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Research Article

Prevalence of Tick Infestation on Cattle at East Badewacho Woreda in Hadiya Zone, Southern Ethiopia

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ABSTRACT

In Ethiopia, Cattle are the pillar of the economy and ixodid ticks of cattle was major problem of cattle production. The present study was conducted from March 2019 to August 2020 on randomly selected cattle in and around East Badewacho District, Hadiya zone, South Ethiopia, with the objectives of determining the prevalence of ixodid ticks genera infestation and assessing the difference in infestation among the different risk factors such as age, sex, body condition score. About 4112 adult ixodid ticks were collected from cattles included in the study. From 384 cattle selected by systematic random sampling method, the overall prevalence of tick infestation was found to be 79.2% (304/384). Four tick genera were identified with the constituents of Amblyomma, 1942 (46.5%), Rhipicephalus (formerly Boophilus), 1274 (31%), Hyalomma, 635 (15.4%) and Rhipicephalus 291 (7.1%). From the total count, Amblyoma was the dominant tick species and Rhipicephalus was the least. The prevalence of tick infestation was found significantly different ($x2 = 9.86$, $P < 0.05$) between age with higher prevalence in adult (37.5%) than young (21.6%). However, there was no statistically significant difference in tick infestation among cattle sex and body condition. The high prevalence of tick infestation in the study area might be associated to lack of community awareness about the impact of ticks, health care services and management practices of cattle. It is strongly suggested that the need to implement community awareness together with the setting up of tick prevention and control strategies.

Keywords: Cattle; Ixodidae; Infestation; Shone District; Ticks

Introduction

Ethiopia has the largest livestock population in Africa, with 65 million cattle, 40 million sheep, 51 million goats, 8 million camels and 49 million chickens [1]. The country has an extremely diverse topography, a wide range of climatic features and a multitude of agro-ecological zones that are suitable to host a these huge animal population [2]. Even though the livestock sub sector contributes much to the national economy, its development is hampered by different constraints. Poor health and productivity of animal due to disease has considerably become the major stumbling block to the potential of livestock industry [3].

In a current situation, parasitism represents a major obstacle to development and utilization of animal resource. Ectoparasites are one of the most important constraints that directly or indirectly affect the socio-economic development of poor farmers [4]. Among the ectoparasites, ticks are ranked as the most economically important and greatest loss in livestock population either by transmitting a wide variety of TBDs or by affecting the health of animals as well as the quality of hiding and skins in Ethiopia as well as in tropics including sub-Saharan Africa [5, 6].

Ticks were considered as parasites of domestic animals as early as 400 B.C. Aristotle in his famous historiaanimalium, stated that the ticks were disgusting parasites generated from grass. Despite this early realization, little work was done until the latter half of nineteenth century, when a number of parasitologists all over the world started working on taxonomy, prevalence, and bionomics, seasonal and regional occurrence of the ticks [7]. Ticks are obligate blood feeding ectoparasites of vertebrates; particularly mammals, birds and reptiles throughout the world [8]. They are cosmopolitan in distribution, but occur principally in tropical and subtropical regions with warm and humid climate which are suitable to undergo metamorphosis [9].

There are at least 884 tick species in two major families, namely the *Ixodidae* comprises approximately 80% and *Argasidae* 20%. Ixodid ticks are one of the most common and harmful bloodsucking ectoparasite of cattle worldwide. They are responsible for a wide range of livestock health problems in several countries of the world [10, 11]. As the reports reveal in Ethiopia, they reduce cattle productivity, milk yield, and skin and hide quality, cause udder damage and predispose to mastitis, suppress immunity, and increase susceptibility to other diseases. Among the genera, the most important tick species in Ethiopian cattle's are *Amblyomma, Hyalomma, and Rhipicephalus (Boophilus)* [12 - 14].

Ticks infestation is severe in different parts of Ethiopia and at a conservative estimate, one million USD is lost annually only through rejection of downgraded hides and skins attributed to tick damage [4, 15]. Even though losses due to tick infestation is considerable in Ethiopia, and a number of researchers reported the distribution and abundance of tick species in different parts of the country, there is scarcity of reports in estimated prevalence and distribution of ticks in Shone district, Hadiya Zone. Hence, the objectives of this study were to Estimating the prevalence and Identification of ixiodid ticks with respect to host related variables in study area.

Materials and Methods

Study Areas

The present study was conducted from March 2019 to August 2020 on randomly selected cattle in and around East Badewacho District, Hadiya zone, South Ethiopia. East Badewacho district is located in Hadiya zone of SNNP Regional government of Ethiopia. It is 25 Km from south of Hosanna and 345 Km south of Addis Ababa. Topographically, it is located at an altitude range of 1650-2050 meter above sea level. Geographically, it is located 07 °90 and $8^0$15' North latitude and 35^0 and $40^0$15' East latitude. The average temperature is 11-27^0c with lower temperature fluctuation climatically. The Shone district has ecological zone of which 100% midline. According to Shone town agricultural statistics information, the animal population in Shone has about 93,040 cattle's, 15,457 sheep's, 19,123 goats, 834 donkeys, 428 horses, 52 mule and 76,747 chickens. The production system of the district is mixed type [16].

Study Design and Animals

The cross-sectional study was conducted from March 2019 to August 2020 on 384 cattle to determine the types of tick genera, favorable preferred site and the relative tick burden. The animals investigated were categorized in to age, sex and body condition score groups according to Nicholson and Butterworth [17]. The animals that were included in this study were those cattle which were not treated with any treatments for a month prior to sample collection time.

Sampling and Sample Size Determination

The study cattle were selected by systematic random sampling to determine Genera of ticks in cattle. The sample size was determined by assuming the expected prevalence of 50% tick infestation. The desired sample for the study was calculated by setting 95% confidence interval at 5% absolute precision [18]. Therefore, sample size of 384 cattle was examined in the study. Areas in the district were selected purposively and the cattle within the selected areas were selected and examined systematically from the household.

Sample collection Methods

Tick collection

Tick collection was done during its parasitic phase from the cattle for tick genera identification. The selected cattle were casted down and restrained appropriately, then the skin of each selected cattle were inspected for the presence or absence of ticks. Adult ticks were manually collected by using forceps from half regions of the animals' body and care was taken to avoid decapitulation [19]. The collected ticks from predilection sites were counted into separate bottle, labeled and preserved in sampling bottles containing 70% ethanol from each study cattle. The ticks were then transported to the Laboratory of Hadiya Zone Livestock and fisheries resource Department, for identification.

Tick identification

Ticks were identified to the genera level according to their morphological key structures such as shape of scutum, legcolour, scutum ornamentation, body grooves, punctuations, basis capitulum, coxaes and ventral plates. During tick identification in the laboratory the sample were put on petridish and adult ticks were identified to genus level under a stereomicroscope using the standard identification keys of [19].

Data Analysis

The data were entered in to Microsoft Excel spread sheets and coded appropriately and analyzed using STATA Version 13.0 statistical software. The data was summarized by descriptive statistics. Chi square test were used to quantify the association among the factors with the presence of tick infestation. For all statistical analysis, a statistical significance level of $p < 0.05$ was considered.

Results

Out of the total 384 animals examined, 304 (79.2%) were found infested with one or more ticks. From the total of 4112 ticks collected, 3 genera and 1 subgenus were identified, of which *Amblyomma* 1912 (46.5%), *Rhipicephalus* (formerly *Boophilus*) accounts 1274 (31%), *Rhipicephalus* 291 (7.1%) and *Hyalomma* 635 (15.4%). From the total count, *Amblyomma* was the dominant tick species and *Rhipicephalus* was the least (Table 2). *Amblyomma* was recorded as the most abundant and the most prevalent tick genera. There was significant **(x2 = 9.86**, Pr = 0.000) difference between different age groups (Table 1).

Variables		Examined	Positive	Prevalence (%)	Chi square	P value
Age	Young	107	83	21.6	9.86	0.00
	Adult	177	144	37.5		
	Old	100	77	20.1		
Sex	Female	217	168	43.7	1.36	0.24
	Male	167	136	35.5		
BCS	Good	30	25	6.5	5.32	0.07
	Medium	223	179	46.6		
	Poor	131	100	26.1		
Overall		384	304	79.2		

Table 1: Prevalence of ticks infestation in age, sex and body condition score

The study revealed that highest rate of overall infestation by ticks occurs during this study period. *Amblyomma* and *Rhipicephalus (Boophilus* genera of ticks were more abundant than the others tick genera during the study. *Hyalomma* and *Rhipicephalu s*ticks were the least collected (Figure 1).

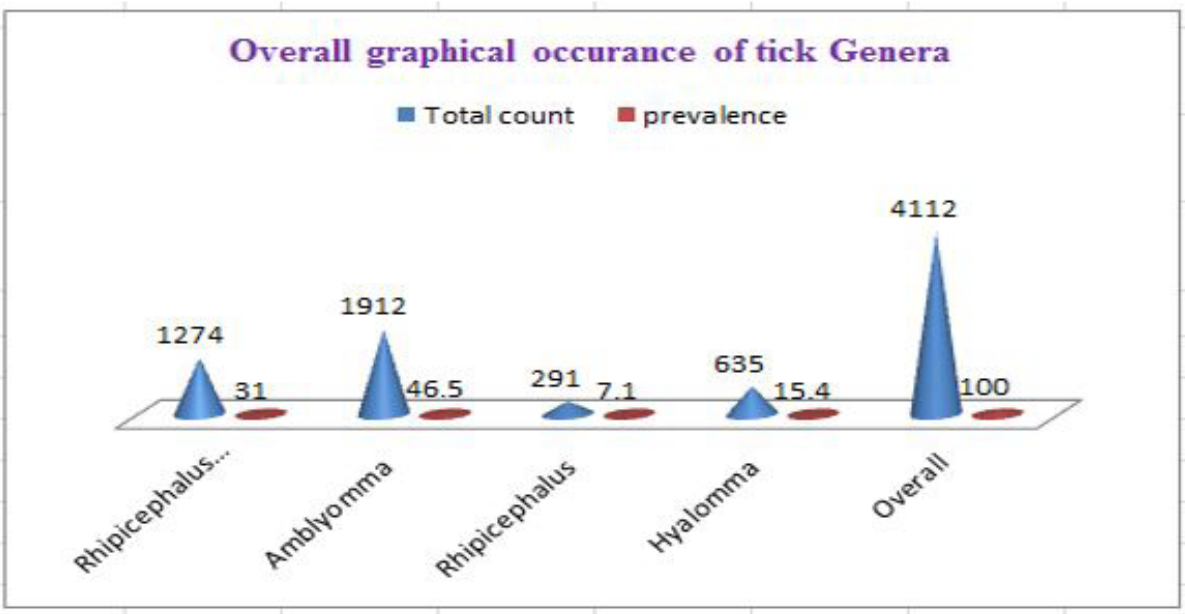

Figure 1: Overall Graphical occurrence of tick Genera

The present study revealed that the preferred attachment sites of ixodidae ticks infesting cattle vary among different genera of ticks. This study suggested that *Ambylomma* species has got greater preference for ventral parts such as udder/scrotum, dewlap/brisket, perineum, legs and shoulder to tail base of cattle in descending order. Tick species that belong to the genus *Hyalomma* showed greater presence for tail and anal region, ventral parts such as legs, perineum and brisket of their host cattle. The subgenus *Rh. (Bo.) decoloratus* looks to had got greater preferences for the attachment sites such as dewlap, head and neck, and shoulder to tail base of their host cattle (Table 2).

Tick genera	Total count	±SD	Predilection sites
Rhipicephalus (Boophilus)	1274	31	Dewlap, neck, head, back
Amblyomma	1912	46.5	udder/scrotum, dewlap/brisket,
Rhipicephalus	291	7.1	Under tail, anovulva, ear and neck
Hyalomma	635	15.4	Under tail, tail brush, anovulva
Overall	4112	100	

Table 2: Count, percentage and attachment sites of tick genera

Discussion

The current study revealed that a total 4112 ticks were collected from a total of 304 animals yielding an overall prevalence of 79.2% and this finding is in agreement with the findings of Nigatu and Teshome [20] who reported an overall prevalence of 89.4%. However, it is different from the findings of Belew and Mekonnen [21]. This difference could be due to the difference in the agro climatic condition of the study areas. Tick activity was influenced by rainfall, altitude and atmospheric relative humidity [22]. Four genera of hard ticks were identified, namely *Amblyomma*, *Rhipicephalus* (*Boophilus), Hyalomm a*and *Rhipicephalus* in the study area. The distribution and abundance of tick species infesting cattle in Ethiopia vary greatly from one area to another area.

Amblyomma as the most prevalent and abundant genera of tick comprising 46.5% of the collected ticks in the study sites. This finding was in line with the findings of Morel, [23]; Pegram *et al.,* [22]; and Assefa, [24] due to the fact that *A. variegatum* is the most common and widely distributed cattle tick in Ethiopia. Likewise *et al.,* [25] indicated *Amblyomma* was the leading tick genera with 43.46% prevalence. This finding was also in agreement with that of previous reports on a high number of *Amblyomma* in three agroecological zones in central Oromia by Ayalew *et al.* [26] and at Haramaya University by Yehualashet *et al.* [27]. It has a great economic importance, because it is an efficient vector of *Cowderi aruminatum* (*Eimeria bovis*) and greatest damage to hide, due to its long mouth parts, so it will reduce the value on world market [28].

In this study *Rhipicephalus (Boophilus)* were found to be the second prevalent and abundant tick species (67.5%). This disagree with Sileshi *et al.* [29] who described that *Rhipicephalus (Boophilus) decolaratus* is the commonest and most wide spread tick in Ethiopia, collected in all administrative regions except in the Afar region. It was in line with Tamru [30] in Asela, and Teshome *et al.* [31] reported the highest prevalence of *B. decolaratus* (80%). According to Shiferaw [32], *B. decolaratus* had highest frequency in the observed area during dry seasons (January, February and early March) in Wolaita zone where as, this result disagreed with the findings of Alekaw [33] at Metekel Ranch, Ethiopia showing prevalence of 5.7%. This may be due to the geographical location and altitude factors which is 1,500 to 1,600 m above sea level of Metekel Ranch. The one-host ticks of the genus *Rhipicephalus (Boophilus)* that parasitize ruminants represent a hindrance to livestock farming in tropical and sub-tropical countries. They transmit the causative agents of anaplasmosis ("gall sickness") and babesiosis ("red water") in cattle [11, 19].

With regard to predilection site for attachment, different tick genera show different site preferences. *Amblyomma* are found in scrotum, udder dewlap and vulva whereas the subgenus *Rh. (Boophilus)* were found on the head and neck, shoulder to tail base and dewlap. *Rhipicephalus* showed high preference to the anogenital region of the body and then followed by the inside of the ear. *Hyalomma* showed similar preferences for the tail and anal region of their hosts which is consistent with previous report by [19].

The current finding revealed that different animal related risk factors were studied to determine whether there is a significant variation in tick infestation between and among different groups of animals with suspected risk factors. The proportion of tick infestation was higher in adult animals as compared to young animals. So, there was statistically significant association ($p > 0.05$), and the higher 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. This finding was also in agreement with the finding of Feseha (1997), Tessema and Gashaw [35] and Belew and Mekonnen [21] who stated a higher proportion in adult cattle.

Conclusion and Recommendations

The present study revealed that high prevalence of ixodid tick infestation in the study area. These pose huge economical and health constraint to the farmers and the animals. The prevalent and abundant tick species investigated in the study area were *Amblyomma, Rhipicephalus (Boophilus), Hyalomma* and *Rhipicephalus*. The study indicated that there was high burden of ticks in the area. However, the attention given to controlling the infestation had not been sufficient. In conclusion, the distribution of ticks are not fixed but are determined by a complex interaction of factors such as climate, host density, host susceptibility, grazing habits, and pasture-herd management. Therefore, effective tick control program should be formulated and implemented based on the distribution pattern of ticks and factors responsible for their distribution. In linewith above conclusion the following recommendations are forwarded:

✓ Systematic intervention and control of tick infestation should be put in place to tackle the diseases.
✓ Detection of acaricide resistance tick species which are economically important since limited types of acaricides were used in the area.
✓ Appropriate pasture management in communal grazing area is important.

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