Prevalence and Identification of Ixodide Ticks in Cattle in Lalo Assabi District, West Wollega Zone, West Oromia, Ethiopia

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Abstract

Ticks are important parasite of cattle that cause huge economic loss at private and national level. Therefore, the cross sectional study was conducted from October 2016 to June 2017 in Lalo Assabi district of West Wollega Zone. The aims of the study were to determine the prevalence of tick infestation and to identify their predilection site, possible risk factors and distribution in the rural and urban area of Lalo Assabi districts. Peasant Associations (PAs), sex, age, body conditions of animals and ticks genera were major factors involved in the study. A systematic random sampling study design was followed to collect samples. From the total of 384 cattle, 265 (69%) cattle were found to be infested with tick. Out of five peasant associations examined, highest prevalence (80.4%) was recorded at Barko Daleti Peasant Associations. Highest prevalence (82%) was observed in male than in female animals (59%). Relatively highest prevalence was recorded in adult animals (70.7%) as compared with young and old age animals. *Amblyomma, Boophilus* and *Rhipicephalus* were tick genera with infestation rate of 30.7%, 23.2% and 15.1%, respectively. Animals with good body condition were relatively affected (74.1%). Different tick genera have different predilection sites. *Amblyomma* had strong preference for udder or scrotum (19.3%), *Boophilus* was highly prevalent on Udder or Scrotum and Genus *Rhipicephalus* was highly found attached to Dewlap (21.1%). However, there was no significant variation on the prevalence of tick infestations (P>0.05). The study revealed that ticks are the most important ectoparasites and cause economic losses in the area. Animal's husbandry and management improvement is warranted to reduce the rate of tick's infestation.

Introduction

Ethiopia, located in the horn of Africa between latitude 30^0 North to 15^0 North of the equator and the longitude from 33^0 East to 48^0 East is agrarian country with an estimated a total land area of 1,101,000 km^2. The proportion of a total population agriculture sector is 82.4% (CSA, 2002). According to CSA (2003) estimate, the livestock population is about 3o million heads of cattle, 24 million sheep, 18million goats, 72 million equines, 1.25 million pigs, and 55.6 million poultry. The Ethiopian contributes only 15% of the GDP.

Total heard 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 (CSA, 2002). However, the occurrence of the disease and parasite are

the major contributing factors that have impeded the full exploitation of the cattle potential (Mesele, 1989).

Vector and vector born disease (VBD) are the major constraints to the developments to the of viable livestock industries where they occur (Mekuria, 1987). The tick and tick born diseases (TBD) are widely distributed throughout the world particularly in tropical and subtropical countries, which cause a tremendous loss in livestock production (Kettle, 1995). In most parts of Africa, including Ethiopia tick and TBD, together with tsetse and trypanosomosis are economically very important disease (Solomon *et al.,* 2001). The economic losses caused by tick and TBDs in cattle alone are estimated at US $ 13.9- 18.7 billion annually worldwide (De castro, 1997). The problem is severing in developing countries where the resource for control and eradication is very limited (FAO, 1984). Among developing countries in Ethiopia, the ticks occupy the first place among the external parasite, and the economic loss incurred when they infest livestock, particularly is enormous (Feseha, 1983).

According to Walker *et al.,* (2003) ticks are considered to be the most important to the health of domestic animals in Africa comprise about seven genera. Among these tick genera, the main ticks found in Ethiopia are *Amblyomma, Boophilus, Haemaphysalis, Hyalomma, Rhipicephalus.* The most important and wide spread tick species are *Amlyomma varigatum* (vector of cowdria rumminantum and Theileria mutans) and *Boophilus decoloratus* (vector of Anaplasma marginale and Babesia bigemina) (Abebaw, 2004). These ticks are important transmitters of disease and can damage the hides and skins, and interfere with meat production. Extensive survey have 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 Boophilus decoloratus, Amlyomma varigatum, R. eversi eversi, Haylomma marginatum rufipes, *Hyalomma truncatumi, Ambyomma cohaerance, Amlyomma gemma, Alyomma elide, Rhipicephalus pulchellus* are also frequently reported in many tick survey carried out in the country (Seyoum, 2001; Solomon, 2007).

Even though there is high risk of tick infestation in the study area, there is no detail current study on tick population, species of tick and the most predominant tick species causing nausis to animal population and high economic losses is not identified.

Hence the objective of the study is:-

To identify the main tick genere infesting the cattle and their distribution in the rural and urban area of Lalo Assabi districts.

To identity predilection site of important tick genus infesting cattle

To asses possible risk factors for tick parasite in cattle

Materials and Methods

Study Area

The study was conducted in Lalo Assabi district in west wollega zone of Oromia Regional State from October 2016 to June 2017. The district capital town, Enango, is located at 461 km to the East of Addis Ababa, the capital city of Ethiopia. Geographically, the district lies between $9°$-20^0N latitudes and 35^0-45^0E longitudes. The total area coverage of the district is estimated at 76 to 261 hectares of land. The altitude of the district ranges from 1500m to 1900m above sea level with the annual rain fall of 1750mm and the mean annual minimum and maximum temperature of 20 and 30°C, respectively. Lalo Assabi is bordered in the east by Ghimbi district, in the west by Guliso district, in the north by Boji dirmaji district and in the south west by Ganji district and south east by Homa district.

According to the district livestock and fishery office recorded data of the total population sizes of the district would 119460 in 2016,out of the total population the registered cattle population is 25411, sheep 16806, goats 1202,horse 5 mule 114,donkey 4115,poultry 71807 and 53520 honey bees. This includes both exotic and local breeds of animals.

Study Population

Among population of animals the study was conducted on cattle populations that are present in rural and urban area of Lalo Assabi district. All the cattle sampled were local breeds kept under extensive production system.

Study Design

A cross sectional study design was conducted to identify important tick species infesting cattle in from five purposively selected peasant associations (i.e. Tosio mole, Warago arsama, Batro chokorsa, Barko dalati and Enango town) of Lalo assabi district during October, 2016 to June, 2017. PAS, Age, sex and body condition of

the animal was considered as variables on the prevalence of ticks.

Sample size determination

Since there was no previous study conducted on ticks in cattle in the area, sample size was determined by assuming 50% prevalence of tick infestation in the area. The desired sample size for the study was calculated by the formula given by Thrusfield (2007). Therefore, if 95% confidence interval is required with 5% margin of error, the sample size (n) is determined by the formula:-

$$n = z^2 p(1-p) / w^2$$

Where n = sample size, p = prevalence, W = margin of error and z is a constant from normal distribution table. Accordingly, the sample size (n) in this case was determined as follows:

$$n = (1.96)2 \times 0.5(1-0.5) / (0.05)2 = 384.$$

Therefore, sample size of 384 cattle was examined in the study.

Collection of Ticks

The whole body surface of the animals were examined for the presence or absence of ticks and half body tick collection methods on the alternate sides were used to collect ticks from the animals and the result doubled to assess the overall burden of ticks (Keiser, 1987; Walker *et al.,* 2003). Ticks were collected from the nine (9) different body sites such as ear, neck, dewlap, brisket, abdomen, udder/scrotum, perineum, ano-vulva and under the tail after proper physical restraining of the animals. During collection, ticks were removed manually from different attachment sites of the animal body by a rotating manner to retain their body parts for identification (Wall and Shearer, 2001). Data collection format was used to register the data during tick collection and proper labeling was made on universal bottles with permanent marker. Date of collection, address, species, sex, age, code of animal and sites of attachment were included in the labeling. Ticks collected from different body sites were preserved in different universal bottles, prefilled with 70% ethanol, for each animal. Then, the sample transported to Bedelle Veterinary Regional Laboratory for further identification of the ticks at genera level. Finally, ticks were identified, counted and recorded up to species within 5 days of collection using stereomicroscope (Hendrix, 1998).

Identification of Ticks

Stereomicroscope was used to identify the ticks based on their morphological features such as mouth parts, scutum, and color of legs, festoons, interstitial punctations, presence or absence of adanal shields, posterior groove and marginal spots. The taxonomic keys of Kaiser (1987) and Walker *et al.,* (2003) were used to identify the ticks under stereomicroscope by manipulating each tick with wire loop.

Data analysis

Analysis of obtained data was done by Chi square (x^2) and independent samples test were used to test the association between ticks infestation with different factors (age, sex and body condition score). For this analysis, SPSS, version 20 was used.

Results and Discussion

Prevalence based on PAS, Sex, Age and Body conditions of Animals

A total of 384 cattle from five Peasant Associations (PAs) were examined and overall of 265 (69%) cattle were found to be infested by different genera of ticks. Highest prevalence (80.4) was recorded at Barko Daleti Peasant Associations (Table 1).

Out of 384 cattle examined, 217 of them were females and 167 were males in which 128 (59%) and 137 (82%) of them were infested by ticks, respectively. Different age groups of animals were observed for tick's infestation. Highest numbers of adult animals (229) were examined as compared with young (109) and old (46) age animals.

Relatively highest prevalence was recorded in adult animals (70.7%). The genera of ticks encountered *Amblyomma, Boophilus* and *Rhipicephalus* with relative infestation rate of 30.7%, 23.2% and 15.1%, respectively. Also tick infestation was observed in relation to body condition and animals with good body condition were relatively affected (72.3%) (Table 1).

Prevalence Based on Predilection Sites

It was revealed in this study that different tick genera have different predilection sites. According to this result, *Amblyomma* had strong preference for udder or scrotum (19.3%), perineum (13.4%), Neck (11.8%) and (10.9%).

Boophilus was highly prevalent on Udder or Scrotum followed by (16.9%) ear and Dewlap (15.3%). *Genus Rhipicephalus* was highly found attached to Dewlap (21.1%) and followed by ear (15.8%) and ano-vulva (14%). Generally, different genera of ticks were attached to Udder or Scrotum (12.5%) which followed by Dewlap (10.2%) (Table 2).

Different tick species are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of tick species in different parts of the country (Solomon *et al.,* 2001; Goshu *et al.,* 2007).

The current study reveals that, total of 384 cattle from five Peasant Associations (PAs) were examined and overall of 265 (69%) cattle were found to be infested by different genera of ticks.

This is relatively high when we compare with the reports of Tadesse and Sultan (2004) with overall prevalence of 59.5%. However, the results of this study is lower than the reports of Alemu *et al.,* (2014) and Gedlu *et al.,* (2014) who reported the overall prevalence of 81.5 and 74%, respectively.

On the other hand, various research works have found less prevalence of tick infestation than the current study including the reports of Addis (2011) and Onu and Shiferaw (2013) who indicated tick prevalence of 25.64 and 14.5%, respectively.

It also greater than the previous works of different researchers including Onu and Shiferaw (2013), Abebe *et al.,* (2010), Tadesse and Sultan (2014), and Bedaso *et al.,* (2014) with prevalence of 4.75, 4.2, 32.2, and 41%, respectively. It is also less than the result of Messele (1989) in Bahir Dar with prevalence of 75.91% and in Assosa (Bossena and Abdu, 2012) with prevalence 75.91%. The difference could be due to the difference in the agro climatic condition of the study areas, because tick activity is influenced by rainfall, altitude and atmospheric relative humidity according to Pegram *et al.,* (1981).

A relatively high tick infestation (80.4%) was recorded at Barko Daleti Peasant Associations. The high prevalence at Barko Daleti might be due to having large common grazing area where they stay the whole day time. It was high prevalence when compared with the report from West Haraghe Zone by Zelalem *et al.,* (2016). However, prevalence of tick infestation was statistically not significant (P>0.05) in all peasant associations (Table 1).

Amblyomma is the first prevalent tick genera in the area (30.7%) while *Boophilus* (23.2%) and *Rhipicephulus* (15.1%). This result agree with previous studies on survey of the tick species in Jimma zone, western Ethiopia conducted by Pegram *et al.,* (1981), Abebaw (1994), De Castro (1994). They found high prevalence of *Amblyomma* in their study area.

Boophilus was the second abundant tick genera in the area with prevalence of 23.2%. This result is slightly greater the survey done in Jimma province with the prevalence of 19.98% (Chali *et al.,* 2017), but it was slightly higher than the survey done in East Haraghe zone, Gursum district with the prevalence of 10.37% (Tesgera *et al.,* 2017). This result is slightly in agreement with the report of Tamiru *et al.,* (2010) who indicated 15.4% prevalence.

Rhipicephulus was the third tick genera found to be occurred in study area with prevalence of 15.1%. The result is greater than the finding done in and around Jimma with the prevalency of 3.32% (Chali *et al.,* 2017). However this result is slightly disagree with the previous work reported with prevalence of 13.5% by Tamerat *et al.,* (2015) and Alemu *et al.,* (2014) with prevalence of 11.5%, and less than the results of Abdisa (2012) and Huruma *et al.,* (2015) who reported 50.9 and 53.4%, respectively. This may be due to environmental condition which is not favorable to their survival, humid and highland nature of the area (Pegram *et al.,* 1981).

The number of male ticks was higher than the number of females in all tick genera identified. This finding agrees with the reports of Abdisa (2012) and Badaso *et al.,* (2014) who reported similar results.

This high number of male ticks may be attributed to the fact that fully engorged female tick drops off the host to lay eggs while males tend to remain on the host up to several months to continue feeding and mating with other females on the host before dropping (Solomon *et al.,* 2001). The reason that female *B. decoloratus* outnumber the males could be due to the small size of males which may not be seen during collection (Tessema and Gashaw, 2010).

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 scrotum/udder, perineum and dewlap whereas *Rhipicephalus* highly prefer under the tail and ano-vulva.

Table.1 Tick Prevalence based on PAS, sex, age and body conditions of animals

Factors	No. of examined	No. of infested	Prevalence (%)	P-value	OR	95%CI	
						Lower	Upper
PAS							
Tosio Mole	84	55	65.5	0.388	1.342	0689	2.616
Werego Arsema	96	62	64.6	0.312	1.396	0.731	2.665
Batro Chokorsa	70	46	65.7	0.328	1.414	0.706	2.832
Barko Daleti	56	45	80.4	0.375	0.694	0.310	1.555
Enango Twon	78	57	73.1	-	-	-	-
Age							
Young	109	72	66.1	0.08	0.91	0.45	1.87
Adult	229	162	70.7	0.80	0.71	0.364	1.37
Old	46	31	67.4	0.30	-	-	-
Sex							
Male	167	137	82	0.13	1.40	0.91	2.159
Female	217	128	59	-			
Body condition							
Good	112	83	74.1	-	-	-	-
Medium	132	94	71.2	0.85	1.06	0.60	1.85
Poor	140	88	62.9	0.09	1.59	0.93	2.72
Total	**384**	**265**					

Table.2 Tick genera and their attachment sites

Predilection site of Ticks	Tick Genera				Total (%)
	None	*Amblyomma* (%)	*Boophilus* (%)	*Rhipicephalus* (%)	
None	119	-	-	-	119 (31.8)
Ear	-	14 (11.8)	15 (16.9)	9 (15.8)	38 (9.9)
Neck	-	13 (10.9)	10 (11.2)	3 (5.3)	26 (6.8)
Dewlap	-	13 (10.9)	14 (15.3)	12 (21.1)	39 (10.2)
Brisket	-	10 (8.4)	8 (9)	7 (12.3)	25 (6.5)
Abdomen	-	10 (8.4)	3 (3.4)	5 (8.8)	18 (4.7)
Udder/Scrotum	-	23 (19.3)	18 (20.2)	7 (12.3)	48 (12.5)
Perinium	-	16 (13.4)	5 (5.6)	1 (1.8)	22 (5.7)
Ano-vulva	-	9 (7.6)	8 (9)	8 (14.0)	25 (6.5)
Under tail	-	9 (7.6)	7 (7.9)	5 (8.8)	21 (5.5)
Total	**119(31)**	**119 (31)**	**89 (23.2)**	**57 (14.8)**	**384 (100)**

However, more or less *Boophilus* found located throughout the body with a few difference on different body parts.

The result of this study is in line with the results of Stachurski (2000) who stated that short hypostome ticks like *Rhipicephalus* usually prefer upper body parts including nape of neck and margin of anus and under tail, while long hypostome ticks like *Amblyomma* attaches to lower parts of the animal body which is also the case in the current study.

The current study identified three genera of ticks in the study area. *Amblyomma* was highly prevalent which is followed by *Boophilus* genus.

The result of the study indicated that ticks were the most wide spreaded and prevalent parasite affecting the cattle with an overall prevalence of 69%. This indicates that the prevalence of the tick is high in the study area.

However the prevalence of ticks is high in the area, there was not yet strategic control of external parasites

including ticks. Therefore, sustainable tick control program should be put in place in order to reduce the current trend of prevalence to lower level.

Based on the above research result and conclusion, the following recommendations are forwarded:-

Awareness on tick control should be promoted among livestock owners

All stakeholders concerned with livestock production and healthcare programs should make concerted effort to plan and implement effective control programs on ticks and other external parasites.

Sufficient budget should be allocated the government and the woreda administrative for the purchase of chemical sprays and spraying equipment on yearly basis.

Further research should be conducted to identify tick up to its species for combating species related problems.

List of Abbreviations

CSA - Central Statistical Agency Of Ethiopia
DVM - Doctor of Veterinary Medicine
EVA - Ethiopia Veterinary Association
FAO - Food and Agricultural Organization
GDP - Gross Domestic Product
ILRI - International Livestock Research Institute
PAs - Peasant Associations
TBD - Tick Born Diseases
US - United State
VBD - Vector and Vector Born Disease

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