

## PREVALENCE OF MAJOR ECTOPARASITES OF DAIRY CALVES AND ASSOCIATED RISK FACTORS IN AND AROUND BAHIR DAR, NORTH WEST, ETHIOPIA

Dawit Belstie Yalew<sup>1</sup> and Aderaw Desta Mekonnen<sup>2</sup>

1. South Mecha woreda Livestock and fisheries Office, Mahilgenet

2. Banja woreda livestock and Fisheries Office, Injibara

**ABSTRACT:** A cross sectional study was carried out from November 2016 to April 2017 with the objective of estimating the prevalence of ectoparasites of dairy calves and associated risk factors in and around Bahir Dar town, Northwest Ethiopia. The calves were selected randomly from the small scale farm in Bahir Dar town and surrounding area. Generally systemic examination of selected calves along with the husbandry information obtained by interrogating the farmer were recorded. All ectoparasites were collected and identified at the genus level in parasitological laboratory by using stereomicroscope. Accordingly, out of 400 calves examined, 176 (44%) were found infested with one or more genera of ectoparasites. The major ectoparasites identified were ticks (36%) followed by lice (13.3%) and fleas (7.5%). Among ticks, subgenus *Boophilus* (23.3%) and *Rhipicephalus* (4.5%) were the most and least prevalent tick genera respectively. Prevalence of the subgenus *Boophilus* tick was significantly associated ( $p < 0.05$ ) among body condition, floor types, cleanness of the house, presence of separate calves pen and type of pen. An association also observed in *Hyalomma* in relation to body condition and the genus *Amblyomma* in relation to floor types, presence or absence separate and type of calf pen. Statistically significant was observed in prevalence of genus *Linognathus* louse in a relation to the breed, body condition and type of pen. Whereas the genus *Damalina* prevalence was significantly associated with milk feeding practice and presence or absence separate calf pen. In conclusion, this study demonstrates high infestation of ectoparasites in calves signifying the need for planning of integrated control measures with sustainable veterinary services aiming in creating awareness about the importance and control of ectoparasites for livestock owners.

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**Key words:** *Amblyomma*; Bahir Dar; *Boophilus*; Calves; Ectoparasites; Tick

### 1. INTRODUCTION

Managing the largest livestock population in Africa, Ethiopia is one of the few countries in the world with huge livestock potential. This livestock sector has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country. There are about 56.71 million cattle, 29.33 million sheep, 29.11 million goats, 1.16 million camels and 56.87 million poultry in the country excluding the Afar and Somali Regions. Out of this cattle population, the calf under one year's constitute about 17.69% (CSA, 2015).

Livestock production in Ethiopia constitutes one of the fundamental means of improving living standards in many regions of the agricultural productive system. It performs multiple functions in the Ethiopian economy by providing food, input for crop production and soil fertility management, raw material for industry, cash income as well as in promoting saving, fuel, social functions and employment (Tilahun, 2010). Livestock play a crucial role in social relations within communities and in inter-state trade. Meat, milk and eggs constitute around 65%, 27% and 8%, respectively, of the value of edible livestock products (SOFA, 2009).

Livestock, at the household level offers a particular package of benefits to pastoralists, for whom few alternative livelihoods exist (Sintayehu *et al.*, 2010). Hides and skins averaged a yearly export value of \$52,160,000 USD, livestock averaged \$3,390,000 USD, and meat \$2,380,000 USD. Over this twenty-one year period, hides and skins provided on average 90% of official livestock sector exports. For a time in the 1990s, hides, skins and leather were Ethiopia's second largest export earner after coffee (Fitaweke, 2012).

Even though ruminants are important components of the Ethiopian farming system, their contribution to food production, rural income and export income are far below the expected potential. This is due to poor nutrition,

prevailing diseases, poor and traditional management practices, low productive performance of the indigenous breeds and lack of appropriate veterinary services (FAO 2006; Genet *et al.*, 2012).

The productivity of cattle depends largely on their reproductive performance and the survival of calves (Amuamuta *et al.*, 2006). The future of any dairy production depends among other things, on the successful program of raising calves and heifers for replacement. This means the health of replacement calves is an important component of total dairy operation profitability (Razzaque *et al.*, 2009), as the dairy heifer calf is the foundation of the future milking herd (Fox, 2007). The proper care and management of calf crop particularly for the replacement heifers is very crucial for the dairy enterprise to grow and prosper (Megersa *et al.*, 2009). Calf hood diseases have a major impact on the economic viability of cattle operations, due to the direct costs of calf losses and treatment and the long term effects on performance and survivorship (Wudu *et al.*, 2008).

In tropical regions where ambient temperature and solar radiation are high, and where forage production fluctuates seasonally and parasitic diseases are present, cattle production depends, among other factors, on the productive potential of the animals and their ability to adapt to the surrounding environment. One of the main problems affecting cattle production is ectoparasites infestations, which are responsible for important losses in the productive indices (Gallardo and Morales, 1999). Ectoparasites are organisms which spend all or part of their life cycles on the external of another organism, the host, and in the process extract nutrient from it for survival. They could live on, puncture, burrow or attach onto the surface of their host causing discomfort, annoyance, weight loss, reduction in milk production and irritation of the skin, which subsequently leads to ulcerations (Belew and Mekonnen, 2011).

Moreover, they cause detrimental effect to animals via stress, impairment in immune function and act as the most important vectors of protozoan, bacterial viral and rickettsial diseases (Manan and Ahmed, 2007; Petney *et al.*, 2007). All ectoparasites cause intense irritation to the skin. Infested animals scratch, rub and bite the affected areas and this end up with skin damage (Radostits, *et al.*, 2007). Their end result may be decreased productivity and reproduction, downgrading and rejection of skins (Tikit and Addis, 2011).

Infestation by ectoparasites could lead to considerable economics loss to small holder farmers. Ectoparasites including lice, ticks, flea and mange are reported to cause wide range of health problem. They are responsible for great economic loss due to reduction in wool quality meat and milk yield causing serious economic losses to the farmer, the tanning industries and country as whole (Beyecha *et al.*, 2014).

Calves have poorly developed defense mechanism and hence they are easily predisposed by ectoparasites and ectoparasite borne disease like babesiosis and anaplasmosis. Ectoparasites affect calves directly through reducing feeding efficiency, by retarding their growth, causing blood loss and damage to hide and indirectly through transmission of bacterial, viral and protozoan infections, predisposing for secondary disease condition such as Screw-worm myiasis and Dermatophytosis (Jemberu, 2004; Soulsby, 2006; Agarwal and Gupta, 2010).

Several studies on the parasitic infections in domestic animals including sheep, camels, cattle, equines were done all over the world (Iqbal *et al.*, 2014). And the existence of various ectoparasities and skin disease (dermatophilosis, demodicosis, ticks and lice infestations) affecting cattle are frequently reported in Ethiopia (Yacob *et al.*, 2008).

Even though numerous studies have been conducted on the ectoparasites of calves in various parts of Ethiopia (Yacob *et al.*, 2008; Gedilu *et al.*, 2014; Regasa *et al.*, 2014), there has not been official information on the prevalence of ectoparasites in calves in and around Bahir Dar, Ethiopia and there is no well separate study on ectoparasites of calve in Ethiopia except (Regasa *et al.*, 2014). Therefore, the objectives of this study was to determine the prevalence of ectoparasites of calves and associated risk factors in the study area.

## 2. MATERIAL AND METHODS

### 2.1 Study Area

A cross-sectional study was carried out from November, 2016 up to April, 2017 to determine the prevalence and associated risk factors of major ectoparasites on dairy calves in around Bahir Dar town which is located 578 km away from Addis Ababa, Northwestern part of Ethiopia. Geographically the study area is located on 11°36'N 37° 23'

latitude and 11.600°N 37.38°E longitude with an altitude of 1,800 meters above sea level. The area receives mean annual rain fall of 1500 mm in rainy season with average temperature of 26°C. About 70% of the land is featured by plain plateaus and covered by various bushes; low woods with mainly every green lands and some semi humid and humid highland vegetation and with major agricultural products like wheat, sorghum, maize and pulse crops. The landscape is marked by the presence of Lake Tana, which drains a water shed of about 3,000km<sup>2</sup> and areas adjacent to Lake Tana and Abay River have poor drainage and annual over flooding during the dry months. Most of the Bahir Dar people practice smallholder mixed crop livestock farming system that is crop production and livestock rearing and own large number of livestock population and which it supplies milk, meat, manure, draft power, skin and hides to the local community (BBOA, 2017).

## 2.2 Study Design and Animal

A cross- sectional study was conducted on calves belonging to a small scale farm. Local and cross bred calves under one year of age (below or equal to 12 ( $\leq 12$ ) months) with different management system were used. A total of 384 calves were sampled by simple random sampling procedure for detailed examination for the presence of skin lesions and ectoparasites.

## 2.3. Study Methodology

### 2.3.1. Sampling methods and data collection

First the small scale farms kept under different management system found in and around Bahir Dar were selected purposefully based on the number of animals in the farm. Then calves from those small scale dairy farms were selected using simple randomly sampling. During the procedure; age, sex, body condition, breed, management system, housing system of each calf were recorded. Age was determined using owner's information and dentition parameters. Calves without teeth often a new born while waiting for the milk teeth have started to wear down, or are fully spread out considered young and hence labeled '<1 year, (Singh, 2008). Breed of the farm were determined by physical characteristics of respective breed and asking the owners. The management system was classified as extensive, semi-intensive or intensive by asking the owner and observing), sex (male, female). The housing condition classified as separate or common pens with calves mixed with dam or other animal and the cleanness of the house also assessed by asking the owner and observation. Body condition score (BCS) was employed (Annex 3) to categorize the animals into poor, medium, and good according to the method described by Nicholson and Butterworth, (1986).

### 2.4.2 Sample size determination

An estimated number of animals required for the study was determined using the formula given by (Thrusfield, 2007) for simple random sampling.

$$n = \frac{1.96^2 P_{exp} (1-P_{exp})}{d^2}$$

Where n= required total sample size

$P_{exp}$  = expected prevalence

d = desired absolute precision (usually 0.05)

The size of the sample was determined using 95% level of confidence, 50% expected prevalence and 0.05-desired absolute precision. Therefore, by substituting these with the above formula, the total sample size (n) becomes 384 but, for the precision of this study 400 calves were taken.

### 2.4.3. Ectoparasite collection and identification

The calves were casted down and restrained properly before collection of ectoparasites. The clinical examination was performed by closed visual inspection, palpation and parting the hair against in the natural direction for easy observation of external parasite. The parasites were removed carefully and gently by hand and forceps to avoid any damage on the body. The collected ectoparasites from their attachment site inserted into universal bottles containing 70% ethyl alcohol. The universal bottles were correctly labelled with species, sex and age of animals before collection and transported to Bahir Dar regional laboratory for further identification using stereomicroscope. Ectoparasite identification was made according to (Urquhart *et al.*, 1996; Walker *et al.*, 2013).

### 2.4.4. Data management and analysis

The collected row data were coded accordingly and entered in to Microsoft excel spread sheet and analyzed using SPSS (statistical package for the social sciences, version 20 Chicago, IL 60606, USA). The Pearson chi square ( $\chi^2$ ) test was used to assess the association of different variables with the prevalence of ectoparasites. A statistical significance was set at a  $p < 0.05$  with 95% confidence interval.

### 3. RESULTS

#### 3.1 The Overall Prevalence of Ectoparasites

Out of 400 calves examined for ectoparasites, 176 (44%) were found infested with one or more ectoparasites (Table 1). The major ectoparasites identified were ticks (36%), lice (13.3%) and fleas (7.5%). An overall four genera of ticks, two genera of lice and one genus of fleas were identified. Among ticks, subgenus *Boophilus* (23.3%) was the most frequently encountered while *Rhipicephalus* (4.5%) was the least common parasites. Among the lice, *Linognathus* (9.8%) and *Damalina* (3.5%) were identified and among the fleas, *Ctenocephalide* was the only genus with a prevalence of 7.8%.

Calves were found infested with either only one or more ectoparasites during the study period. The prevalence of infested calves with only ticks, lice and fleas were 25.75%, 3% and 3.5% respectively. However, more than one ectoparasite infestations in a single animal were also encountered (Figure1). The prevalence of this mixed infested calves with tick and lice was 7.25%, tick and fleas was 2%, lice and flea 1% and tick, lice and flea was 1.5%.

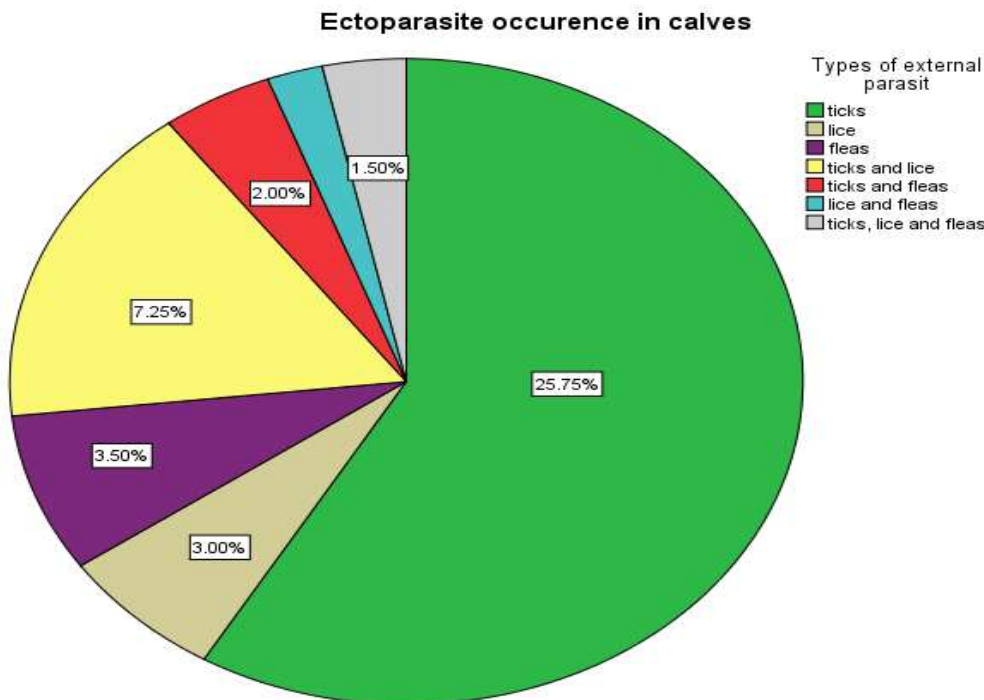


Figure 1 Prevalence of ectoparasites in calves in Bahir Dar, (2017)

As indicated in (table 1) the prevalence of ectoparasites have statistically significant association with breed, body condition, production system, housing cleanness, type of pen, milk feeding practice and floor type.

**Table 1. Overall prevalence of ectoparasites with the associated risk factor**

| Factor            | Category    | Animal examined | positive | Prevalence (%) | $\chi^2$ | p- value |
|-------------------|-------------|-----------------|----------|----------------|----------|----------|
| Age               | ≤ 6 mon     | 220             | 92       | 41.8           | 0.945    | 0.331    |
|                   | 6- 12 mon   | 180             | 84       | 46.7           |          |          |
| Breed             | Local       | 224             | 112      | 50.0           | 7.438    | 0.006    |
|                   | Cross       | 176             | 64       | 36.4           |          |          |
| Sex               | Female      | 195             | 93       | 47.7           | 2.105    | 0.147    |
|                   | Male        | 205             | 83       | 40.5           |          |          |
| Body condition    | Poor        | 121             | 81       | 66.9           | 41.724   | 0.00     |
|                   | Medium      | 162             | 64       | 39.5           |          |          |
|                   | Good        | 117             | 31       | 26.5           |          |          |
| Production system | Extensive   | 217             | 112      | 51.6           | 11.705   | 0.003    |
|                   | Intensive   | 16              | 7        | 43.8           |          |          |
|                   | Semi- intes | 167             | 57       | 34.1           |          |          |
| Housing           | Separate    | 217             | 65       | 30.7           | 32.575   | 0.00     |
|                   | With dam    | 188             | 111      | 59.0           |          |          |
| Calve pen         | Individual  | 110             | 25       | 22.7           | 27.865   | 0.00     |
|                   | Group       | 290             | 151      | 52.1           |          |          |
| Floor type        | Concrete    | 150             | 46       | 30.7           | 17.316   | 0.00     |
|                   | Ground      | 250             | 130      | 52.0           |          |          |
| House cleanness   | Clean       | 189             | 67       | 35.4           | 10.631   | 0.001    |
|                   | Un- clean   | 211             | 109      | 51.7           |          |          |
| Milk feeding      | Suckling    | 303             | 145      | 47.9           | 7.535    | 0.006    |
|                   | By bucket   | 97              | 31       | 32.0           |          |          |
| Total             |             | 400             | 176      | 44.0           |          |          |

**Prevalence of ectoparasites in a relation to sex and age of calves**

The overall prevalence of ectoparasites in female and male calves was (47.7%) and (40.5%) respectively. Statistically significant variation was not ( $p > 0.05$ ) observed in the prevalence of each ectoparasites genera between male and female calves (Table 2). The overall prevalence of ectoparasites in calves ≤6 months and 6-12months was (41.8%) and (46.7%) respectively. Similarly statistically significant difference was not ( $p > 0.05$ ) observed in the prevalence of each ectoparasites genera among the two age group, as shown (Table 2).

**Table 2: The prevalence of ectoparasites in a relation to the sex and age of calves**

|                        | Sex        |           |       |         | Age             |                  | $X^2$ | P-value |
|------------------------|------------|-----------|-------|---------|-----------------|------------------|-------|---------|
|                        | female=195 | male=205  |       |         | ≤6 months (220) | 6-12months (180) |       |         |
| Ectoparasites          | N (%)      | N (%)     | $X^2$ | P-value | N (%)           | N (%)            |       |         |
| <i>Boophilus</i>       | 49 (25.1)  | 44 (21.5) | 0.75  | 0.386   | 51 (23.2)       | 42 (23.3)        | .001  | .9772   |
| <i>Ambylomma</i>       | 29 (14.9)  | 31 (15.1) | .005  | .739    | 27 (12.3)       | 33 (18.3)        | 2.852 | .091    |
| <i>Hyalomma</i>        | 20 (10.3)  | 19 (9.3)  | .111  | .739    | 23 (10.5)       | 16 (8.9)         | .276  | .599    |
| <i>Rhepicephalus</i>   | 6 (3.1)    | 12 (5.9)  | 1.793 | .181    | 11 (5.0)        | 7 (3.9)          | .284  | .594    |
| <i>Damalinea</i>       | 9 (4.1)    | 5 (2.4)   | 1.402 | .236    | 6 (2.7)         | 8 (4.4)          | .864  | .353    |
| <i>Linognathus</i>     | 23 (11.8)  | 16 (7.8)  | 1.808 | .179    | 24 (10.9)       | 15 (8.3)         | .746  | .388    |
| <i>Ctenocephalides</i> | 18 (9.2)   | 13 (6.3)  | 1.167 | .280    | 16 (7.3)        | 15 (8.3)         | .156  | .693    |

### Prevalence ectoparasites in a relation to breeds and body condition of calves

Statistically insignificance difference was ( $p>0.05$ ) observed between the breed and prevalence of almost in all ectoparasite genera. However, significant variation ( $p<0.05$ ) in the prevalence of genus *Linognathus* louse among the breed group was identified. Higher rate (7%) was found in local breed than cross breeds (5.7%). In this study, statistically significance difference ( $p<0.05$ ) was observed in *Linognathus*, *Boophilus* and *Ctenocephalides* with relation to body condition. Highest prevalence (39.7), (17.4%), (16.5%) for *Linognathus*, *Boophilus* and *Ctenocephalides* respectively was observed in calves under poor body condition. (Table 3).

**Table 3: prevalence in a relation to breeds and body condition of calves**

|                        | Breed       |                 | Body conditions |         |            |                |            |                |         |
|------------------------|-------------|-----------------|-----------------|---------|------------|----------------|------------|----------------|---------|
|                        | Local (224) | Crossbred (176) |                 |         | Poor (121) | Moderate (162) | Good (117) |                |         |
| Ectoparasites          | N (%)       | N (%)           | X <sup>2</sup>  | P-value | N (%)      | N (%)          | N (%)      | X <sup>2</sup> | P-value |
| <i>Boophilus</i>       | 56 (25.0)   | 37 (21.0)       | 0.874           | 0.350   | 48 (39.7)  | 33 (20.4)      | 12 (10.3)  | 30.104         | .000    |
| <i>Amblyomma</i>       | 38 (17.0)   | 22 (12.5)       | 1.541           | .215    | 21 (17.4)  | 27 (16.7)      | 12 (10.3)  | 2.944          | .229    |
| <i>Hyalomma</i>        | 24 (10.7)   | 15 (8.5)        | .538            | .463    | 12 (9.9)   | 16 (9.9)       | 11 (9.4)   | .023           | .989    |
| <i>Rhipicephalus</i>   | 11 (4.9)    | 7 (4.0)         | .200            | .655    | 5 (4.1)    | 9 (5.6)        | 4 (3.4)    | .776           | .678    |
| <i>Damalina</i>        | 8 (3.6)     | 6 (3.4)         | .008            | .930    | 7 (5.8)    | 5 (3.1)        | 2 (1.7)    | 3.063          | .216    |
| <i>Linognathus</i>     | 29 (7.0)    | 10 (5.7)        | 5.991           | .015    | 21 (17.4)  | 17 (10.5)      | 1 (0.9)    | 18.577         | .000    |
| <i>Ctenocephalides</i> | 19 (8.5)    | 12 (6.8)        | .382            | .538    | 20 (16.5)  | 5 (3.1)        | 6 (5.1)    | 19.097         | .000    |

### Prevalence of ectoparasites with cleanliness and floor types of the house

The overall prevalence of ectoparasites in calves live in clean and unclean house was (35.4%) and (51.7%) respectively. The prevalence of *Boophilus* and *Ctenocephalides* is higher in calves kept in unclean house than those kept in clean house and statistically significant ( $p<0.05$ ). Higher prevalence (28.9), (10.4%) for *Boophilus* and *Ctenocephalides* respectively was observed in calves live in unclean house. Likewise the prevalence of *Boophilus* and *Amblyomma* were higher and statistically significant in calves kept under ground floor than concrete floor. While the other ectoparasite infestation of caves mentioned in table were not statistically significant ( $p>0.05$ ) in both house cleanliness and floor type (Table 4).

**Table 4: prevalence of ectoparasites with cleanliness and floor types of the house**

|                      | Cleanliness of the house |                 | Floor types    |         |                |              |                |         |
|----------------------|--------------------------|-----------------|----------------|---------|----------------|--------------|----------------|---------|
|                      | Clean (189)              | Not clean (211) |                |         | Concrete (150) | Ground (250) |                |         |
| Ectoparasites        | N (%)                    | N (%)           | X <sup>2</sup> | P-value | N (%)          | N (%)        | X <sup>2</sup> | P-value |
| <i>Boophilus</i>     | 32 (16.9)                | 61 (28.9)       | 8.017          | .005    | 24 (16.0)      | 69 (27.6)    | 7.069          | .008    |
| <i>Amblyomma</i>     | 24 (12.7)                | 36 (17.1)       | 1.489          | .222    | 11 (7.3)       | 49 (19.6)    | 11.064         | .001    |
| <i>Hyalomma</i>      | 24 (12.7)                | 15 (7.1)        | 3.540          | .060    | 15 (10.0)      | 24 (9.6)     | .017           | .896    |
| <i>Rhipicephalus</i> | 9 (4.8)                  | 9 (4.3)         | .057           | .811    | 6 (4.0)        | 12 (4.8)     | .14            | .709    |
| <i>Damalina</i>      | 5 (2.6)                  | 9 (4.3)         | .775           | .379    | 2 (1.3)        | 12 (4.8)     | 3.336          | .068    |
| <i>Linognathus</i>   | 14 (7.4)                 | 25 (11.8)       | 2.235          | .135    | 9 (6.0)        | 30 (12.0)    | 3.835          | .050    |

|                        |         |              |       |      |          |          |      |      |
|------------------------|---------|--------------|-------|------|----------|----------|------|------|
| <i>Ctenocephalides</i> | 9 (4.8) | 22<br>(10.4) | 4.475 | .034 | 10 (6.7) | 21 (8.4) | .394 | .530 |
|------------------------|---------|--------------|-------|------|----------|----------|------|------|

### Prevalence of ectoparasites with presence of calf pen and types of pen

The overall prevalence of ectoparasites in calves' share common housing with dam and calves not kept with dam was 59.0% and 30.7%, respectively. It was statistically significant ( $p < 0.05$ ) in most ectoparasites genera except *Rhipicephalus*, *Hyalomma* and *Linognathus*. Likewise the lice *Damalina* and *Linognathus* and among the tick *Boophilus* and *Amblyomma* ectoparasite genera were statistically significant in calves lived in group pens than calves lived in individual pen. Higher prevalence (4.5%), (17.7%), (27.6%), (19.7%) for *Damalina*, *Linognathus*, *Boophilus* and *Amblyomma* respectively in calves lived in group pens (Table 5).

**Table 5: prevalence of ectoparasites with presence of calf pen and types of pen**

|                        | calf pen (housing)    |                   |                |         | Types of pen        |                |                |         |
|------------------------|-----------------------|-------------------|----------------|---------|---------------------|----------------|----------------|---------|
|                        | Separate pen<br>(212) | With dam<br>(188) |                |         | Individual<br>(110) | Group<br>(290) |                |         |
| Ectoparasites          | N (%)                 | N (%)             | X <sup>2</sup> | P-value | N (%)               | N (%)          | X <sup>2</sup> | P-value |
| <i>Boophilus</i>       | 36<br>(17.0)          | 57 (30.3)         | 9.934          | .002    | 13(11.8%)           | 80<br>(27.6)   | 11.112         | .001    |
| <i>Amblyomma</i>       | 16 (7.5)              | 44 (23.4)         | 19.650         | .000    | 3 (2.7)             | 57<br>(19.7)   | 17.924         | .000    |
| <i>Hyalomma</i>        | 20 (9.4)              | 19 (10.1)         | .051           | .821    | 12 (10.9)           | 27 (9.3)       | .232           | .630    |
| <i>Rhipicephalus</i>   | 11 (5.7)              | 7 (3.7)           | .498           | .480    | 5 (4.5)             | 13 (4.5)       | .001           | .978    |
| <i>Damalina</i>        | 3 (1.4)               | 11 (3.7)          | 5.805          | .016    | 0 (0)               | 14 (4.8)       | 5.03           | .019    |
| <i>Linognathus</i>     | 14 (6.6)              | 25 (3.3)          | 5.074          | 0.24    | 5 (4.5)             | 34<br>(11.7)   | 4.671          | .031    |
| <i>Ctenocephalides</i> | 11 (5.2)              | 20 (10.6)         | 4.139          | .042    | 4 (3.6)             | 27 (9.3)       | 3.591          | .058    |

### Prevalence of ectoparasites with production system and milk feeding practice

The prevalence of ectoparasites genera in milk feeding practice was significantly varied ( $p < 0.05$ ) only in *Amblyomma* and *Damalina*. Higher prevalence of *Amblyomma* (7.2%) and *Damalina* (4.5%) was observed in suckling calves than milk bucket feeding calves (Table 6). The overall prevalence of ectoparasites in calves managed under extensive, intensive and semi-intensive production system was (51.6%), (43.8%), (34.1%) respectively. The prevalence of ectoparasites infestation were found not statistically associated among production system except, *Hyalomma* which was statistically significant ( $p < 0.05$ ) among production system. Higher in extensive production (18.9%) than semi intensive (8.4%) and intensive (16.7%) production system (Table 6).

**Table 6: prevalence of ectoparasites with production system and milk feeding practice**

|                  | Milk feeding practice |                |                |         | Production system  |                   |                            |                |         |
|------------------|-----------------------|----------------|----------------|---------|--------------------|-------------------|----------------------------|----------------|---------|
|                  | Suckling<br>(303)     | Bucket<br>(97) |                |         | Extensive<br>(217) | Intensive<br>(16) | Semi<br>intensive<br>(167) |                |         |
| Ectoparasites    | N (%)                 | N (%)          | X <sup>2</sup> | P-value | N (%)              | N (%)             | N (%)                      | X <sup>2</sup> | P-value |
| <i>Boophilus</i> | 75<br>(24.8)          | 18<br>(18.6)   | 1.581          | .209    | 58<br>(26.7)       | 5 (31.2)          | 30 (18.0)                  | 4.660          | .097    |
| <i>Amblyomma</i> | 53<br>(17.5)          | 7 (7.2)        | 6.085          | .014    | 41<br>(18.9)       | 1 (6.2)           | 18 (10.8)                  | 5.876          | .053    |

|                        |              |         |       |      |              |          |          |       |      |
|------------------------|--------------|---------|-------|------|--------------|----------|----------|-------|------|
| <i>Hyalomma</i>        | 30 (9.9)     | 9 (9.3) | .032  | .857 | 20<br>(18.9) | 5 (31.2) | 14 (8.4) | 8.830 | .012 |
| <i>Rhipicephalu</i>    | 14 (4.6)     | 4 (4.1) | .042  | .837 | 10 (4.6)     | 1 (6.2)  | 7 (4.2)  | .157  | .925 |
| <i>Damalina</i>        | 14 (4.6)     | 0       | 4.644 | .031 | 9 (4.1)      | 0        | 5 (3.0)  | .976  | .614 |
| <i>Linognathus</i>     | 31<br>(10.2) | 8 (8.2) | .329  | .567 | 26<br>(12.0) | 1 (6.2)  | 12 (7.2) | 2.699 | .259 |
| <i>Ctenocephalides</i> | 23 (7.6)     | 8 (8.2) | .044  | .833 | 19 (8.8)     | 0        | 12 (7.2) | 1.726 | .422 |

#### 4. DISCUSSION

In this study an overall prevalence of 44% of ectoparasites indicate the great importance and widespread occurrence of ectoparasites in calves in the study area. This result was higher than (Regasa *et al.*, 2014) who reported to be 32.8% in young cattle (calves below six months of age) in and around Bishoftu town. In contrast it was lower than the report of (Bilkis *et al.*; 2011) from Bangladesh who was reported to be 46.15% in calves less than or equal to one year. This difference in prevalence of ectoparasites might be due to the presence of different factor like poor husbandry systems, poor awareness of farmers, inadequate veterinary services, the difference in sample size of different researcher, difference in age and breed of animal. Furthermore, it may be also associated with the agro-ecological difference where the researchers were conducted their research which could favor or limits the distribution ectoparasites in the area as well as in the animal. (Pegram *et al.*, 1981; Shiferaw and Abebe, 2006).

In the current study the overall prevalence of tick was 36% and it was the most prevalent ectoparasite recorded in calves. This finding was higher than the report (13.5%), (7.5%) and (2.6%) by Regasa *et al.* (2014) in Bishoftu town, Yacob *et al.* (2008) in Adama and Fentahun and Mohamed (2012) in Assosa respectively. However, it was lower than the report (72.6%) from India, (Singh and Rath, 2013). This difference might be due to agro-ecological, method of study, husbandry practice, the season and length of study period and the sample size might be contributed to this variation in the prevalence of tick. The high prevalence ticks in this study when compared to lice and flea might be due to the presence of factor that worsen the occurrence tick such as managing calves in the free grazing, epidemiological determinants like high temperature, humidity, moderate rainfall, adequate water sources, prolonged sunlight favor the survival and reproduction of ticks thus possible exposed of calves for tick infestation (Pegram *et al.*, 1981; Sajid *et al.*, 2008; Kumsa *et al.*, 2012a).

Ticks identified in this study area were *Boophilus*, *Amblyomma*, *Hyalomma* and *Rhipicephalus*. Out of the three genera of ticks recorded, the most prevalence was *Boophilus* (23.3%) followed by *Amblyomma* (15%), *Hyalomma* (9.8%) and *Rhipicephalus* (4.5%); this was in line with some reports (Yacob *et al.*, 2008; Onu and Shiferaw, 2013; Regasa *et al.*, 2014), who reported *Boophilus*, followed by *Amblyomma* were the dominant genera in Bishoftu town, Bench Maji zone and Southwest Ethiopia respectively. In contrast to this, Ayana *et al.* (2016) reported higher prevalence of *Rhipicephalus* (27%), *Hyalomma* (26%), *Amblyomma* (25.3%) and *Boophilus* (21.7%). In addition, Fantahun and Mohamed (2012), Kassa and Yalew (2012), Tamiru and Abebaw (2010), Sileshe *et al.* (2007) reported higher prevalence of *Rhipicephalus* than *Boophilus*. This variation between the current and previous studies can most probably be attributed to differences in agro-ecology of study sites, management and breed of the study calves (Szabo *et al.*, 2007). In this study, *Rhipicephalus* was the least dominant tick genera of calves. This observation is in agreement with the previous findings (Shiferaw and Abebe, 2006; Solomon *et al.*, 2007) in different parts of Ethiopia.

In present study, two genera of lice was identified, they were *Linognathus* (9.8%) and *Damalina* (3.5%). This was in close agreement with the research conducted in Endegagn district, Southern Ethiopia (Kumsa and Bekele, 2008), where both *Linognathus* and *Damalina* lice were identified from animals in different husbandry system. The overall prevalence of lice (13.3%) in this study was higher when compared to the report of Yacob *et al.* (2008) who reported 9.6% in calves less than or equal to one year in Adama. On the other hand, the prevalence reported in this study was lower than the report (26.8%) by Regasa *et al.* (2014) in Bishoftu town and (21.6%) by Gharbi *et al.* (2013) in Nabeul, North East Tunisia. This variation in prevalence lice were might be related to climatic variation, management practice and different sample size used. The seasonal variation of the study period may also contribute to this difference as the lice population on animal vary seasonally, depending on the condition of the host. Lice population greater during the rainy months (Walker, 2007). Moreover, the overall prevalence of fleas was found to be 7.8% and

the genus *Ctenocephalide* was the only genus that was identified in the study area. The current finding on the prevalence *Ctenocephalide* was relatively lower than that was reported by Tongjura *et al.* (2012).

There was no an association between the prevalence of ectoparasite infestation and age of calves. This result is in line with the finding of few scholars (Kassa and Yalew, 2012; Onu and Shiferaw, 2013) but, it disagreed with the previous works in Assosa by Fentahun and Mohamed (2012). This study revealed that the prevalence of *Linognathus* was higher in local breed (7%) than cross breed calves (5.7%). This was in agreement with report by Bilkis *et al.* (2011), Tessema and Gashaw, (2010), Yacob *et al.* (2008) who reported a positive correlation between prevalence of lice and breed of cattle. It might be attributed to differences in management systems, lack of control measures against ectoparasites on local breeds' and lack of interest of farmers about local animal as well as taking more care to cross breed than local (Tadesse and Sultan, 2014). Furthermore, the milking procedure in local breeds is done on the presence of calves as a stimulant for milking throughout the lactation period which contributes for the transmission of lice through prolonged contact with infested calves (Regasa *et al.*, 2014).

The prevalence of tick *Boophilus*, lice (*linognathus*) and fleas *Ctenocephalides* was statistically significant ( $P < 0.05$ ) among body condition of calves. The other ectoparasite genera were statistically insignificant ( $p > 0.05$ ) with body condition. This result is in line with other researcher's results performed in different parts of Ethiopia (Belew and Mekonnen, 2011; Fetahun and Mohamed, 2012). The observation indicate that animals having poor body condition are less resistant ectoparasite infestation and lack of enough body potential to build resistant with age advancement whereas over-conditioned animals showed reasonable combat to the infestation (Manan *et al.*, 2007).

The prevalence of *Boophilus* and *Ctenocephalide* were significantly associated ( $P < 0.05$ ) with cleanness of the house. Higher prevalence *Boophilus* (28.9%) and *Ctenocephalide* (10.5%) were observed in calves kept in unclean house than those kept in clean house. This higher prevalence might be due to the unclean house provide suitable environmental for ectoparasites; the tick and flea drop of on the bending, bunk and sheds; as the result, other calves may then infected from contaminated bending, bunk and sheds (Regasa *et al.*, 2014). *Boophilus* and *Amblyomma* were statistically varied ( $P < 0.05$ ) among calves kept in ground floor than those kept in concrete floor. This might be due to the ground floor is full of dust and unable to cleaning easily this makes the ground floor are suitable for living of ectoparasites, which is important for hiding themselves.

Highly significant variation ( $p < 0.05$ ) had occurred with prevalence of almost all ectoparasites with presence of calves' pens. High prevalence *Damalina* (3.7%) *Boophilus* (30.3%) *Ctenocephalide* (10.6%) and *Amblyomma* (23.4%) were observed in calves' that share common housing with dam than calves kept alone. This association might be due to the ectoparasites lice, tick, and fleas are easily transfer from their dam to calves which share a common house. Since higher infestation in dam proportion calves, may be imputed to outdoor management and long distant movement of dams searching for food and water as compared to calves, so the exposure opportunity is higher (Pawlos and Derese, 2013). This result contradicted with the finding finding in Bishoftu (Regasa *et al.*, 2014) that showed no association between the prevalence of ectoparasites and calves sharing common house with dam. Similarly the ectoparasites genera *Damalina*, *Linognathus*, *Boophilus* and *Amblyomma* were statistically significant ( $p > 0.05$ ) in relation to the type of calves pen. Higher prevalence of this ectoparasites genera were existed in calves which had a common calf pen than calves that had separated calves pen. The existence of this difference might be due to the closed confinement of high number of calves in a single pen makes them to share ectoparasites to each other that came from the dam by one calf.

In this study, there was a statistical association between milk feeding practice of calves and prevalence of tick *Amblyomma* and lice *Damalina*. Higher prevalence *Damalina* (4.5%) and *Amblyomma* (17.5%) was observed in suckling calf than bucket feeding calf (7.2%). This finding was in agreement with the study conducted in Bishoftu Ethiopia (Regasa *et al.*, 2014). This higher prevalence of lice and ticks in suckling calves in this report might be due to the increase in contact rate of calf with dam which favors the transmission of lice and ticks. Lice are easily transmitted from animal to animals when animals in close contact with one another such as during feeding, breeding or shipping (Radostits *et al.*, 2006).

Even though the prevalence of ectoparasites genera were higher in calf kept under extensive production system than those kept under intensive farming system, this investigation showed that all ectoparasites genera were insignificantly associated among production system except *Hyalomma* which was statistically varied. This finding was in close

agreement with earlier finding (Tadesse and Sultan, 2014) that recorded prevalence of tick infestation under extensive production system was higher than intensive farming system. The high prevalence of ectoparasites in extensive production system might be due to regular washing of barns and animals, regular treatment of animals with acaricides which will reduce the susceptibility of tick infestation in intensive farming animals where as extensive farming animals move anywhere for feeding, staying and drinking, and hence susceptibility of tick infestation is higher. This finding was contradicted from the finding of (Gedilu *et al.*, 2014) who stated that the prevalence of ectoparasites like tick was highly associated with the management system. This situation might be due to sample size difference, age difference, and the ways of collecting sample.

## 5. CONCLUSION AND RECOMMENDATIONS

The present study shows ectoparasites were prevalent in calves less than one year of age. Among ectoparasites encountered, ticks were the most frequently identified one. Housing conditions (cleanliness, floor types and presence or absence of separate calf pen from dam), body condition, breed, production system and milk feeding practice were some of the factors associated with the ectoparasite infestation. The problem of external parasite in calves seems to be crucial as they cause discomfort, annoyance, weight loss, losses in the productive indices, impairment in immune function and act as the most important vectors of protozoan, bacterial viral and rickettsial diseases and above all, loss of tannery industry due to rejection and downgrading of hide is a major concern.

In light of the above conclusion the following recommendations are forwarded:

- ❖ There should be a close attention by all stakeholder; farmers, veterinarians and government on the control and prevention measures to minimize losses caused by ectoparasites infestation and transmission of the pathogen to animals.
- ❖ Awareness should be created for small scale farmer concerning risk factors of ectoparasite infestation, effect and control methods.
- ❖ Since calves are the main source of the next generation of dairy industry, further research should be done in order to identify the species of ectoparasite and the seasonal infestation difference of ectoparasites in the area as the ectoparasites prevalence vary with season.

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