreed cattle; this result is in agreement with [54]. The higher prevalence of tick infestation in local breed animals may be attributed to the currently existing modified animal husbandry practices where crossbreed (High yielding) animals are kept indoors with intensive care whereas local breed cattle are managed under a free grazing system. Therefore, the chance of occurrence in local breeds is greater than in crossbreeds.

In this study, Tick infestation was statistically significant (p ≤ 0.00) in cattle kept free grazing, which was 2.795 times higher than house feeding animals. This finding is in agreement with [50]. This situation might be due to the management condition of house feeding animal is more focused, the house may be regularly cleaned which will reduce the exposure of tick infestation whereas field grazing cattle move anywhere for feeding, staying and drinking, and hence chance of exposure to tick infestation is higher. There was no significant difference (P>0.05) in the prevalence of tick infestation among the peasant association, but the highest prevalence was recorded in Biyo awale followed by Jalo balina areas of PAs 68.81%, and 64.21%respectively, compared to the location in Ija Aneni and wahel areas PAs as shown in Table 2.

The male to female sex ratio shows that A.gemma, A.varigatum, Rh.evertsieversi, and Rh.pulchlus, show that males are greater than females except in Rh. (B.decoloratus) (Table 3). This is due to fully engorged female tick drops off to the ground to lay eggs while male tend to remain permanently attached to the host up to several months later to continue feeding and mating with other females tick on the host before dropping off and hence males normally remains on the host longer than female [9]. The reason that female Rh. (B.decoloratus) be more than the males could be due to the small size of males which may not be seen during collection [34].

The observation was highest in single followed by two, and three tick-infested animals with diversified tick species in the study area and possible co-existence of different tick genera both on infested animals and in a geographic area with various distributions which was in line with and This could be due to the presence of suitable shrub land; temperature, relative humidity, and bimodal rainfall distribution in the studied area; which might be favor the survival and multiplication of different tick genera in the animals [10].

In relation to the attachment sites of ticks on the host body, different tick species were found to be having different predilection sites in this study. Consequently, A. variegatum and A.gemma had a strong preference for axillae, Ano-vulva, udder or scrotum; R.pulchelus and R. evertsi for ear, neck/dewlap, under tail and anus; Rh (B.decoloratus) more or less for different body parts back/flank, axillae, neck and ano-vulval areas. The result of this study is in line with the results of [47]. This choice of attachment sites is might be due to the grooming effect of animals or the tendency of the tick to attach to the skin animals. States that short hypostome ticks like Ripicephalus usually prefer upper body parts including nape of neck and margin of the anus, and under tail while long hypostome ticks like Ambloyomma attaches to lower parts of the animal body.

CONCLUSIONS AND RECOMMENDATION

The current study indicated that ticks were widely distributed throughout the study area and animals were infested by different species of the tick with an overall prevalence of 63.02%. The important and abundant tick species investigated in the study area were; A. variegatum. R.pulchelus R. (B.decoloratus), R.evertsi evertsi and A.gemma respectively. Furthermore, predilection sites are identified that helps in designing control methods in the study area. Heavy infestations by different tick species might suppress the health of cattle and also damage teats, hide and skin, reduce the productivity of animals and there are direct effects associated with tick infestation that leads to tick worry, anorexia, and anemia. In the consequence of this conclusion, the following recommendations were suggested:

- The effective tick control program should be formulated and implemented based on the distribution pattern of ticks and factors responsible for their occurrence
- Further seasonal investigation of tick infestation should be conducted by other scholars and organizations.

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