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Ticks infestation in bovine in cases of college of veterinary medicine veterinary clinic and beef cattle farm Haramaya University, Oromia Regional State, Eastern Ethiopia

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Abstract
A cross-sectional study was conducted from December 2020 to January 2021 to determine the species diversity and associated risk factors of ticks on cattle in the study site Haramaya University, CVM, Veterinary clinic and beef cattle farm, Eastern, Ethiopia. During the study period, a total of 50 cattle was considered and examined for presence of ticks and associate risk factors. Ticks were identified to species level by using morphological identification keys under a stereomicroscope. A total of 54 adult ticks were collected and identified to their genera and species level. Two genera and three species were recorded, in which two species each belong to the genus *Amblyomma*, one species belong to the sub genus *Rhipicephalus (Boophilus)*. Of all the total ticks collected, sub genus *Rhipicephalus (Boophilus)* and *Amblyomma* constituted, 20 %, % and 16 % respectively. The adult tick species identified were *Boophilus decoloratus* (100%) *Amblyomma variegatum* (62.5 %) and *Amblyomma cohaerens* (37.5 %). The average burden of adult tick infestation was 3.4 ticks per animal. In this study, poor body conditioned cattle has significantly (P=0.000) higher prevalence of tick infestation during the study period. Therefore, to reduce and avoid losses incurred by ticks infestation, cost effective tick control programs should be formulated and implemented in the study area incorporated with selection of tick resistant breeds of cattle, good management systems and participating and awareness creation of livestock owners regarding tick control and prevention methods.

Keywords: Ticks, Cattle, Cross Sectional Study, Haramaya University, software

1. Introduction

Ticks are obligate blood feeding ectoparasites of vertebrates particularly mammals, birds and reptiles throughout the world (Wall and Shearer, 2001) [74]. All ticks spend most of their life cycle away from their hosts, hiding either in soil and vegetation or in the nests of their hosts (Latif and Walker, 2004) [36]. The blood from mammals, birds, reptiles and amphibians is the only critically important source of nutrition for growth, development of organs for male, female, larvae and nymphs of ticks (Walker *et al*., 2014) [71]. They belong to the phylum Arthropod; class Arachnid, and order Acari (Wall and Shearer, 2001) [74]. Currently, a total of 896 tick species have been described worldwide. Ticks are grouped into three families as Ixodidae (hard ticks) with 702 officially recognized species, Argasidae (soft ticks) comprising 193 species and Nuttalliellidae with a single species (Guglielmone *et al*., 2010) [50]. Ixodid ticks pass via four stages in their development; eggs, 6- legged larva, 8-legged nymph and adult (Minjauw and McLeod, 2003) [46]. They are categorized into one-host; two-host or three-host life cycles according to the number of host required to complete their lifecycle (Walker *et al*., 2014) [71].

In Ethiopia, ticks are very common and widely distributed in all agro-ecological zones of the country (Pegram *et al*., 1981; Kumsa *et al*., 2013) [54, 71]. They are prominent parasites and competent vectors of pathogens that affect both humans and animals (Estrada-Peña, 2015) [13] and are usually considered to have more veterinary significance because they negatively affect the health and productivity of domestic animals as a consequence of direct parasitism and disease transmission (Latif and Walker, 2004) [36]. They are responsible for severe economic losses both through the direct effects associated with their blood sucking behavior (Jongejan and Uilenberg, 2004; Kumsa *et al*., 2015) [27, 34].

The main genera of ticks infesting cattle in Ethiopia are *Ambylomma*, *Rhipicephalus*, *Hyalomma* and *Haemaphysalis* and a subgenus *Rhipicephalus* (*Boophilus)* (Mokonnen *et al*., 2007). Several studies have been conducted in different parts of Ethiopia on ticks infesting cattle (Pegram *et al*., 2004; Yacob *et al*., 2008; Kumsa *et al*., 2016) [78, 66]. The most common *Ixodid* ticks species infesting cattle in Ethiopia are *Ambylomma cohaerens*, *Am. variegatum*, *Am.gemma*, *Rh (Boo.). decoloratus*, *Rh. pulchellus*, *Rh. evertsi*, *Rh. praetextatus*, *Hy. rufipes*, *Hy. dromedarii Hy. truncatum*, *Ha.aciculifer* and *Ha. leachi*(Mekonnen *et al*., 2001; Mokonnen *et al*., 2007; Melaku, 2013; Kumsa *et al*., 2016; Teshale *et al*., 2016) [66].

The previous studies report revealed that that approximately 80% of cattle populations of the world are at risk of tick infestation (Kumsa and Mekonnen, 2011) [30]. Tick infestations have nowadays received greater importance and thus there is increasing necessity for accurate identification of ticks species diversity and geo-graphical distribution (Teshale *et al*., 2016) [66]. However, there is lack of precise and up-to-date comprehensive information on ticks species diversity and associated risk factors of ticks infestations in cattle in cases of Haramaya University CVM, Veterinary clinic and Beef cattle farm, Eastern, Ethiopia.

Therefore, the major objectives of this study were:
To determine the prevalence, species diversity and associated risk factors of tick infestation in cattle in study area.

2. Literature review

2.1. Taxonomy of Ticks

Ticks are within a member called the phylum (Arthropoda), class (Arachnida), sub class (Acari) and Order (Parasitiformes) (Torr *et al*., 2004) [70]. Within the Parasitiformes, ticks belong to the suborder Ixodida, which contains a single super family, the Ixodoidea, which is divided into two major families, Argasidae (soft ticks) and Ixodidae (hard ticks), and the rare family Nuttalliellidae, with a single African species (Bowman and Nuttall, 2008; Estrada-Peña *et al*., 2010) [7].

Nuttalliellidae represents only one single species (Nutalliella namaqua; found in South and South-West Africa as a parasite of small mammals).The terms hard and soft refer to the presence of a dorsal scutum or "plate" in the Ixodidae, which is absent in the Argasidae. Their mouthparts are anteriorly attached and visible from dorsal view. If eyes are present, they are located dorsally on the sides of the scutum (Goddard, 2009) [20]. The family Ixodidae, or hard ticks, contains some 683 species. As adults, Ixodid exhibit prominent sexual dimorphism: the scutum covers the entire dorsum in males, but in females (and immatures) the scutum is reduced to a small podonotal shield behind the capitulum, thereby permitting great distention of the idiosomal integument during feeding (Jongejan and Uilenberg, 2004) [27]. Ixodidae ticks are relatively large and comprise thirteen genera. Seven of these genera contain species of veterinary and medical importance: Amblyomma, sub genus Rh. (Boophilus), Rhipicephalus, Haemaphysalis, Hyalomma, Dermacentor and Ixodes (Lora, 2001) [39].

The family Argasidae, or soft ticks, consists of about 185 species worldwide and have one important genus that infests cattle, Ornithodoros (Latif and Walker, 2004) [36]. Adult argasids lack a dorsal sclerotized plate or Scutum, their integument is leathery and wrinkled, their mouthparts are not visible from above, and they show no obvious sexual dimorphism. Argasidae are wandering ticks, which only remain on their host while feeding (Barker and Murrell, 2004) [3].

2.2. Morphology

Tick morphology consists of two primary regions, the mouthparts (capitulum) and the body (idiosoma). The mouthparts on hard ticks protrude in front of the body and are visible from above, but the body of soft ticks extends forward above the mouthparts so they are only visible from beneath as indicated in (Figure 1). The body of ticks includes the eyes, legs, and respiratory, digestive and reproductive structures (Nava *et al*., 2009) [50].

***Source*:** (Nava *et al*., 2009) [50]

Fig 1: Morphology of hard (right) and soft (left) tick

Ticks differ from other mites; they are larger and have recurved teeth or ridges on the central mouthparts (called the holdfast organ). Ticks do not have wings and they cannot jump and they cannot run, hop, fly or even move quickly**.** They also have a sensory pit on each of the first pair of legs known as Haller's organ which is packed with chemoreceptor setae used in host location. This pit detects stimuli such as heat and carbon dioxide. Ticks also detect light and dark as well as shapes, shadows and vibrations all stimuli that help them find their vertebrate hosts. Ixodidae ticks are relatively large, ranging between 2 and 20mm in length. Ixodidae ticks are characterized by the presence of a rigid chitinous Scutum that covers the entire dorsal surface of the adult male whereas it extends only for a small area in the female (Estrada-Peña *et al.*, 2010) [14].

The mouthparts (capitulum) have three specialized structures called palps, chelicerae and a hypostome that are attached to a base called the basis capituli. The body (idiosoma) of ticks is typically not hardened to a great extent. In hard ticks, most of the exterior cuticle is soft and has many internal folds that look like grooves on the surface of the body. The uniform, rectangular folds located on the rounded posterior end of hard ticks are called festoons. Unfolding and stretching of the soft cuticle along these grooves allows immature and adult female hard ticks to take enormous blood meals and swell to weigh 50 to 100 times their original weight (Lehane, 2005) [38].

2.3. Life cycle

In the hard ticks mating takes place on the host, except with Ixodes where it may also occur when the ticks are still on the vegetation. Male ticks remain on the host and will attempt to mate with many females whilst they are feeding. They transfer a sac of sperm (spermatheca) to the female. The females mate only once, before they are ready to engorge fully with blood. When they finally engorge they detach from the host and have enough sperm stored to fertilize all their eggs. Female hard ticks lay many eggs (2,000 to 20,000) in a single batch. Female argasid ticks lay repeated small batches of eggs. Eggs of all ticks are laid in the physical environment, never on the host (Hendrix and Robinson, 2016) [23].

Members of the family Ixodidae undergo either one-host, two-host or three-host life cycles. Most ticks of public health importance undergo the three-host life cycle. The three hosts are not always the same species, but may be the same species, or even the same individual, depending on host availability for the tick. Argasid ticks have two or more nymphal stages, each requiring a blood meal from a host. Unlike the Ixodidae ticks, which stay attached to their hosts for up to several days while feeding, argasid ticks are adapted to feeding rapidly (about an hour) and then promptly leaving the host (Latif and Walker, 2004) [36].

All feedings of ticks at each stage of the life cycle are parasitic. For feeding, they use a combination of cutting mouthparts for penetrating the skin and often an adhesive (cement) secreted from the saliva for attachment. The ticks feed on the blood and lymph released into this lesion. All ticks orient to potential hosts in response to products of respiration. The feeding of Ixodidae ticks is slow because the body wall needs to grow before it can expand to take a very large blood meal. Males of Ixodidae ticks feed but do not expand like the females. They feed enough for theirreproductive organs to mature (Dantas-Torres, 2008; Huruma *et al.*, 2015; Hendrix and Robinson, 2016) [9, 8, 23].

2.3.1. Life cycle of one host ticks

Eggs are laid on soil. Larvae hatch after several weeks of development and crawl onto vegetation to quest for a host. When they have completed feeding they remain attached to the host and moulting occurs there. The nymphs then feed on the same host and also remain attached. After another moult the adults hatch and then feed on the same host. The adults will change position on the same host for mating. Thus all three feedings of any individual tick occur on the same individual host. The life cycle of one-host ticks is usually rapid, for sub genus Rhipicephalus (Boophilus) it takes three weeks for the feedings on one host and two months for egg laying and larval development. The adult is considered the diagnostic stage, as identification to the species level is best achieved with adults. Few Ixodidae of public health importance follow this pattern; an example is *Rhipicephalus (Boophilus) annulatus*, which can serve as a vector for Babesiosis (Estrada-Peña *et al.*, 2010) [14]. Vertical transmission of Babesia via transovarially transmission has been demonstrated for some species of ticks (Kumsa *et al.*, 2014) [32].

2.3.2. Life cycle two host ticks

The two-host life cycle is similar to one-host life cycle but only the larvae and nymphs feed on the same individual host, and the adults will feed on another host. *Hyalomma detritum detritum* and *Rhipicephalus evertsi* have two-host life cycles. The adult is considered the diagnostic stage, as identification to the species level is best achieved with adults. An example of an Ixodidae tick of public health concern with this life cycle is *Hyalomma marginatum*, a vector of Crimean-Congo viral hemorrhagic fever. Two-host Ixodidae ticks have a life cycle that usually spans over two years. Gravid females drop off the second host after feeding to lay eggs. Adults feed on the second host during the summer and mate. In the fall, females drop off the second host to continue the cycle. Humans may serve as first or second hosts for ticks with this life cycle. Also, the second host does not necessarily have to be a separate species, or even a separate individual, as the first host (Latif and Walker, 2004) [36].

2.3.3. Life cycle of three host ticks

This is the commonest type of lifecycle. Larvae develop in the eggs until ready to hatch, usually in several weeks. Larvae feed once on a host, then detach from the host and hide in sites such as soil or vegetation. They moult to nymphs. Nymphs feed once and moult in the same way as larvae. From the nymphal moult either a female or male hatches. The female feeds once and lays one huge batch of eggs. The depleted female then dies. The male may take several small feeds, mate and then die. Ticks that have recently hatched from eggs or from moulting have soft bodies and are inactive for one to two weeks until the external body wall hardens. The life cycle of three host ticks is slow, from six months to several years. The adult is considered the diagnostic stage, as identification to the species level is best achieved with adults. Most ticks of public health importance follow this pattern, including members of the genera Ixodes (Lyme diseases or borreliosis, babesiosis), Amblyomma (tularemia, ehrlichiosis and Rocky Mountain spotted fever), Dermacentor (Rocky Mountain spotted fever, Colorado tick fever, tularemia, tick paralysis), and Rhipicephalus (Rocky Mountain spotted fever, boutonneuse fever). The three hosts do not necessarily have to be different species, or even different individuals. Also, humans may serve as first, second or third hosts (Estrada-Peña *et al.*, 2004) [14].

2.4. Pathogenicity and clinical signs

Direct effects of ticks on cattle are tick worry, blood loss, damage to hides and skins of animals and introduction of toxins (Marufu, 2008) [40]. Tick feeding can introduce cutaneous bacteria into the skin, causing abscesses, or into the circulation, leading to bacteraemia and septicaemia (Wall *et al*., 1997) [74].

2.5. Diagnosis

Ticks diagnosis is based on history, clinical examination and the collection and identification of ticks from the skin and environments. The laboratory techniques used for examination of ticks are Visual examination or by using stereomicroscope (Wall and Shearer, 1997) [74].

2.6. The distribution of ticks in Ethiopia

The distribution and abundance of tick species infesting domestic ruminants in Ethiopia vary greatly from one area to another area (Kongsuwan *et al.*, 2010) [29]. In Ethiopia, studies on tick fauna have begun early in the 19th century. Since then, different researchers from abroad and country determine the pattern of ticks and the tick-borne diseases; and ticks are common in all agro-ecological zones of the country (Santana, 2000; Willadsen, 2004) [59, 76]. The main tick genera found in domestic animals of Ethiopia are *Amblyomma*, *Hyalomma*, *Rhipicephalus*, *Haemaphysalis* and *Rhipicephalus* (Kongsuwan *et al.*, 2010) [29].

Among the genera *Rhipicephalus*, *Rhipicephalus lunulatus* species were observed in Central Ethiopia (Silk, 2009) [63] and *Rhipicephalus muhasmae* in Borena (Xu *et al*., 2005) [77], in wetter western areas of the country (Willadsen, 2004; Habeeb, 2010) [76]. Seyoum, 2001 [60]; Moyo and Masika, 2008) [49] has recorded *Rh. humoralis*, *Rh. cliffordi*, *Rh. compositus* and *Rh.distinctus* in Wollo and Northeast areas. *Rhipicephalus evertsi evertsi*, "Red-legged tick" Solomon *et al*. (2001) [65], is the most widespread species of *Rhipicephalus* (Njoroge and Bussmann, 2006; Hlatshwayo and Mbati, 2005) [51]. *Rhipicephalus pulchellus*, "Zebra tick" (Solomon *et al*., 2001) [65], is distributed widely in the north eastern (Moyo and Masika, 2008) [49], eastern (Regassa, 2000) [56] and southern range (Hlatshwayo and Mbati, 2005) part of the country. *Rhipicephalus simus*, "Glossy tick" (Solomon *et al*., 2001) [65], are found in northern (Njoroge and Bussmann, 2006) [51], eastern (Regassa, 2000) [56], central (Silk, 2009) [63]. Of the genus Amblyomma four species that commonly infest cattle includes *Amblyomma variegatum*, *A. gemma*, *A. lepidum* and *A. cohaerens* and are known to exist in Ethiopia (Forse, 1999; Melaku, 2013). Regassa in Borena zone showed that *A. variegatum*, *A.gemma* and *A. lepidum* distributed in wider area of southern Ethiopia.

From the studies of Abebaw (Pegram, 1981) [54] in Jimma *A.variegatum* and *A. coherence* are widely distributed in south western Ethiopia. *Amblyomma variegatum* and *A. cohaerens* are the two most prevalent *Amblyomma* species in Awassa areas in decreasing order (Morel, 1989) [12]. In eastern Ethiopia, *A.variegatum* and *A. gemma* are the two most widely spread species (Sileshi *et al*., 2007) [15]. *Amblyomma gemma*, "*Gem-like bont tick*" (Mekonnen *et al*., 2001), is recorded in eastern and southern Ethiopia (Willadsen, 2004; Habeeb, 2010) [76]. *Ambylomma variegatum* and *Ambylomma* coherence in was also recorded in Haramaya (Regassa, 2001) [58]. It is clearly associated with dry types of vegetation or semi-arid rangelands (Willadsen, 2004) [76]. *Amblyomma lepidum*, "East African bont tick" (Mekonnen *et al*.,2001) [25], is most commonly inhabits arid habitats and in open bushed shrub or wooded grassland and its distributions overlap with *Ambylomma gemma* and that of *Ambylomma variegatum* (Solomon *et al*., 2001) [65].

Two species of *Rhipicephalus* (Boophilus) sub genus are known to exist in Ethiopia, which include *Rhipicephalus (Boophilus) decoloratus* and *Rhipicephalus (Boophilus) annulatus*. The study done by Regassa in Borena zone; (Mekonnen *et al*.,2001; Silk,2009) [58, 63] in central Ethiopia; Assefa (Pegram, 1981) [54] in Asella; Berhane Regassa, 2001) [58] in Awassa; Dessie (De Castro,1994) [24] in Asella; Seyoum (Moyo and Masika, 2008) [49] in Wollo and Asosa area (Seyoum, 2001) [60] indicated the distribution of *Rhipicephalus* (Boophilus) decoloratus. *Rhipicephalus (Boophilus) annulatus* is known to present in Gambella region and recorded by Pegram et al (Willadsen, 2004) [76] and de Castro (Habeeb, 2010) [76]. In Ethiopia, about eight species of *Hyalomma* that affect cattle are identified, which includes *Hyalomma marginatum rufipes*, *Hy. dromedarii*, *Hy. tuncatum*, *Hy.m. marginatum*, *Hy. impelatum*, *Hy. anatolicum excavatum*, *Hy.anatolicum anatolicum* and *Hy. albiparmatum* (Mekonnen *et al*.,2001) [78].

2.7. Control and Prevents of ticks infestation

The successful implementation of rational and sustainable tick control programmes in grazing animals is dependent upon a sound knowledge of the ecology or epidemiology of the tick as it interacts with the host in specific climatic, management and production environments. In most situations, however, efficient and reliable methods for the control of cattle ticks and TBD are based on the use of a chemical treatment (acaricide application), often without a local understanding of appropriate ecology or epidemiology (FAO, 2004; Alanr, 2011) [38, 26].

The availability of each of these options, their advantages and disadvantages, and the cost benefit of each alternative strategy should be assessed before deciding on a control programme (Kirby, 2010) [20]. Ideally, strategies should target the parasitic and free-living phases of the life cycle and the role of the ticks in the transmission of TBDs should not be neglected (Kaufman *et al*., 2006) [37].

It is now generally understood that tick control should not only be based on acaricide use, despite the fact that this remains the most efficient and reliable single method. Complementary approaches have been developed and are being researched to enable integrated control strategies against the tick and its haemoparasites (Kirby, 2010; Alanr, 2011) [10, 68]. The most common tick control methods used are briefly described as follows:

Ecological tick control: Ecological control method is used for habitat and host linked treatment. Tick control in the habitat and vegetation requires modification of the plant cover by removal of vegetation that shelters ticks (Kirby, 2010) [51].

Biological tick control: During the past decades, interest in developing antitick biocontrol agents such as birds, parasitoides, entomopathogenic nematodes, entomopathogenic fungi and bacteria have gained momentum (George *et al*., 2008) [6].

Chemical tick control: Acaricide treatments are commonly used in a suppressive approach, applying multiple treatments at regular intervals during the height of infestation.

Tick vaccine: A vaccine by contrast has the potential to be a non-contaminating, sustainable and cheap technology, potentially applicable to a wide variety of hosts.

Ethno-veterinary in control of tick: Ethno-veterinary medicine covers people's knowledge, skills, methods, practices and beliefs about the care of their animals (Moyo and Masika, 2008) [49]. Some of the ethno veterinary remedies have been documented and some have been validated for their acaricidal properties. For example, certain plants have been found to possess strong acaricidal and/ or tick repellent properties. These include: *Nicotiana tabacum*, *Vernonia amygdalina*, *Tephrosiavogelii*, *Chrysanthemum cinerariaefolium* (Kongsuwan *et al.*, 2010) [29].

3. Material and Methods

3.1. Study Area

The study was conducted from December, 2020 to January, 2021 in Haramaya University, College of Veterinary Medicine, Veterinary Clinic and Beef cattle farm. Haramaya University is located in eastern Hararghe zone, Oromia regional state, Ethiopia. Haramaya is located approximately 527km east of Addis Ababa; 14km west of Harar town. The elevation of the area is about 2000m above sea level and geographically it located 041°59'58'' latitude and 09°24'10''longitudes. The district has about 63,723 cattle 13,612 sheep 20,350 goats 15,975 donkeys 530 camels and 42,035 chickens. The district receives an average annual rain fall approximately 900mm and climatically there are two ecological zones of which 66.5% is midland and 33.5% is lowland (Shimelis, 2010) [61].

3.2. Study Animals

The study animals were cattle come to CVM, Veterniary Clinic and kept for Beef purpose at Haramaya University beef cattle farm. The study was conducted on cattle for the investigation of tick infestations in study area. The study was conducted on 50 cattle which manage under extensive and semi-intensive management system. The information regards to age, sex, breed, body condition and was made during sample collection.

3.3. Study Design

A cross-sectional study design was used to determine the magnitude of tick infestation in cattle and their associated risk factors from December, 2020 to January, 2021.

3.4. Sampling

3.4.1. Sample Size Determination

By presence ticks were using simple random sampling methods and 95% identified by Directsteriomicroscope. Adult ticks were confidence interval with required 5% precision, the sample collected and identified of each adult tick was size was determined by the formula of (Thrusfield, 2007).

$$n = \frac{1.96^2 \, pexp\,(1-pexp)}{d^2}$$

n= required sample size
Pexp=expected prevalence
d= required precision

The expected prevalence of tick infestation in eastern Ethiopia was 40.26% (Amsalu *et al.*, 2017) [2]. Based on the above formula the total sample size is 91 but due to time limitation and COVID-19 Problem only 50 animals were examined to isolate species diversity and determine the prevalence of tick infestation in the study site.

3.6. Sample Collection and Laboratory Processing For Ticks Infestation

Each animal was thoroughly examined for the presence of ticks by direct macroscopic observation, exposed body parts (Nwosu *et al.*, 2003) [52]. Tick collections were done during its parasitic phase from the cattle for species identification. The selected cattle was restrained appropriately, the skin of each selected cattle were inspected for the presence or absence of ticks. All visible ticks (adults) were manually collected by using forceps from different body of animals and cares were taken to avoid damage of different organ of ticks (Walker *et al.*, 2014) [71].

The collected ticks from predilection sites were kept into separate bottle, labeled and preserved in properly labeled plastic container containing 70% ethanol for each study cattle. Then the ticks were transported to the Parasitology Laboratory of the College of Veterinary Medicine of Haramaya University located at station campus, for identification. Ticks were identified to the species level according to their morphological key structures such as shape of scutum, leg colour, scutum ornamentation, body grooves, punctuations, basis capitulum, coxaes and ventral plates. During tick identification in the laboratory the sample was be put on petridish and adult ticks were identified to species level whereas larvae and nymphs were identified to genus level under a stereomicroscope using the standard identification keys of Pegram *et al*. (1987); Houseman (2013) [25] and Walker *et al*. (2014) [71]. Sample collection format was also prepared and the history of the individual cattle such as age, sex, body condition score and other characteristics was recorded while taking sample.

4.7. Data Management and Statistical Analysis

The data was summarized, compiled and after coding stored in Microsoft Excel 2007 spread sheet and transfer to R software, Version 3.5.1 for statistical analysis. Descriptive and analytic statistics were computed using R Software, Version 3.5.1. Logistic regression analysis was employed to see the association of risk factors with that ticks infestation. The degree of association was computed using Odds Ratio (OR) and 95% confidence interval (CI) (Thrusfield, 2005)

5. Result

Of the total of 50 cattle examined 16 (32%) of them were infested with one or more ticks (Table 1). Overall, three species of ticks belonging to two genera *Ambylomma*, sub genus (*Rhipicephalus*) *Boophilus* were identified (Table 2 and Table 3).

Table 1: Overall prevalence of tick infestation in cattle in cases of CVM, Veterinary clinic and HU Beef Farm

Number of examined	No. of Positive	No. of Negative
50	16	34
Total	0.32(32%)	0.68(68%)

The prevalence of tick infestation in bovine was 36% in HU beef farm and 25% in CVM, Veterinary Clinic respectively (table 2).

Table 2: The prevalence of tick infestation in bovine based on study sites

Study Sites	No.examined	No.of positive (%)
HU Beef farm	25	9(36)
CVM,Veterinary Clinic	25	7(25)
Total	50	16(32)

Morphological identification of the collected ticks revealed the *Subgenus (Rhipicephalus) Boophilus* (20%) was the most prevalent in the cases of CVM, Veterinary clinic and HU Beef Farm followed by genus and *Amblyomma (*16%) (Tcable 3).

Table 3: Prevalence of genera of ticks infesting cattle in the cases of CVM, Veterinary clinic and HU Beef Farm

Genus	No. of cattle infested	Prevalence (%)
Ambylomma	8	16
Subgenus Boophilus	10	20

Morphological identification of the collected ticks showed that *Rhipicephalus (Boophilus) decoloratus* (100%), was the most prevalent and predominant tick species on cattle in the study area followed by *Amblyomma variegatum* (62.5%) and *Am.coharences* (37.5%) (Table 4).

Table 4: The prevalence of tick species on cattle in the cases of CVM, Veterinary clinic and HU Beef Farm.

Species	No. of cattle infested	Prevalence (%)
Ambylomma Variegatum	5	62.5
Ambylomma coharunes	3	37.5
Rhipicephalus(Boophilus) decoloratus	10	100

The current study showed that the risk of infestation of female cattle was higher when compared to male cattle. The study also indicated that ticks infestation was higher on adult cattle than on young and old cattle. Ticks infestation on cattle with poor body condition scores was significantly higher (P=0.000) when compared with medium and good body condition score (Table 5).

Table 5: Potential risk factors for tick infestation status of cattle in the cases of CVM, Veterinary clinic and HU Beef Farm.

Risk factors	No. of examined	No. of positive (%)	Chi-square(χ2)	P-value
Sex				
Male	32	9(28)	1.95	0.458
Female	18	7(38.8)		
Body Condition score				
Poor	11	11(100)	0.047	0.000
Medium	27	5(18.5)		
Good	12	1(8.3)		
Age				
Adult	22	9(41)	2.345	0.478
Old	15	3(20)		
Young	13	4(30.7)		

χ^2 = Chi-square

6. Discussion

The current study showed that ticks infestations in cattle are the major constraints on the animals production and productivity in the study area. In this study, adult ixodid ticks of two genera (*Amblyomma* and subgenus *Rhipicephalus Boophilus*) and three tick species were identified. This finding is in agreement with the previous study report in and around Haramaya town, Eastern part of Ethiopia by Amsalu *et al*. (2017) [2]. The most abundant species ticks identified in the study areas were *Rhipicephalus (Boophilus) decoloratus* (100%) followed by *Amblyomma vareigatum* (62.5%) and *Amblyomma cohaerens* (37.5%) in the study area respectively.

Rhipicephalus (Boophilus) decoloratus is the most abundant tick species in the study area that accounts for 100 %, this result was in higher three times than with other study conducted in Humbo district (Wasihun and Doda, 2013) [75] in Ethiopia with the prevalence of 30.63% and in addition to this the current study result higher than the study conducted in Holeta town (Tiki and Addis 2011) [67] with the prevalence of 18.13%. It is mainly found in wetter high lands and sub-high lands receiving more than 800 mm rain fall annually. The distribution pattern is similar to that of *Amblyomma variegatum* (Pegram *et al*., 1981; Feseha, 1997) [53].

Amblyomma vareigatum (62.5%) is the second most abundant ticks in the study area. This ticks known by its common name, the tropical bont tick, is widely distributed in Ethiopia (Sileshi *et al*., 2007) [62] and is the most important ticks of livestock mainly because of it is the principal vector of economically important livestock tick- borne diseases.

Amblyomma cohaerens is the third abundant tick during the study periods and makes 37.5 % of the total collection of adult ticks. The result of this study was inconsistent with the study conducted in Jimma areas (Yetbarek, 2004) [79] which reported *Amblyomma cohaerens* to be the first most abundant tick of cattle in west Ethiopia.

The prevalence tick infestation in cattle are significantly associated with the poor body condition scores of the animals (p-value = 0.047) when compared with other potential risk factors were considered during the study period. This finding was also in agreement with the findings from the similar location, in Eastern Harerghe which reported higher prevalence in poor body condition animals than medium and good body condition cattle. The prevalence of tick infestation between different body condition score groups had a significant difference (p-value<0.0001) which was in line with the study conducted in Assosa, Western Ethiopia (Bossena and Abdu, 2012) [6]. The higher Prevalence in poorly conditioned animals was most likely due to poor management system and low immunity associated with inadequate nutrition.

The higher prevalence of tick infestation was observed in Adult (41%) age animals when compared with young animals. The higher proportion might be due to outdoor management and of long distant movement of adult animals to search feed and water as compared to younger animals, so the chance of exposure is higher and it also associated with decreased in immunity as the animals get older.

7. Conclusion and Recommendation

The overall prevalence revealed that tick infestations are the major health problem of animals in the study area. During the study period two genera and three species of ticks were identified. The most abundant and distributed tick species in the study area are *Rhipicephalus (Boophilus). decoloratus*, *Ambylomma. variegatum*, and *Ambylomma. cohaerens*. Age, sex and body condition scores of animals were considered as potential risk factors where, tick infestation was found significantly higher in poor body condition scores cattle as compared to medium and good once. To design the appropriate tick infestation control strategies the potential risk factors should be taken into consideration.

Based on the above conclusion the following recommendations are forwarded

- Detail studies on tick infestation of cattle should be conducted in study areas with large sample size.
- Awareness creation about the economic importance of

tick infestation of cattle in study areas is needed.
- Appropriate control intervention need to be implemented to reduce the negative impacts of tick infestation of cattle in study areas.

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