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Research Article

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Prevalence and Identification of Major Bovine Hard Tick Species in South Ari Woreda, South Omo Zone

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Abstract

Cross-sectional study was conducted in and around South Ari woreda of South Omo zone from March, 2023 to June, 2023 to determine the prevalence of hard tick infestation and to identify their species, predilection site, possible risk factors and their distribution in selected kebeles of study area. Accordingly, 384 local zebu cattle were selected from four randomly selected kebeles by using simple random sampling technique and examined for tick infestation and adult ticks were collected for tick identification purpose. From total of 384 randomly selected zebu cattle, 271(70.6%) of the animals were infested with different tick species and 113 (29.4%) of them were free of tick infestation. The majority of cattle were infested with Amblyomma 151 (39.3%) followed by Hyalomma 50(13.02%), Boophilus 41(10.7%) and Rhipicephalus 29 (7.5%). Different risk factors (age, body condition, sex and attachment site) were strongly affected the prevalence and the degree of infestation. There was no statistically significant difference in prevalence of tick infestation in female cattle (70.8%) and male (70.2%). Relating with body condition tick infestation was higher in poor body condition score (84.0%) followed by medium (72.4%) and good body condition (51.2%). In relation to the attachment sites of ticks on the host body, Amblyomma had strong preference to head, leg, udder, vulva, neck and scrotum. The proportion of tick infestation was higher in adult animals (73.8%) when compared to young animals (62.9%). The study revealed that ticks are the most important ectoparasites and cause economic losses in the area. A longitudinal study on seasonal variation in species composition and abundance should be carried out for effective intervention. Animal's husbandry and management improvement should be warranted in addition to effective intervention strategy to reduce the rate of tick infestation.

Keywords: Bovine, Hard Tick Species, Prevalence, South Ari, South Omo

1. Introdution

Livestock productions contribute great role both for the national economy and the livelihood of rural communities in sub-Saharan African countries including Ethiopia [1]. Ethiopia, located in the horn of Africa between latitude 300 North to 150 North of the equator and the longitude from 330 East to 480 East and is one of agrarian country with an estimated a total land area of 1,101,000 km2 [2].

Ethiopia contains the largest livestock population from African continent which reaches a count of approximately 70 million cattle, 42 million sheep, 52 million goats, 8 million camels and 56 million chickens in the country [3]. Among those livestock species, cattle play a significant role in the socio-economic aspects of the life of people in Ethiopia. Hides of large animals are important economic products contributing for the largest share to the total and agricultural export commodities. Conversely, about one quarter to one third of all the skins processed at tanneries are unsuitable for export due to various defects where majority of these defects

are due to ectoparasitic infestation [4]. Total herd meat off-take is estimated at around 7% annually which is perhaps one third lower than the average for tropical Africa. Cattle are the prime resource for the people and government of Ethiopia [5].

Despite the large population of animals in Ethiopia, productivity is low, and often below the average for most eastern and sub-Saharan African countries and this was raised from animal diseases (bacterial, parasitic, viral and fungal diseases), poor veterinary services, poor nutritional status, reproductive insufficiency and ineffective management of existing constraints [6]. Specifically, cattle production is affected by widespread endemic parasitic infections (endoparasites and ectoparasites), poor management systems, lack of improved genetic potential, inadequate veterinary services and lack of adequate infrastructure in remote areas [7].

Parasitism by external and internal parasites in extensive and intensive production system is among the commonest problems in general and, ectoparasites could create detrimental effects on their hosts through puncture, burrow, or attach onto the surface and cause discomfort, annoyance, weight loss due to interrupted feed intake, loss of condition reduction in milk production, irritation of the skin and loss of hair and down grade the quality of skin, and predispose to infection in particular [8,9]. Among the ectoparasites, ticks are well known for substantial effects in livestock production. Ticks are very common and extensively distributed in all agroecological zones especially in tropical and subtropical areas including Ethiopia [10].

In most parts of Africa, including Ethiopia tick borne diseases, together with tsetse and trypanosomosis are economically very important diseases [11]. According to ticks are the most advantegous vector to spreading of disease (viral, bacterial, rickettsial and protozoal) from infected cattle to healthy ones [12]. Greater variety of those pathogenic micro-organisms are tranismitted by tick than any other arthropod vector group, and are among the most important vector diseases affecting animals.

The distribution and abundance of tick species infesting domestic ruminants in Ethiopia vary greatly from one area to another area. The major ticks genera found in Ethiopia are Amblyomma, Boophilus, Haemaphysalis, Hyalomma, Rhipicephalus [13]. Extensive survey has been also carried out on the distribution of tick species on livestock in different regions of the country in which different tick species such as *Boophillus decoloratus, Ambyloma varigatum, R. eversi eversi, Hyalomma marginatum rufipes, Hyalomma truncatumi, Ambyloma cohaerance, Amblyomma gemma, Amblyomma elide, Rhipicephalus pulchellus* are also frequently reported in many ticks survey carried out in the country [14]. Among the genera listed above, Ambylomma and Rhipicephalus are more dominant in many parts of Ethiopia. In Ethiopia, anaplasmosis, babesiosis, theileriosis and cowdriosis are most commonly known tick-borne diseases and in addition to this, anemia, dermatitis, toxicosis and paralysis are nonspecific symptom cause by this vector [11,15].

In Ethiopia ticks can lead to huge loss to the national economic through both either direct effects by blood sucking or indirectly as disease and toxin transmitting pathogens. Ticks are voracious blood feeders; and predispose hosts to secondary bacterial diseases, and myiasis [16]. Moreover, according to it has also damaging effects on the quality of hides and skin production. Studies conducted in South Omo indicated that there was high prevalence of tick- and tick-borne disease. According to tick burden was one of major cause of babesiosis (prevalence of tick in area was 86.17%), *Babesia bigemnia* (15.53%) and *B. bovis* (6.17%) in Dassenech and Salamago [17]. Although there have been many research works conducted in South Omo and other parts of Ethiopia regarding ixoded ticks' infestation, there is still long lasting challenge that livestock owners are currently facing, particularly in South Ari woreda. Furthermore, there is no any published and unpublished information regarding to ixodid cattle tick infestation in the current study area.

Hence, it is essential to give relevant information on distribution of different hard tick species of cattle and their genera to implement effective control strategy. Therefore, the current study was aimed to determine the prevalence of ixodid tick infestation on cattle and to identify the common tick genera and species in South Ari Woreda of South omo zone.

2. Material and Methods

2 .1. Study Area

The study was conducted in and around south Ari woreda, found in south Omo Zone and is located at the southern part of the Southern Nation Nationality and People Regions (SNNPR). The district is located 50. 67'-60 .19' N & 360.30'-360.73'E, found at 767 km from capital city (Addis Ababa) and 570 km from the capital city of SNNPR, Hawassa and 17 km from zonal administrative center, Jinka town. It borders North Ari district in North, Benatsemay district in South, Salamago district in west and Malle district in east. The Woreda has three agro climatic Zone Dega, Woyinadega and Qola. The annual rain fall of three agro-ecoogical zones is 1000 mm, 650 mm and 450 mm respectively and the annual temperature of the woreda is Dega 13° C, Woyinedega 17° C and Qola 29° C. The livestock in the area comprises of cattle 195,597, goat 43,466, Sheep 90,001, horse 26,239 and poultry 148,223 (South Omo Zone Finance and Economy Development Department, 2012).

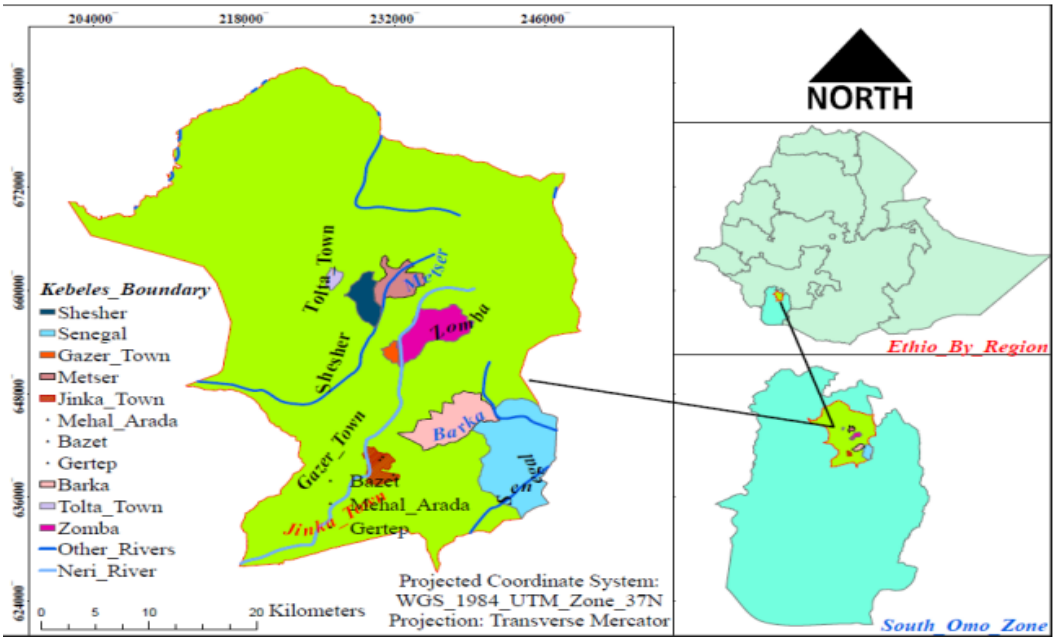

Figure 2: Location of Study Area

2.2. Study Population

The study was conducted between March, 2023 and June, 2023. Tick samples were collected from local zebu cattle and of all age and both sexes were used as study population for the prevalence and identification.

2.3. Study Design

A cross-sectional study was implemented to identify important tick species infesting cattle from four purposively selected kebele (i.e., Gazer 01, Ayida, Zonba, and Pilla). The study was conducted on a total of 384 cattle. The animals were selected and sampled by using simple random sampling technique from the study area for tick collection and identification from different body regions. Strata was given based on age (1-3 year, young and >3-year, adult), sex (male and female) and body condition (good, medium, and poor).

2.4. Sample Size Determination and Sampling Technique

The sample size was determined by assuming the expected prevalence of 50% tick infestation (no previous prevalence of cattle tick infestation was conducted).

The desired sample size for the study was be calculated using the 95% confidence interval and at 5% absolute precision by applying Thrusfield, (2007) formula. Therefore, a sample size of 384 cattle was examined in the present study.

$$n = \frac{1.962 \times Pexp\ (1\text{-}pexp)}{d2}$$

Where: n = required sample size
P exp = expected prevalence
d = desired absolute precision =0.05

Accordingly total 384 animals were sampled

Simple random sampling method was used for selection of study kebele and respondents for questionnaire survey. Accordingly; Pilla, Gazer 01, Zonba and Ayida kebeles was included in this study design.

2.5. Data Collection Methods

Properly restraining of selected study animal and examination of animal for the presence of tick was being done from head to tail including legs on the body of the cattle. Ticks were collected without damaging and injuring the animal body. For losing the attachment of the ticks from the body surface we used the ethanol.

2.6. Data Management and Analysis

Important information regarding date of sample collections, area of collection and site of collection, species and breed of host cattle was registered and immediately transported to Jinka Regional Veterinary Laboratory. The sample was coded, and then preserved in separate prefilled universal bottle containing 70% ethanol by considering their site of collection. Identification of tick genus and species was performed by using stereo microscope. Data collected during study period was stored and coded in Microsoft Excel 2007 spreadsheet and it will be summarized using descriptive statistics such as percentages and averages. Prevalence is, define as a proportion of cattle infested by tick to the number of total sample size. Analysis was done by Stata/ SE version 14.0 software using person's chi-square (x2) test to investigate the statistically association between hypothesized risk factors such as age, sex and body condition categories. P-value less than 0.05 will be used as statistical significance.

3. Results

In this study, total 384 cattles were examined to detect tick

infestation. From the total cattle examined, 271(70.6%) were infested with different tick species and 113 (29.4%) of them were free of tick infestation. From tick infested animals, the sample was collected from different body site and identification was done at laboratory. Ticks belonging to four genera: Amblyomma 151 (39.3%), Hyalomma 50(13%), Boophilus 41(10.7%) and Rhipicephalus 29 (7.5%) were identified as shown in Table 2. A relatively high prevalence of tick infestation (73%) was recorded at Gazer 01 followed by Ayida kebele (72%), Pilla (66%) and Zonba (60%) as indicated in Table 4. The five tick species were identified and categorized under four genera. The majority of animals examined were infested with *A. variegatum* (26%), *A.gemma* (12.8%), *H.truncatum* (12.2), *B.decoloratus* (12%) and *R.evertsi evertsi* (7.6%) respectively as shown in (Table 3).

3.1. Prevalence Based on Predilection Site

In the present study the preferred attachment sites of ticks were investigated. The results showed that various tick species have relatively different predilection sites. The most preferred attachment sites for most tick species were neck/belly (22.1%), udder (12.2%), vulva (12.0%), head (11.2%), leg (6.8%), scrotum (4.7%) and sternum (1.6%) as shown below (Table 4).

Tick genera	Total number of cattle infested	Prevalence (%)
Ambylomma	151	39.3
Hyalomma	50	13.02
Boophilus	41	10.7
Rhipicephalus	29	7.5

Table 2: The Percentage of Cattle Tick Genera in Study Area

Tick species	Number observed	Proportion (%)
A. variegatum	101	26.3
A. gemma	50	13.02
H. truncatum	50	13.02
B. decoloratus	41	12.0
R. evertsi evertsi	29	7.6

Table 3: Number of Various Tick Species From Cattle at Study Sites

Parameters	Number of cattle	Number of cattle infected	Proportion (%)	Pearson chi2	p-value
Origin				0.3949	0.91
Ayida	100	72	72		
Gazer 01	102	73	71.5		
Pilla	94	66	70.2		
Zonba	88	60	68.1		
Sex				0.0332	0.856
Male	157	110	70.06		
Female	227	161	70.9		
Body condition				36.85	0.00
Poor	164	138	84.1		
Medium	97	70	72.1		
Good	123	63	51.2		
Age				4.67	0.031
Young	116	73	62.9		
Adult	268	198	73.8		

Table 4: Tick Infestation Prevalence In Relation To Risk Factors (Origin, sex, age and body condition score)

Attachment site	Number of infected animals	Percent	Pearson chi2	P-value
Neck/belly	84	22.1	74.53	**0.000**
Udder	47	12.2		
Vulva	46	11.9		
Head	43	11.1		
Leg	26	6.7		
Scrotum	19	4.6		
Sternum	6	1.5		

Table 5: Majorly Preferred Attachment Sites of Ticks Observed During the Study Period

4. Discussion

In Ethiopia there is great variation of tick species distribution from place to place. In the present study, 70.57% of the studied animals were infested with one or more tick genera. This is consistent with a previous report of Abriham in Lalo Assabi district with overall prevalence of 69% and Dimshasha in Abuna Gindeberet district with over all prevalence of 71.35%. *Ambylomma variegatum* (26.3%) was founded to be the most abundant tick species in this study area, followed by *A.gemma* (13%), *H. truncatum* (13%), *B. decolaratus* (12.0) and *R.evertsi evertsi* (7.6%) respectively. However, due to factor like annual rainfall, relative humidity, atmospheric temperature, vegetation cover, altitude and host availability their distribution and abundance can be vary from place to place [18].

The present study has shown that Ambylomma (39.3%) was one of the most dominant tick genera in the study. This finding is similar with Debele, whose report prevalence was (40%) in Honkola Wabe woreda of Arsi zone [19]. These might be due to suitable humidity and temperature of the study area for Ambylomma reproduction and survival. *Hyaloma truncatum* was recorded as the second most prevalent (12.2) tick species in study area. This finding was lower than that of study conducted by Gurmessa (16.9%) in and around Sebeta town [20]. This prevalence might be due to geographical location of Gazer as *H.truncatum* is highest in number in high rainfall area.

Boophilus was the abundant tick genera in the area with prevalence of 10.7%. This finding was similar with survey done in East Haraghe zone, Gursum district with the prevalence of 10.37% [21]. But this result is slightly lower than report of Tamiru who indicated 15.4% prevalence [22]. Rhipicephulus was the fourth tick genera found to be occurred in study area with prevalence of 7.5%. The result is greater than the finding done in and around Jimma with the prevalency of 3.32% [23]. However, this result is disagreed with the previous work reported by Abdisa with prevalence 50.9% and Huruma who reported and 53.4% [20,24-26].

The present study was shown that the cattle with poor body condition score (84.1%) was higher infested by tick than medium (72.1%) and good body condition (51.2%). This is due to poor body condition cattle have low body resistance and exposed to tick when grazing on the land.

The present result shows that the prevalence of tick infestation was slightly equal in female cattle (70.9%) and male (70.06%). This finding is inconsistence with Debele who reported 43.6% and 100% of prevalence in female and male cattle, respectively [19]. This minor variation may be due to the fact that mostly male and female animal graze on field with each other and exposed to tick.

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. Accordingly, *Amblyomma* had strong preference for head, leg, udder, vulva, neck and scrotum. The proportion of tick infestation was higher in adult animals (73.8%) when compared to young animals (62.9%). This proportion may be due to outdoor management and long distant movement of adult animals to search for food and water compared to younger animals, so the chance of exposure is higher.

5. Conclusion and Recommendations

The current study indicated that there was high burden of ticks in the South ari woreda that majority of all sampled animals (70.57%) infested with ticks on their body. Adjustable information on tick species distribution and dynamics are very essential to assess the economic loss encountered due to tick infestation and also to identify the appropriate measure of tick control. The important and abundant tick species investigated in the study area were; *A. varigatum, A. gemma, H. truncatum, B. decoloratus and R. evertsi evertsi*. However, the attention given to controlling the infestation had not been sufficient. Generally, the distribution of tick is not fixed but are determined by a complex interaction of factors such as climate, host density, host susceptibility, grazing habits, and pasture-herd management. In light of the above conclusion the following recommendations are forwarded:

- Awareness on tick control should be promoted among livestock owners.
- Strengthening veterinary service delivery in the study area.
- Further research on seasonal variation in species composition and abundance should be carried out for effective intervention.
- Effective tick control program should be formulated and implemented based on the distribution pattern of ticks and factors responsible for their distribution.

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