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Cattle Ticks and Tick Borne Haemoparasite Species Identification and Associated Risk Factors in Two Districts of West Arsi Zone, Ethiopia

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Abstract

Different tick species and tick-borne diseases of cattle are present in Ethiopia and they induce huge production loss in livestock industry by creating serious animal health problems. The present study was conducted from November 2017 to April 2018 in Arsi Negele and Asasa districts of West Arsi Zone, Oromia National Regional State, Ethiopia. A cross sectional study design and purposive sampling technique were employed to select 384 study animals so as to identify ticks species and tick-haemoparasite species and also to identify risk factors that affect the prevalence and association of tick born diseases. Tick and haemoparasite identification were carried out by using drect stereomicroscopic and direct thin blood examination. The study identified two tick genera and four tick species. The tick species encountered were *Rhipicephalus decoloratus* (51.6%) *Ambylomma variegatum* (46.1%) *Ambylomma gemma* (20.1%) and *Rhipicephalus evertsi evertsi* (1.2%). Out of all 384 cattle examined for the presence of tick-born haemoparasites 11.4% (n=44) of them were positive. From this 6.2%, 3.6 %, 1.3% and 0.8% of them were positive for *Anaplasma marginale, Babesia bigemina, Babesia bovis and Anaplasma marginale,* respectively. Two cattle (0.5%) were found positive for both *Anaplasma marginale and Babesia bigemina.* The highest prevalence of total tick born haemoparasites (57.1%) was occurred in *A. Variegatum, A. gemma* and *R. decoloratus* mixed infestations. In conclusion ticks and tick born haemoparasitic infections were common problems in the study area. Thus, awareness creation for farmers about the impacts of ticks and tick born diseases on livestock production and productivity and also applying appropriate and timely strategic tick control methods by veterinary service providers were advisable.

Keywords: Anaplasma; Babesia; Cattle; Haemoparasites; Prevalence; Tick Specie; West Arsi Zone; Ethiopia

Introduction

Ethiopia has the largest livestock population in Africa. Among livestock, cattle play a significant socio-economic role in the livelihoods of the Ethiopian people [1]. The country has the largest cattle population estimated at 56.71 million head [2]. Cattle provide meat and milk, and contribute to the economic welfare of the people by providing hide, power, and traction for agricultural purpose and fertilizer for increasing the productivity of small holdings [3]. In addition cattle are the major sources of foreign exchange. However, poor health and productivity of animals due to diseases is considered as the major stumbling block to the potential of the cattle industry [4].

As indicated currently parasitism represents a major obstacle to development and utilization of animal resource [5]. In Ethiopia among the major parasitic diseases ticks and tick-borne diseases (TBDs) rank third after trypanomosis and endoparasitisim in causing economic losses [6]. Ticks are one of the most important ectoparasites of cattle. They can serve as vectors of tick borne disease, cause tick paralysis and lead to large economic losses of livestock production all over the world [7].They are interesting largely because of their considerable medical and veterinary importance and have attracted a great deal of scientific attention due to their role as vectors of numerous pathogens [8,9]. Tick borne hemoparasites is all tick-borne organisms which are visible with light microscope and which occur in the circulating blood as part of their normal life-cycle [10].The most important tick-borne hemoparasites are *Babesia, Theileria* and *Anaplasma* [11]. About 90% of the world's cattle populations are affected by tick and tick born disease (TBDs) which are widely distributed throughout the world [12]. World-wide losses due to diseases transmitted by ticks and the costs of tick control have been estimated to be in the range of several billion (109) US dollars annually [13].

This diseases cause substantial economic losses in bovines, particularly in tropical and subtropical regions, where 80 % of the world's total cattle population occurs [14].

In Africa, tick-borne protozoan diseases (e.g. theileriosis and babesiosis) and rickettsial diseases (e.g.anaplasmosis and heartwater (cowdriosis) are the main health and management problems of domestic ruminants [15]. The country's environmental condition and vegetation are highly conducive for ticks and tick-borne disease perpetuation [16].

In Ethiopia, cattle ticks causes serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, down grading and rejection of skin and hide [12]. The main tick genera found in Ethiopia includes *Ambylomma*, sub genus ticks *Rhipicephalus (Boophilus), Haemaphysalis, Hyalomma* and *Rhipicephalus* [17]. As indicated in Ethiopia there are about 47 species of ticks found on livestock and most of them have importance as vector and disease causing agent and also have damaging effect on skin and hide production [18].

Ticks effects on animals include loss of blood (anemia), Tick toxicosis, tick worry bite wound, myiasis and TBDs [19]. Tick borne diseases (TBDs) also constrain the improvement of the local breeds of cattle in Africa because of the high levels of mortality in exotic *(Bos-taurus)* and cross bred cattle [3]. These economically most important haemo-parasitic TBDs of ruminant on a global scale are Babesiosis, Anaplasmosis, Theileriosis and Cowdriosis of cattle and small ruminants [10]. The major cattle tick-borne diseases in Ethiopia as anaplasmosis, babesiosis, cowdriosis and theileriosis [20].

Relevant data on the distribution of ticks and tick borne hemo-parasites of different species and factors predisposing cattle is essential for the development of effective tick and tick borne hemo-parasites control strategies. In this study area information recording this problem is scanty. Some reports from the veterinary clinics reveal the existence of ticks and tick-borne haemo-parasites using routine parasitological examination technique Therefore, this study was designed with the objectives of identifying species of ticks infesting cattle, to identify different species of tick borne hemo-parasites affecting cattle and to identify the potential risk factors of the host associated with tick-borne haemo-parasites prevalence in the study area.

Materials and Methods

Study Area

The study was conducted in two selected districts of West Arsi Zone (Arsi Negelle and Asasa) of Oromia Regional State from November 2017 to the end of April 2018. The two districts were selected purposively as no research was done previously in the area concerning status of tick and tick borne hemoparasite. The Zone is located in South-Eastern Ethiopia at an altitude ranging from 1500 to 3800 meters above sea level (m.a.s.l). The annual mean rainfall ranges from 500 to 2000mm and annual ambient temperature varies from 9 ^{o}C to 31^{o}C. The estimated cattle population in the zone was 951,301 head [21].

Arsi-Negelle is one of the districts in West Arsi Zone located between 70 09 up to 7041'N and 38025'-38054'E, in lowland central rift valley region. It is 210 km south of Addis Ababa on the Shashamane-Hawassa road. The overall farming system is strongly oriented towards grain production and dependent on the use of oxen for land preparation. According to the National Metrological Services Agency at Arsi-Negelle station the mean annual temperatures were 6.8 ^{o}C and 27.2 ^{o}C respectively, while rain fall varies between 250-750 mm per annum [22].

Gedeb Asasa is also one of the districts in West Arsi Zone of Oromia Region.The administrative center of the district is Asasa. The altitude of this distric ranges from 2200 to 4180 meters above sea level; Mount Kaka is the highest point in the woreda. A survey of the land in this woreda shows that 76.9% is arable or cultivable, 17.3% pasture, 0.4% forest, and the remaining 5.4% is considered swampy, mountainous or otherwise unusable [23].

Study Population

The study populations for this study were cattle coming to Arsi Negelle and Asasa Veterinary clinic and clinics which are found around the two towns. The animals were selected purposively (based on the existence of at least one tick on their body) as the aim of the study is of identifying tick and tick- born haemo-parasites species and determining their relative prevalence and association between them and risk factors. Epidemiological information regarding ages, sex, breed, body condition and date of sample collection was recorded.

Study Design and Sample Ssze Determination

A crosssectional study design was conducted from November2017 to the end of April 2018 to identify tick and tick-borne haemo-parasites infesting cattle in and around Arsi Negele and Asasa town and to assess their association in the area. The sample size was determined based on the formula recommended by [24].

$n = 1.96^2 \times P_{exp} (1- Pexp)/d^2$

Where n= sample size required, P_{exp}= expected prevalence, d= desired absolute precision.

Since the prevalence of tick and tick-borne haemo-parasites infesting cattle in and around Arsi Negele and Asasa town had not been studied earlier, 50% expected prevalence rate was assumed. A 95% confidence interval and 5% desired absolute precision was also used and the calculated sample size for this study was 384 animals to collect tick and blood.

Study Methodologies

Collection and Identification of Ticks

The entire body surface of the cattle was inspected for the presence of ticks. After fully restraining of the animals, all visible adult tick species were removed by hands and using special forceps holding the basis capitulum so as not to lose the mouth parts of the ticks. Ticks from each animal were collected and placed in separate pre-labeled universal bottles containing 10% formalin solution until identification was done. Required information like date of collection, age of animal and sex of anima were recorded. The age of animals was grouped as young (between 1 and 3 years) and adults (>3 years) according to the classification method used by [25]. Body condition scores of animals were evaluated duringsample collection. They were classified as emaciated (poor), moderate (medium) and good based on anatomical parts and the flesh and fat cover at different body parts [26]. Tick species identification was done using direct stereomicroscope at Hawassa University Parastology Laboratory using key morphological characteristics as described by [7].

Collection and Examination of Blood Sample

Blood films examination Giemsa staining procedures and microscopic examination of slides was conducted according to [27]. Blood was taken from the ear veins and thin blood smears were made and labeled in pencil on the smear indicating age, sex, locality and date of collection. The slide was then air dried and immediately fixed with absolute methyl alcohol for few seconds and then the smear was stained with 10% Giemsa´s stain. Finally, the slides were thoroughly examined under a research compound microscope using oil immersion. The parasites searched for include, *Babesia spp, Anaplasma sppand Theileria spp.*

Statistical Analysis

The colleted data was entered into Microsoftexcel sheet 2007 and later analyzed by using 20 versions Statistical package for the social sciences (SPSS) computer software program. Descriptive statistics like percentage and chi-square ($\chi 2$) test was used to estimate the prevalence, and association between different tick species and tick borne parasites respectively. In all the analyses, confidence level is held at 95% and $p < 0.05$ is set for statistical significance level.

Results

Ticks and Tick-Born Haemoparasite Species Identification

In this study, a total of 384 cattle were examined. Two tick genera (Rhipicephalus and Ambylomma) and four tick species were identified. The tick species identified were *Rhipicephalus decoloratus, Ambylomma variegatum, Ambylomma gemma* and *Rhipicephalus evertsi evertsi* in descending order of relative infestation rates as shown in (Table 1).

Tick species	No of positive animals	Prevalence (%)
Rhipicephalus decoloratus	198	51.6
Ambylomma variegatum	177	46.1
Ambylomma gemma	77	20.1
Rhipicephalus evertsi evertsi	47	1.22

Table 1: Relative infestation rate of identified tick species

Out of 384 cattle examined for the presence of tick borne haemoparasites, 44 (11.4%) of them were found positive for haemoparasites. Two genera and four haemoparasite species were detected during the thin blood smears examination (Table 2).

Tick borne haemoparasite species	No of positive animals	Prevalence (%)
Babesia bigemina	14	3.6
Babesia bovis	5	1.3
Anaplasma marginale	24	6.2
Anaplasma centerale	3	0.8
B.bigemina and A. marginale	2	0.5
	48	12.5%

Table 2: Prevalence tick borne haemoparasite species

Table 3 showed us the association of tick borne haemoparasites infectivity with risk factors like origin, sex, age, breeds and body conditions score (BCS) in the study area. There was no statistically significant association (P>0.05) between tick borne hemoparasites infectivity and their relative frequencies on the basis of origin and breeds of examined animals. However, there was statistically significant association (P<0.05) between the tick borne hemo-parasites infectivity and their relative frequencies on the basis of sex, age, and body condition score (BCS) of examined animals with high prevalence recordes in female, adult and poor body condition animals.

Variables		No of animals examined	No of animal positive	χ2-value	p-value	OR	95% CI
Origin	Asasa	202	27(13%)	1.11	0.29	0.71	0.37-1.35
	Arsi negele	177	17(9.6%)				
	Total	**384**	**44(11.5%)**				
Sex	Female	250	35(14%)	4.56	0.03	0.44	(0.212 2.35-25-54
	Male	134	9(6.7%)				
Age	Young	126	3(2.4%)	15.23	0.000	7.75	2.35-25.54
	Adult	258	41(15.9%)				
Breed	Local	355	42(11.8%)	0.04	0.42	0.6	0.13-2.41
	Cross	29	2(6.9%)				
BCS	Good	53	0(0%)	9.22	0.01		
	Medium	137	15(10.9%)				
	Poor	194	29(14.9%)				

Table 3: Association of tick born haemo-parasites infectivity with risk factors like origin, sex, age, breeds and body conditions scoring

Logistic regression analysis indicated that, among those factors that show significant association, age of animals was highly associated with tick borne hemoparasites infectivity. Adult age groups of animals were highly affected by tick borne hemoparasites than young animals (Table 4).

Variable		No of animals examined	No of animal positive	χ2-value	p-value	OR (95%CI)
Sex	Female	250	35(14%)	6.15	0.023	0.4 (0.21-0.95)
	Male	134	9 (6.7%)			
Age	Young	126	3 (2.4%)			
	adult	258	41(15.9%)	19.52	0.001	8.11(2.44-26.95)
BCS	Good	53	0 (0%)			
	Medium	137	15(10.9%)			
	Poor	194	29(14.9%)	17.69	0.366	

Table 4: Logistic regression analysis for sex, age and body condition score

Association of assumed risk factors (origin, sex, age, breeds and BCS) with babesia and anaplasma positivity in the study area is indicated in (Table 5 and 6) respectively.

Variables		No of animals examined	No of animal positive	χ2-value	p-value	OR (95%CI)
Origin	Asasa	207	12 (5.8%)	0.69	0.41	0.69
	Arsi negele	117	7(4%)			
Sex	Female	250	18 (7.2%)	7.73	0.005	**0.09**
	Male	134	1 (0.7%)			
Age	Young	126	2 (1.6%)	4.5	0.034	4.37
	Adult	258	17 (6.6%)			
Breed	Local	355	18 (5.1%)	0.15	0.69	0.67
	Cross	29	1 (3.4%)			
BCS	Good	53	0 (0%)	4.12	0.13	
	Medium	137	6 (4.4)%			
	Poor	194	13 (6.7%)			

Table 5: Association of the genus Babesia positivity with risk factors like origin, sex, age, breeds and body conditions scoring

Regarding age of animals, there was a statistically significant association with adult animals has higher probability to be positive for babesia and anaplasma than young animals. Prevalence association of babesia species with risk factors like origin, sex, age, breeds and BCS shown in Table 7 indicates no statistically significant association (P>0.05) between babesia species and risk factors.

Prevalence of anaplasma species with risk factors like origin, sex, age, breeds and BCS shown in Table 8 indicated statistically significant association (P<0.05) between anaplasma species and age of animals with the highest prevalence *A. marginale* (8.9%) in adult animals.

Variables	No of animals examined	No of animal positive	χ2-value	p-value	OR	(95%CI)
Origin						
Asasa	207	17 (8.2%)	0.96	0.33	0.67	0.29-1.5
Arsi negele	117	10(5.6%)				
Sex						
Female	250	19 (7.6%)	0.36	0.55	0.77	0.33-1.8
Male	134	8(6%)				
Age						
Young	126	1 (0.8%)	11.16	0.001	14	1.88-104.46
Adult	258	26(10.1%)				
Breed	355	26 (7.3%)	0.62	0.43	0.45	0.06-3.46
	29	1(3.4%)				
BCs						
Good	53	0 (0%)	5.55	0.06		
Medium	137	9 (6.6)%				
Poor	194	18(9.3%)				

Table 6: Association of the genus Anaplasma positivity with risk factors like origin, sex, age, breeds and body conditions scoring

Variables		No of animals examined	No of positive animal for *B. bigemina*	No of positive animals for *B.bovis*	Total No of positive animals
Origin	Asasa	207	10 (4.8%)	2 (1%)	12(5.8%)
	Arsi negele	117	4 (2.3%)	3(1.7%)	7 (4%)
Sex	Female	250	13 (5.2%)	5 (2%)	18 (7.2%)
	Male	134	1 (0.7%)	0 (0%)	1 (0.7%)
Age	Young	126	2 (1.6%)	0 (0%)	2 (1.6%)
	Adult	258	12 (4.7%)	5 (1.9%)	17 (6.6%)
Breed	Local	355	13 (3.7%)	5 (1.4%)	18 (5.1%)
	Cross	29	1 (3.4%)	0 (0%)	1 (3.4%)
BCS	Good	53	0 (0%)	0 (0%)	0(0.0%)
	Medium	137	4 (2.9%)	2 (1.5)%	6 (4.4%)
	Poor	194	10 (5.2%)	3 (1.5%)	13 (6.7%)

Table 7: Prevalence of the two *Babesia species* with assumed risk factors

Variables		No of animals examined	No of positive animals for *A. marginale*	No of positive animals for *A.centerale*	Total No of positive animals
Origin	Asasa	207	17 (8.2%)	0 (0%)	17(8.2%)
	Arsi negele	117	7(4%)	3(1.7%)	10 (5.6%)
Sex	Female	250	16 (6.4%)	3 (1.2%)	19 (7.6%)
	Male	134	8(6%)	0 (0%)	8 (6%)
Age	Young	126	1 (0.8%)	0 (0%)	1 (0.8%)
	Adult	258	23 (8.9%)	3(1.2%)	26 (10%)
			χ2=9.53		χ2=11.16
			P=0.002		P=0.001
			OR=12.23	0 (0%)	0(0.0%)
CI=1.6-91.66		OR=14.1	4 (2.9%)	2 (1.5)%	6 (4.4%)
CI=1.88-104	Poor	194	10 (5.2%)	3 (1.5%)	13 (6.7%)
Breed	Local	355	23 (6.5%)	3 (0.8%)	26 (7.3%)
	Cross	29	1 (3.4%)	0 (0%)	1 (3.4%)
BCS	Good	53	0 (0%)	0 (0%)	0(0%)
	Medium	137	9 (6.6%)	0 (0)%	9(6.6%)
	Poor	194	15 (7.7%)	3 (1.5%)	18(9.3%)

Table 8: Prevalence of the two Anaplasma species with assumed risk factors

Prevalence of anaplasma species with risk factors like origin, sex, age, breeds and BCS shown in Table 8 indicated statistically significant association ($P<0.05$) between anaplasma species and age of animals with the highest prevalence A. marginale (8.9%) in adult animals.

Discussion

In Ethiopia, different tick and tick born haemo-parasites species are widely distributed and number of researches reported the distribution of different tick and tick born hemo-parasite species in different parts of the country. However, the faunistic survey on identification bovine tick and tick born hemo-parasites with related risk elements and their association has not yet been investigated in this study area. In this study, *Rhipicephalus decoloratus* was found to be the most abundant tick species in the area (51.6%). In the same way, higher prevalence of *R. decoloratus* was reported in and around Asosa by [28]. Similarly, in Humbo district, Southern Nations and in Asela reported *R. decolaratus* as the highest prevalencein the area [29,30]. Our result is disagreeing with the finding who reported low prevalence 5.7% at Mekele ranch [31]. *R. decolaratus* is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions except in the Afar region [32]. This variation may be due to the change in environmental conditions, geographical location with the result of global warming that highly affect the ecology of ticks. Change in temperature and rainfall have been reported to affect the distribution of diseases of vectors [33].

A. variegatum was the second abundant tick species of cattle in the study area (46.1%). Similar to this study, reported *A. variegatum* as the second prevalent (25%) tick species of cattle in and around sebata town. However, reports from different parts of Ethiopia such as in Asela and in Holeta indicated that *A. variegatum* as the most abundant tick species in the respective study areas [34-36].

In this study *A. gemma* is the third abundant tick species (18.1%). This study also shows restriction of this tick species to Arsi negele district which fond in central rift valley region with annual rain fall between 250-750 mm per annum. This is comparable with statement that shows restriction of this tick species to the area of arid, semi-arid between altitude 500 to 1750 m above sea level and rift valley semi-arid plain and bush land recieving 350 to 750 mm rainfall annually [37].

R. eversi eversi is the fourth abundant tick species (1.22%) in this study. This study was in line with the finding of who reported as the fourth abundant species (12.3%) in and around Mizan teferi, south western Ethiopia [38]. This tick species was also reported to be prevalent by other authors such as in Bahir dar, and n Assela [30,39,40]. Mentioned that the native distribution of *R. eversi evertsi* in Ethiopia seems to be connected with middle highland, dry savannas and steppes in association with zebra and ruminant [37]. The results of the present study shows occurrence of this tick species in both study area (Arsi negele and Asasa) as shows no apparent preference for any particular altitude, rainfall or season for this tick species [41]. However, difference in their prevalence in two study areas may be due to other climatic condition rather than altitude, rainfall or season. Tick distribution and their population vary according to their adaptability to ecology, eco-climate, microhabitats, ambient temperature, rainfall and relative humidity which is critical factors affecting life cycle of ticks [38].

The study result shows highest prevalence (42.90%) of anaplasma and total tick born hemoparasite (57.10%) in *A. variegatum*, *A. gemma and R. decoloratus* mixed infestations. In *A. gemma* and *R. evertsi* mixed infestations the highest prevalence of babesia (50%) is also indicated. Similar to this, shows transmission of *B bigemina* by *R. evertsi evertsi*.This result also agrees with finding who indicated abundance of *R. evertsi* and *R. decoloratus* in Uganda and their ability to *transmit A. marginale* [42,43]. In similar way, stated that, *Rhipicephalus decoloratus* is vector of *Anaplasma marginale* and *Babesia bigemina* [41]. He also concludes that, the distribution of *A. variegatum* is similar to that of *B. decoloratus*. In contrast to the current finding, stated that, Amblyomma gemma is not known to be important to the health of domestic animals [17]. According to the two primary diseases of concern that are associated with the tropical bont tick *(ambylomma varigatum)* are also *dermatophilosis* and heartwater, not babesia and anaplasma [44]. The probable reason for this difference is that, even though the disease is not actually transmitted by this tick species, the immunosuppression that occur secondary to feeding stated by may predisposes the animals to the tick born haemoparasites [45]. The damage that results from wounds caused by the large mouthparts of this tick may also enhances mechanical transmission of tick born haemoparasite by arthropods (blood sucking diptera) of the genera *Tabanus, Stomoxys, Culex* and *Aedes,* biting flies and fomites contaminated by infected blood. In general, *A. marginale* is spread by *Rhipicephalus spp, Dermacentor spp,* and *Ixodes ricinus,* but has not been proved to be transmitted by *Amblyomma spp*. [46].

In the present study, the overall prevalence rate of cattle tick born hemoparasites is 11.4%. This result is comparable with the findings of who report 17.2% in Metekele. In the present study, prevalence of Babesiosis and Anaplasmosis was found 4.9% and 7% respectively [31]. This was relatively higher than the findings of who reported 1.6% and 0.5% for Babesiosis and Anaplasmosis respectively in Tiyo District, Arsi Zone [47]. The study from Western Ethiopia Benishangul Gumuz Regional State, by reported the overall prevalence of 1.5% from which *B. bovis* was 1.24% and *B. bigemina* was 0.248% wich is lower than current study [48]. From Central Ethiopia, bishoftu was also reported low prevalence of *bovine babesiosis* (0.6%) [49]. In contrast, was reported higher prevalence of *Anaplasma* (60.36%) and *Babesia* (42.86%) in Brazil [50]. High prevalence of bovine babesiosis was also reported in and around Jimma town, southwest Ethiopia compared to other study which is 23% [51]. The difference might be due to different factors like climatic factors required for the biology of the parasites and its vector and veterinary service delivery.

In this study, low prevalence was recorded for *Anaplasma marginale* (6.2%), *Babesia bigemina* (3.6%), *Babesia bovis* (1.3%) and *Anaplasma centerale* (0.8%). These results are comparable with the studies of who reported reported lower prevalence of *Anaplasma marginale* 1.6%, *Anaplasma centerale* 0.3%, *Babesia bigemina* (0.3%) and B. bovis (0.3%) [38]. Smilar result was reported by who reorted the rate of animals infected with *B. bovis, B. bigemina,* and *A. marginale* was 7.3%, 1.2%, and 21.3%, respectively [52]. [53] Reported 5.30% and 3.97%, prevalence of *B. bigemina* and *B. bovis* in cattle in Beheira and Faiyum respectively. [54] And [55] were reported that *Babesia spp.* was detected in 11.31% and 8.15% of cattle in Gharbia and Menofia in Egypt respectively. [56] Detected *A. marginale* in cattle with a rate of 3.68%. Micro-climate pattern, tick distribution, breeds, and the sampling condition may be the reason for this slight variation in prevalence rates.

Incontrast to the current finding, reported higher prevalence of *B. bigemina* (52.0%), *B. bovis* (33.2%), and *A. marginale* in 76.2% by using Polymerez chain reaction (PCR) in dairy cattle in Brazil [57]. In a study conducted in semi-arid region of Bahia, the prevalence of antibodies (anti-*B. bigemina* and anti-*B. bovis*) was 77.7% and 75.5%, respectively [58]. These differences could be due to the fact that thin blood smear examination is not efficient means of identifying tick-borne haemoparasites.

The present study finding shows significant association of tick born haemo-parasites infectivity with age, sex and body conditios. According to this finding, females, adult animals and animals with poor BCS were affected more by tick borne hemo-parasites. Among those factors that show significant association with tick born haemo-parasites infectivity, age of animals was highly associatiated with tick borne hemoparasites infectivity. Association of Babesia and Anaplasma positivity with age of animals and prevalence association of *A. marginale* with age also shows significant association with higher prevalence in adult animal. Other factors like origin, sex, breeds and BCSwere notshow statistically significant association (P>0.05) between babesia and anaplasma positivity and their relative frequencies.

The result is in line with who found greater positivity of *Babesia* in adult cattle [59]. This result was also in line with the finding of from Pakistan who reported high prevalence in old animals with 13.4% followed byadult animalswith 11.7% while the lowest was found in young animals [60]. However, the results of this paper is disagree with the result of who found that the calves were 3.62 and 2.53 times more susceptible when compared to adult cows for *A. marginale* and *Babesia spp*. Respectively [61]. The results ofthis studyalso disagree with the finding of who reportedthat calveswere more susceptible to *Babesia species* when compared to adult cows [62]. This variation can be due todifference in management system. In fact, young animals particularly calves under six months of age have maternal immunity acquired from colostrum feeding, so that they are almost slightly resistant to infection as compared to old animals [63]. On the other hand lower prevalence in young animals attributed due to restricted grazing of young animals which likely to reduce their chance of contact to vectors of these diseases [64].

This finding shows significant association of tick born haemo-parasite infectivity with sex of animals with higher prevalence in female animals which agree with the finding of who indicated that, females had more infected [65].Unlike the current findings, there were no haemoparasites prevalence differences among the different sexes according to [66]. However, indicated that male cattle were more infected than female [66]. This shows that both females and males are susceptible to infection with haemoparasites in areas where the disease vectors are endemic. The difference may be due to the size of samples or the load of ticks which was more on females than male animals.

Tick born haemo-parasites infectivity in the study animals was statistical significant on basis of body condition score. Similar finding was indicated by who reported significant association of haemo-parasites with BCS with higher prevalence in emaciated animals [38]. Even though, loss of body condition is not always associated with this disease and can be other chronic disease of other parasitic, bacterial, viral and nutrition deficiency or poor management systems of the farm animals, most of animals affected with tick born haemo-parasites can be also loss their body condition. In addition, during this study it was very common to see high burden of ticks in animal with poor body condition unlike those animals with good body conditions and this can increase rate of tick born haemo-parasites infection.

In conclusion, tick and tick borne hemoparasites are the most common health problems in cattle. The tick species identified in the study area were *A. variegatum, A. gemma, R. decoloratus* and *R. evertsi evertsi.* The major tick borne hemoparasite species identified were *Anaplasma marginale*, *Anaplasma centerale, Babesia bigemina* and *Babesia bovis*. The results of the present study revealed as there is higher prevalence of total tick borne hemoparasite in mixed infestations of *A. variegatum, A. gemma* and *R. decoloratus* tick species. In the study area the prevalence of babesisosis and anaplasmosis varied among host factors. Although it is difficult to deduct conclusive ideas about the general association of tick and tick borne hemo-parasite species in the study area due to the fact that thin blood smear examination is not efficient means of identifying tick-borne hemoparasites species, it is clear that tick and tick borne hemoparasites constitutes a very important place and may pose significant health and economic problems of cattle production in the area. Therefore, based on these conclusion remarks, further research should be conducted on tick and tick born hemoparasite species identification by using efficient diagnostic techniques and on their epidemiology for the continuous understanding of improved control strategies and awareness should be given to animal breeder on problem of tick and tick borne diseases and about their control methods.

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