**WOLDIA UNIVERSITY COLLEGE OF AGRICULTURE, SCHOOL OF**

**VETERINARY MEDICIN**

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**STEDY ON THE PREVALENCE AND IDENTIFICATIONS OF HARD TICK IN CATTLE IN AND AROUND WOLDIA**

**BY**

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**BOARD OF EXTERNAL EXAMINERS**

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# ABSTRACT

# 1. INTRODUCTIN

Ethiopia has the largest livestock population in Africa, with 65 million cattle, 40 million sheep, 51 million goats, 8 million camels, and 49 million poultry (CSA, 2020). In Ethiopia, livestock production remains crucial and represents a major asset among resource-poor small holder farmers by providing milk, meat, skin, manure and traction force (Lemma, et al., 2009).The contribution of livestock to the national economy particularly with regard to foreign currency earnings is through exploration of live animal, meat and skin and hides (MoARD , 2008).

Hides and skin account for 12-16% of the total value of exports from Ethiopia (Asfawet al., 1997). The current utilization of hides and skins in Ethiopia is estimated to be 48% for cattle, 75% for goats and 97% for sheep with exacted off take rate of 33, 35 and 7% for sheep, goats and cattle, respectively ( Mahamudet al., 2000). Though hides and skin are important source of export income its contribution to the national economy may be for below the expected potential. This is due to external parasite like ticks and other (Bayu 2005).

Ticks are blood-feeding ectoparasites found on mammals, birds, and reptile’s worldwide. Phylogenetically, they belong to the phylum Arthropoda and are divided into two large families: Ixodidae (hard ticks) and Argasidae (soft ticks), with the former being the largest and medically most important group (Efstratiou *et al*., 2021). The Argasidae is the family of soft ticks and includes some 193 species, so, it is one of the two big families of ticks. They lack the hard scutum present in the hard ticks (Ixodidae), the capitulum (mouthparts-bearing structure) is located on the underside of the animal’s body and is not readily visible, while in the Ixodidae the capitulum projects forward from the body (William, 2001). In Ethiopia, one argasid tick species, *Argas persicus*, also known as “fowl tick” has been recorded as widely spread in the country (Getahun *et al*., 2016).

The Ixodidae (hard-bodied ticks) are the most important family characterized by a rigid chitinous scutum, for males, it covers the entire dorsal surface of the body (Sarwar, 2017). In adult female, larva and nymph the scutum extends only for a small area to permit the abdomen to swell after feeding. Sexual dimorphism is apparent only in the adult stage (Wall and Shearer, 2008).There are different generas like, *Rhipicephalus*, *Boophilus, Amblyomma*, *Hyalomma,* and *Haemaphysalis*, contain one or more species of major veterinary importance in the tropics (Sonenshine *et al.,* 2002). These are also the most common ixodid tick genera found in domestic animals of Ethiopia (Desalegn *et al*., 2015). .

Approximately 850 species have been described worldwide (William, 2001). Over 79 different species of ticks are found in eastern Africa, but many of these appear to be of little or no economic importance (Kilpatrick et al., 2007). In Ethiopia, about 47 species of ticks are found on livestock and most of them are important as vectors and also have damaging effect on skin and hide production (Anne and Conboy, 2006).

The life cycle of ticks is composed of four instars: the egg, larva (six legged, no reproductive organs), nymph (eight legged, no functional reproductive organs), and adult (Wall and Shearer, 2001). According to the number of hosts they require to complete their development during their life cycle, tick species can be classified into three groups: one-host ticks, two-host ticks and three-host ticks (Mekonnen, 1995) Tick occurrence and tick loads vary with seasons, geographic location, vegetation type, breed, habitation and age of the animal (Dehur et al., 2017).

Ticks transmit the wide varieties of pathogens including bacteria, rickettisia, protozoa and viruses. The major cattle tick borne diseases in Ethiopia are anaplasmosis, babesoisis, cowdrosis and theileriosis (ILRI-FAO, 2005). Ticks also cause nonspecific symptoms like anemia, dermatitis, toxicosis and paralysis (Solomon et al., 2001).

Ticks feed only on the blood of the host and can have direct effect on hosts (Marquardit, 2005). High engorgement ticks species therefore ingest about three times the volume of the blood found at the end of the meal (Walker *et al*., 2003). Attachment of the host causes irritation of the skin, with subsequent ulceration and sometimes secondary bacterial infection (Sileshi *et al*., 2007). In addition, ticks wound may became infested by screw-worm or other agents of mayasis, and also associated with the spread of bovine dermatophilosis caused by *dermatophilus congolensis* (Minjauw and Mcleod, 2003). At the site of tick bite necrosis and hemorrhage occur followed by inflammatory response often involving eosinophils. Tick bite wound can become infected with staphylococcus bacteria causing local cutaneous abscess or pyaemia (Wall and shearear, 2001). The Ixodid ticks recognized for their important direct effect includes species of *Ambylomma,,Hyaloma, and Rhipicephalus* (Minjauw and Mcleod, 2003). In Ethiopia, ticks besides to disease transmission due to ticks borne diseases in livestock, they also have damaging effect on skin and hide production (Bayu, 2005).

A strong association between economic impact and the epidemiology of the diseases has been documented (de la Fuente *et al*., 2019). The losses due to the ticks and tick-borne diseases (TTBDs) complex can be classified as direct and indirect (Rodriguez-Vivas., 2017). The direct economic effect on production results from damage caused by tick bites in heavily infested animals, blood loss in cases of heavy parasite loads, anemia, severe allergic reactions due to toxins in tick saliva, chronic stress and irritation which not only alters the behavior and welfare of the animals, but also leads to immuno-depression, and loss of energy directed to the constant movement that occurs in response to infestation (Abbas *et al*., 2014).

Indirect losses stem from the effects of tick-transmitted pathogens (Alim *et al*., 2012). Other indirect losses include the cost of treatment for clinical cases, tick control costs, unearned income or inefficiencies in the production system such as maintenance of genetically tick-resistant breeds which are less productive (lost potential), acaricide-contaminated animal products, and trade restrictions of livestock products between possible trade partners (Bekele 2002). Therefore, ticks not only cause economic losses through direct mortality of high grade animals, but also by hindering genetic improvement (productive potential) of entire herds or regions (Kivaria, 2006).

The most widely used method for the effective control of ticks is the direct application of acaricide to the host (Minjauw and Mcleod, 2003). The commonly used acaricie include arsenics, amitraz, cyhalothrin, dixathion, ethion, diaznon and ivermectin which is given subcutaneously and allow the satisfactory control of ticks (Rodostits *et al*., 2007). Treatment every 21 days during the tick seasons showed good control. Since nymphal stages appear to be less susceptible to most acaricides a 12 days intetrval is often necessary between treatments at the beginning of the tick‟s seasons (Urquhart *et al*., 1996).

Ticks are one of the most important vectors of animal diseases and ectoparasites globally and have direct impact on the vertebrate hosts, causing to reduction of body weight gain, milk and meat production in cattle, while ticks‟ bites reduce the quality of leathers (skin and hide) (Tamiru and Abebaw, 2010).They are also responsible for anemia and severe dermatitis in domestic animals. Cattle population in the study area are affected by tick but there was no research condacted on tick of cattle in the study area, therefore, elevant data on the distribution of ticks is essential for the development of effective tick and tick borne diseases control strategies.

## 1.1 Objectives

### *1.1.1 General objective*

* To study the prevalence and identifications of hard tick on cattle in Woldia.

### *1.1.2 Specific objective*

* To assess the major risk factors associated with the prevalence of adult hard ticks in cattle in the study area.
* To determine the prevalence of adult hard ticks and identify the major ticks that infecting cattle’s in the study area.

# 2. MATERIALS AND METHODS

## 2.1 Study Area

The study was conducted from December, 2022 to May, 2024 in and around Woldia. Woldia is a town, woreda, and capital city of North Wollo Zone in northern Ethiopia. It is located in north of Dessie and southeast of Lalibela in the Amhara Region, this town has an elevation of 2112 meters above sea level. Lies on the geographical coordinates of 49°59' N latitude and 39° 59' N Longitude.

## 2.2 Study Design

A cross sectional study was applied in 384 randomly selected cattle’s for study on prevalence and identification of hard tick in and around Woldia from December 2023 May; 2024.

## 2.3 Study Animals

The study animals was both local and cross cattle breeds, male and female categorized into three age groups as young (3 years), adult (3-6 years) and old (>6) (Bekele,2002). Body condition categories as; poor, medium and good (Nibret  *etal*, 2012).

## 2.4 Sample Size Determination

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 level at 5% absolute precision (Thrusfield, 2007). Therefore, sample size of 384 cattle were examined in the study.

Sample size determined by the following formula:

N = (1.96)2 x p(1-p) =384

D2

When: N= required sample size;

P= expected prevalence

D= desired absolute precision

Therefore, the sample size of this study was 384.

## 2.5 Tick Collection and Identification

The entire body surface of the host was inspected for ticks. After fully restraining of the animal, all visible adult tick species were removed by hands. Collection of ticks was done on different sites of the animal, like, udder/scrotum, neck,and under tail. Ticks from each animal and from each site were collected and preserved in separate universal bottles containing 70% alcohol that had been pre-labeled before transportation to laboratory for identification. Required information like date of collection, age of animal, sex of animal, body condition scores and site of collection were recorded. Tick genera identification was done using a stereomicroscope at Woldia Unversity Microbiology Laboratory.

## 2.6 Data Analysis

Data obtained in this survey was entered in MS Excel work sheet and analysed using STATA® version 11, for windows software. Descriptive statistical analysis such as table was used to summarize and present the data collected. Ticks prevalence was calculated as percentage by dividing the number of animals positive to the total sampled animals. Pearson chi-square (χ²) test was employed to assess the existence of association between tick infested cattle’s and different potential risk factors considered in the study. For this analysis P-value <0.05 were considered significant whereas Pvalue >0.05 considered non-significant

# 3. RESULTS

## 3.1.Overall Prevalence of Tick Infestation

In the current study out of the total of 384 cattle examined for the presence of ticks, 185(48.18%) were found to be infested with varying number of tick genera. A total of 871 ticks were collected from different body region of cattle. Four Ixodidae tick genera namely Amblyomma, Hayalomma, Boophilus and Rhipicephaluswere identified from the study area. From a total of 384 bovine animalsexamined for tick, 200 were males and 184 were females, according to their age 92 animals were 1-3 years,153 animals were between 4-6 years and 139 animals were >6 year age. Again 42 cross and 342 local breed as well as 75 poor,201 medium and 108 good body condition score cattle were considered for this study. From four genera of ticks Ambiyomma was the most abundant ticks 45.23% (n=394) followed by Hayalomma 27.55% (n=240), Rhipicephalus 21.01% (n=183) and Boophilus 6.21% (n=54).

## 3.2 Prevalence of Tick Infestation Regarding the Host Related Factors

Regarding the host related factors in the study, there was no statistically significant variation (P > 0.05) in prevalence of ticks between the sex and age of animals and there was statistically significant variation (P< 0.05) in prevalence of ticks between the breed and body condition score of animals.The prevalence of tick infestation in local breeds was 50.88 % (n=174) and 26.2% (n=11) in cross breeds.The prevalence of tick infestation in the sex of animals was 49 % (n=200) in male animals and 47.3% (n=184) in female animals.The body condition score of the cattle population was found to be variable among tick infestation Accordingly, high prevalence were recorded in animals having poor body condition 63%(n=75) than that of cattle having good body condition 46.67%(n=108) and cattle having medium body condition 46.77%(n=201). According to age of \animals, the prevalence of tick infestations of young, adult and old was 42.4% (n=92), 47.1% (n=153) and 53.3% (n=139) respectively.(table 1)

**Table 1**: Prevalence of tick infestation based on different host categories (risk factors). table one

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variables | Catago  ries | N | NPA (%) | P-value | OR | 95% CI  [Lower-Upper] |
| Sex | Male  Female | 200  184 | 98 (49%)  87 (47.3%) |  |  |  |
| Age | Young | 92 | 39 (42.4%) |  |  |  |
| Adult | 153 | 72 (47.1%) | 0.151 | 1.52860 | 0.8568521-2.726987 |
| Old | 139 | 74 (53.2%) | 0.027 | 2.061928 | 1.087865-3.908155 |
| BCS | Good | 108 | 45 (46.67%) |  |  |  |
| Medium | 201 | 94 (46.77%) | 0.000 | 3.033438 | 1.797584-5.118952 |
|  | Poor | 73 | 46 (63%) | 0.000 |  | 1.85177-7.346851 |
| Breed | Local | 342 | 174 (50.8%) |  |  |  |
| Cross | 42 | 11 (26.1%) | 0.000 | 0.1566916 | 0.0955312-0.257007 |
| Total |  | 384 | 185(48.18%) |  |  |  |

**NB:** N=total number of examined animal,

NPA=number of positive animals

OR=odds ratio

CI=confidence interval

BSC=body condition score

\

## 3.3.Tick Burden and Identification in Study Area

A total 871 Ixodid ticks were collected among which four genera of ticks were identified. Amblyomma was the most abundant (45.%) genus followed by Hayalomma 27.55% (n=240), Rhipicephalus 21.01% (n=183) and Boophilus was confirmed to be the least prevalent tick genus 6.21% (n=54). During the study time, the number of Male tick genera was higher than female tick in(Table 2)

**Table2:**Identification of the different genera of tick

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tick Genera | No. of Male | No.  of Female | | Total | Male to Female  ratio | Prevalence |
| Amblyomma | 263 | 131 | | 394 | 2.01 | 45.23% |
| Hyalomma | 134 | 106 | | 240 | 1.26 | 27.55% |
| Rhipicephalus | 119 | 64 | | 183 | 1.86 | 21.01% |
| Boophilus | 31 | 23 | | 54 | 1.35 | 6.21% |
| Total |  | |  | 871 |  | 100% |

|  |
| --- |
|  |

The current study indicated that every tick species prefers different attachment sites. Among those ticks attachment site, under Tail (25.8%) was the most preferred sites followed by Udder (23.31%), Scrotum (22.85%), Dewlap (16.43%), Sternum (8.16%) and then Ear 3.45%) (Table 3).

**Table 3**: General of ticks and their distribution on body regions of cattle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Body region | Amblyomma | Hyalomma | Rhipicephalus | Boophilus | Total |
| Under tail | 87 | 65 | 57 | 16 | 225 (25.8%) |
| Scrotum | 101 | 50 | 48 | - | 199 (22.85%) |
| Udder | 95 | 57 | 39 | 12 | 203 (23.31%) |
| Dewlap (Neck) | 63 | 45 | 16 | 19 | 143 (16.43%) |
| Sternum | 48 | 19 | - | 4 | 71 (8.16%) |
| Ear | - | 4 | 23 | 3 | 30 (3.45%) |
| Total | 394 | 240 | 183 | 54 | 871 (100%) |

# 4. DISCUSSION

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