

Original Research Article

Prevalence of Ectoparasites of Small Ruminants Presented at Mekelle University Veterinary Hospital, Tigray Region, Ethiopia

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Abstract: A cross sectional study was conducted from November, 2016 to March, 2017 to determine the prevalence and to identify ectoparasites on small ruminants presented at Mekelle University Veterinary Hospital. A total of 381 small ruminants (231 sheep) and (150 goats) were examined for the presence of ectoparasites. Accordingly, a total of 231 (51.9%) sheep and 150 (56.0%) goats were found infested with one or more ectoparasites. The overall ectoparasite prevalence of both sheep and goats was 53.5% (204). Ectoparasites identified in sheep were: ticks (37.6%), fleas (5.2%), lice (3.9%), sheep ked (1.7%), mite (2.2%), and mixed infections (1.3%); whereas, in goats ectoparasites encountered were: ticks (46%), fleas (6%), and lice (4%). No statistical significant difference ($P > 0.05$) were found between the species of small ruminants and the overall ectoparasite infestation as well as ectoparasite prevalence to body condition. However, species of small ruminants were significantly associated with Tick infestation ($P < 0.05$). Total ectoparasite prevalence was significantly ($P < 0.05$) higher in adult than young and female than male small ruminants respectively. The analysis showed us there was statistically significant association ($P < 0.05$) in the prevalence of ticks with age of small ruminants, while it was relatively higher prevalence of ticks (36.5%) in adult than (4.5%) in young. This study demonstrates high infestation of ectoparasites in small ruminants signifying the need for control activities to be undertaken in the area to reduce their impact on the growth and productivity of small ruminants as well as on the leather industry by creating awareness about the importance and control of ectoparasites for farmers.

Keywords: Ectoparasites; Prevalence; Small ruminants.

INTRODUCTION

Livestock is the main stay of the vast majority of Ethiopian people with large and small communities almost entirely dependent on this industry for economic stability [1]. The livestock sector in Ethiopia play significant role in the national economy. It contributes 15-17% and 35-49% of the total and agricultural Gross Domestic Product (GDP), respectively and provides livelihood for 37-87% of the population. Hides, skins and leather products made up 7.5% of the total export value whereas live animals accounted for 3.4% [2].

Ethiopia ranks first in Africa and tenth in the world with respect to livestock population. The estimated livestock population of Ethiopia is 53.99 million heads of cattle, 25.49 million heads of sheep, 24.06 million heads of goats, 50.38 million heads of poultry and 5.21 million beehives. Tigray region owns an estimated 4.07 million heads of cattle, 1.38 million heads of sheep and 3.19 million heads of goats [3].

Small ruminants represent the most important part of the Ethiopian livestock system. Which constitute about 30% of the total livestock population of the country and provide 46% of the value of national meat production, 14% of milk consumption, and 58% of the value of hide and skin production [4].

These groups of animals are highly adaptable to a broad range of environments, and can be breed for diverse purposes including skin, meat, and milk production, and as means of cash income [5].

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Owing to their high fertility, short generation interval and adaptation even in harsh environment, sheep and goats are considered as an investment and insurance to provide income for the purchase of food during seasons of crop failure. Furthermore, wool and manure are also important byproducts of small ruminant productions [6].

However, the contribution of small ruminants to food consumption, rural income and export economy is below the expected potential. This could be due to a number of several factors including widespread diseases, inadequate feed and poor feeding systems, poor genetic potential of the local breeds, poor management systems [7].

Skin diseases are major problems that reduce small ruminant productivity. External parasites are the major causes of skin diseases that hamper small ruminant production in many areas of Ethiopia. In addition to down grading and condemnation of skin; skin diseases impose economic losses as a result of reduction of wool quality, losses due to culling and occasional mortalities and losses associated with treatment and prevention of the diseases. Of these skin diseases, ectoparasites take more of the proportion of economic losses in Ethiopia [8].

Lice, sheep keds, mange mites, fleas and ticks are the most common ectoparasites of small ruminants that are reported to cause a wide range of health problems such as mechanical tissue damage, irritation, inflammation, hypersensitivity, abscesses, weight loss, lameness, anemia, and in severe cases death of infested animals which leads economic losses in Ethiopia [9]. Occurrence and spread of skin diseases could correlate with host factors, poor management, climatic factors, feed scarcity and inadequate veterinary services [10].

Ectoparasites that infest small ruminants are widely distributed and ubiquitous in all agro-ecological zones in Ethiopia. Infestation by those ectoparasites often highly damaging and in most cases cannot be permanently eradicated. Thus, infestation by ectoparasite can cause a major obstacle to development and utilization of animal resources [11]. Ectoparasites that infest small ruminants cause serious economic loss to small holder farmers and the tanning industry through mortality of animals, decreased production and reproduction, down grading and rejection of skin [12]. It was reported that 35% of sheep and 56% of goat skin rejections in Ethiopia are attributed to ectoparasites [13]. All these established facts imply that ectoparasites pose serious economic losses to the farmer, the tanning industry and the country as a whole [14].

Moreover, ectoparasites are the most important vectors of protozoan, bacterial, viral and rickettsial diseases. Ectoparasitic diseases such as sarcoptic and psoroptic mange, tick and lice infestation have frequently been reported in Ethiopia [15].

There were some studies carried out on ectoparasites of small ruminants in different parts of Tigray region. Some control measures have also been implemented. However Ectoparasitism in small ruminants still remains a problem in the region as well as at country level. A number of cases were presented in mekelle university veterinary hospital. Reliable and current information is needed to reinforce the control programs and monitor the progress of such activities; thus, the objectives of this study were:

- To determine the prevalence of ectoparasitic infestation of small ruminants
- To identify associated risk factors with the occurrence of ectoparasites in small ruminants presented at Mekelle University Veterinary hospital

MATERIALS AND METHODS

Area Description

The study was conducted at Mekelle University Veterinary Hospital, Mekelle, Tigray National Regional State, and Northern Ethiopia. Mekelle is located around 780 kilometers north of the Ethiopian capital Addis Ababa, at a latitude and longitude of 13°29'N 39°28'E coordinates, with an elevation ranges from 2000-2270 meters above sea level. The average temperature was 69.7°F (20.9°C). The warmest month, on average, is May with an average temperature of 74.3°F (23.5°C). The coolest month on average is December; with an average temperature of 65.3°F (18.5°C). The average amount of precipitation for the year in Mekele is 27.8" (706.1 mm). The month with the most precipitation on average is August with 8.5" (215.9 mm) of precipitation. The month with the least precipitation on average is February with an average of 0.4" (10.2 mm). In terms of liquid precipitation, there are an average of 85.0 days of rain, with the most rain occurring in July with 22.0 days of rain, and the least rain occurring in February with 1.0 days of rain.

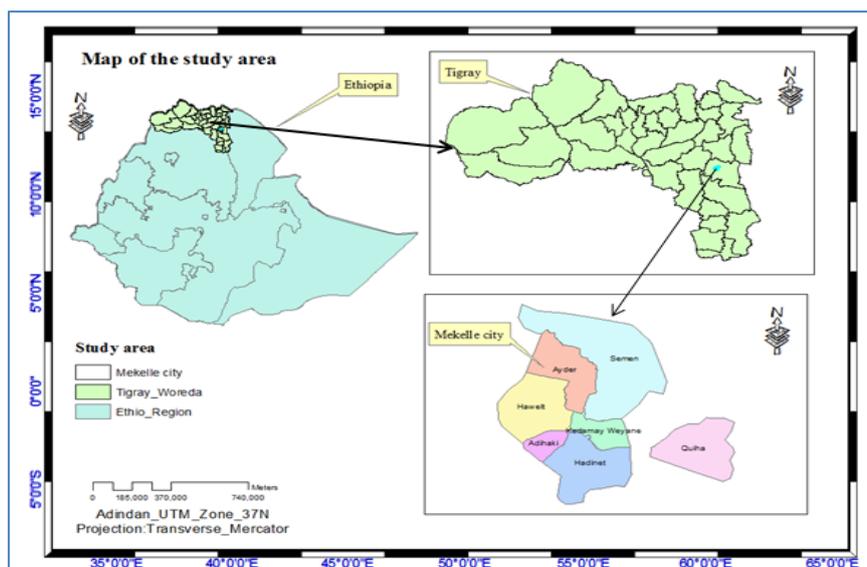


Fig-1: Mekelle City administration; Extracted from ArcGIS, [16]

Study Population

The study animals were small ruminants (sheep and goats) that were presented at Mekelle University, Veterinary Hospital for various purposes and selected randomly for determination of the prevalence of ectoparasites. The animals were originated from nearby villages, or from the city itself. Prior to examination, each animal selected was categorized based on sex, age, body condition, and species. The ages of animals were determined by the method described by Alello and Mays [17]. When lambs and kids were less than 6 months of age, they were considered as young and animals more than 6 months old were included in the adult age group.

Study Design

A cross sectional study was conducted on small ruminants presented to Mekelle University Veterinary Hospital from November 2016 to March 2017 to determine the prevalence of ectoparasites in small ruminants. Animals coming to the veterinary hospital for various purposes were selected randomly and examined for the presence of ectoparasites.

Sample Size Determination

Simple random sampling technique was used for sampling and the sample size required for this study was determined depending on the expected prevalence of the parasite and the desired absolute precision. The sample was computed using the formula given by Thrusfield [18].

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

Where n=sample size

1.96=the value of the 95% confidence level

d=desired absolute precision 5%

P_{exp} =expected prevalence

To calculate the total sample size, the following parameters were used: 95% level of confidence (CL), 5% desired level of precision and with the assumption of 54.8% expected prevalence of ectoparasites in small ruminants [19]. Thus the sample sizes for the present study were determined as, $n = 381$.

STUDY METHOD AND SAMPLE COLLECTION

A total of 381 animals (231 sheep) and (150 goats) were randomly selected that were presented to Mekelle University Veterinary Hospital for different cases. Before clinical examination, the age, species, sex, and body condition of each randomly selected animal were recorded. These sheep and goats that came to Veterinary Hospital were examined for the presence of ectoparasites. The clinical examination was performed by multiple fleeces parting in the direction opposite to that in which hair or wool normally rests and visual inspection and palpation of the skin for parasites on all parts of the animal including ears and digits. Ectoparasites such as ticks, lice, sheep ked and fleas were collected by hand from their attachment site and put in clean sample collecting bottle and preserved with 10% formalin and taking samples to the laboratory for further processing and identification. Skin scrapping was collected for suspected cases of mange mite. After addition of 10% KOH to the specimen, mites were released from scabs and crusts before examination.

DATA ANALYSIS

Statistical Package for Social Science (SPSS) software version 20 was used to analysis all the data. Descriptive statics such as percentages and frequency distribution was used to describe the nature and the characteristics of the data and subjected to chi-square (χ^2) and P-value test. Statistical significance was set at $P < 0.05$.

RESULTS

Prevalence of Ectoparasites of Sheep and Goats by Species

From total of 381 small ruminants examined, 204 were positive for one or more type of ectoparasite with an overall prevalence of 53.5% (Table 1). Ectoparasites identified in sheep were: tick (37.6%), flea (5.2%), lice (3.9%), ked (1.7%), mite (2.2%), and mixed infections (1.3%) with total prevalence of 51.9%, whereas, in goat ectoparasites encountered were: tick (46.0%), fleas (6.0%), and lice (4.0%) with total prevalence of 56.0%.

Table-1: Overall prevalence of ectoparasites in sheep and goats

Ectoparasite group	Sheep(n=231)positive(%)	Goat(n=150)positive(%)	Overall prevalence(%)	χ^2	p-value
Tick	87(37.6)	69(46)	40.9	28.418	0.00
Lice	9(3.9)	6(4.0)	3.9	0.349	0.840
Flea	12(5.2)	9(6.0)	5.5	1.096	0.578
Sheep Ked	4(1.7)	0(0.0)	1.0	1.306	0.253
Mite	5(2.2)	0(0.0)	1.3	3.290	0.070
Mixed in	3(1.3)	0(0.0)	0.8	3.089	.213
Total	120(51.9)	84(56)	53.5	9.188	0.163

* Values in parenthesis are in percentages, Mixed. In=mixed infection

The overall prevalence of ectoparasite infestation was higher in goats (56.0%) than in sheep (51.9%). From identified ticks, *Rhipicephalus* account for the highest proportion followed by *Boophilus*. An overall prevalence of ectoparasites was observed in the two small ruminant species at genera level. In sheep *Rhipicephalus* (24.7%) was the abundant followed by *Boophilus* (11.3%), *Hyalomma* (0.8 %) and *Amblyomma* (0.8%). while in goats the prevalence of *Rhipicephalus* was (32.0%), *Boophilus* (2.7%), *Hyalomma* (9.3%) and *Amblyoma* (2.0%).

The identified genera of lice infesting sheep and goats were *Damalina* spp and *Linognathus* have prevalence of 2.2% and 1.7% in sheep respectively. While in goats the respective prevalence was 1.3% and 2.7%. The prevalence of *Dammalina* was higher in sheep (2.2%) than (1.3%) in goats and *Linognathus* was higher in goats (2.7%) than in sheep (1.7%).

The prevalence of mange mite on sheep showed that only one genera of mange mite identified was *psoroptes* with 2.2%, while mange mite was not identified in goats. The overall prevalence of flea was 5.5% from 5.2% in sheep and 6.0% in goats, respectively (Table 1). *Ctenocephalides felis* was the most frequently observed flea species 4.8% in sheep and 4.7% in goats than *Ctenocephalides canis* with 0.4% in sheep and 1.3% in goats. Sheep ked was identified only from sheep with 1.7% prevalence.

Among the ectoparasites identified in the area, ticks were the highest followed by fleas and lice (Table 1). The prevalence of ticks was significantly ($P < 0.05$) higher in goats than sheep whereas mange mite and sheep ked were only identified in sheep.

There were only three cases of mixed infestation observed only on sheep, those mixed ectoparasite were *Rhipicephalus* with *Boophilus*, *Rhipicephalus* with *Ctenocephalides felis*, and *Ctenocephalides felis* with *Ctenocephalides canis* on the three different sheep with the overall mixed infestation of (0.8%).

Table-2: Frequencies and percentages of ectoparasites identified

Ectoparasite group	Sheep (n=231) Positive (%)	Goat (n=150) Positive (%)	Total in (%)
<i>Rhipicephalus</i>	57(24.7)	48(32)	27.6
<i>Amblyomma</i>	2(0.8)	3(2)	1.3
<i>Hyalomma</i>	2(0.8)	14(9.3)	4.2
<i>Boophilus</i>	26(11.3)	4(2.7)	7.9
<i>Sheep ked</i>	4(1.7)	0(0)	1.0
<i>Mange mite</i>	5(2.2)	0(0)	1.3
<i>Damalina species</i>	5(2.2)	2(1.3)	1.8
<i>Linognathus species</i>	4(1.7)	4(2.7)	2.1
<i>C.canis</i>	1(0.4)	2(1.3)	0.9
<i>C.felis</i>	11(4.8)	7(4.7)	4.7

* Values in parenthesis are in percentages, C.=Ctenocephalides

Prevalence of Ectoparasites in Sheep and Goat by Age Group

The prevalence of ectoparasites was significantly ($p < 0.05$) higher in adult animals than young animals except flea infestation. With regard to age wise comparison, among the 381 animals examined the high prevalence was for tick (36.5%), in adult and tick (4.5%), in young animals (Table 3). The overall ectoparasites prevalence was 44.6% in adults and 8.9% in young animals.

Table-3: Prevalence of ectoparasites by age group of both host animals

	age	Tick	flea	lice	Ked	mite	mixed	Total
Sheep= 231	adult	78(33.8)	4(1.7)	8(3.5)	4(1.7)	5(2.2)	2(0.9)	101(43.7)
	young	9(3.9)	8(3.5)	1(0.4)	0(0)	0(0)	1(0.4)	19(8.2)
	total	37.6	5.2	3.9	1.7	2.2	1.3	51.9
Goats= 150	adult	61(40.6)	3(2.0)	5(3.3)	0(0)	0(0)	0(0)	69(46)
	young	8(5.3)	6(4.0)	1(0.6)	0(0)	0(0)	0(0)	15(0.1)
	total	46.0	6.0	4.0	0.0	0.0	0.0	56.0
Overall Prevalence	adult	139(36.5)	7(1.8)	13(3.4)	(1.0)	5(1.3)	2(0.5)	170(44.6)
	Young	17(4.5)	14(3.6)	2(0.5)	0(0)	0(0)	1(0.3)	34(8.9)
	total	40.9	5.5	3.9	1.0	1.3	0.8	53.5
	χ^2	28.542	17.320	3.404	0.659	1.659	14.667	48.349
	p.value	0.000	0.000	0.182	0.417	0.198	0.001	0.000

* Values in parenthesis are in percentages

Prevalence of Ectoparasites in Sheep and Goat by Sex

Ectoparasite prevalence in the male and female small ruminants of both species was 17.3% and 36.2% respectively and the difference was statistically significant ($P < 0.05$). The overall prevalence of ectoparasites in female and male sheep was 36.4% and 15.6%, respectively; whereas, in female and male goats the prevalence was 36% and 20%, respectively (Table 4).

Table-4: Prevalence of ectoparasite in sheep and goat by sex

	sex	Tick	flea	Lice	ked	mite	mixed	Total
Sheep= 231	Male	26(11.3)	5(2.2)	3(1.3)	0(0)	0(0)	2(0.9)	36(15.6)
	Female	61(26.4)	7(3.0)	6(2.6)	4(1.7)	5(2.2)	1(0.4)	84(36.4)
	Total	87(37.7)	12(5.2)	9(3.9)	4(1.7)	5(2.2)	3(1.3)	120(51.9)
Goats= 150	Male	21(14.0)	6(4.0)	3(2.0)	0(0)	0(0)	0(0)	30(20)
	Female	48(32.0)	3(2.0)	3(2.0)	0(0)	0(0)	0(0)	54(36)
	Total	69(46.0)	9(6.0)	6(4.0)	0(0)	0(0)	0(0)	84(56)
Overall prevalence	Male	47(12.3)	11(2.9)	6(1.6)	0(0)	0(0)	2(0.5)	66(17.3)
	Female	109(28.6)	10(2.6)	9(2.5)	4(1.0)	5(1.3)	1(0.7)	138(36.2)
	Total	40.9	5.5	3.9	1.00	1.3	0.8	53.5
	χ^2	14.806	2.121	0.808	1.320	3.326	10.174	15.954
	p-value	0.011	0.346	0.668	0.251	0.068	0.006	0.014

* Values in parenthesis are in percentages

Prevalence of Ectoparasites in Sheep and Goat by Body Condition

Before clinical examination, the body condition of each selected animals were recorded. The body condition score (BCS) of sheep and goats were determined based on the description given by Gatlenby [20], and Steele [21] respectively. The infestation rate of ectoparasites are higher in poor body condition of small ruminants compared to good body conditioned. However, there was no statistical significant difference among body condition categories ($P > 0.05$) (Table 5).

Table-5: Prevalence of external parasites of small ruminants by body condition

Body condition	Ectoparasites	
Sheep= 231	Poor	89(38.5)
	Good	31(13.4)
	Total	111(51.9)
Goats=150	Poor	60(0.4)
	Good	24(16.0)
	Total	84(56.0)
Overall Prevalence	Poor	149(39.1)
	Good	55(14.4)
	Total	53.5
	χ^2	9.769
	p-value	0.135

* Values in parenthesis are in percentages

DISCUSSION

Ectoparasite prevalence of small ruminants in the present study shown that 51.9% in sheep and 56% in goats, with an overall prevalence of 53.5%. This suggested the great importance of ectoparasites in small ruminants of the study area. The present result is comparable to the report of Mulugeta *et al.* [22] and Sertse and Wossene [23] who reported 55.2% in sheep and 58.0% in goats and 50.5% in sheep and 56.4% in goats in Tigray and the eastern Amhara regions, northern Ethiopia respectively. Similarly, Rahmeto *et al.* [24] has reported 51.7% in sheep and 59.6% in goats in Selected Districts of Tigray Region. In the current study, the difference in prevalence of ectoparasites between the two host species was not statistically significant ($P>0.05$). In contrast a study in Wolaita Soddo by Yacob *et al.* [25] reported sheep were more infested (68.7%) than goats (28.4%). This could be due to factors affecting the distribution of the problem in the different study area.

These higher infestation rates might be attributed to various important factors including favourable climatic factors, malnutrition especially during long dry season, poor husbandry system, poor awareness of farmers to the effects of ectoparasites, and inadequate animal health services in the study area [26].

In this present study, ticks were found to be the most frequently recorded ectoparasites in both sheep and goats. This finding is generally in agreement with those reported by Yacob *et al.* [25] in Ethiopia, Rahmeto *et al.* [27] in Selected Districts of Tigray Region, and Yakhchali and Hosseine [28] in Iran. A study by Zelalem [29] has reported a higher tick prevalence of 65.5% in sheep and 33% in goat in Dire Dawa region, Eastern Ethiopia, and Dawit *et al.* [30] documented 31.4% in sheep and 12.2% in goats at Bahir Dar Veterinary Clinic, Northwest Ethiopia. In contrast to the above report in the present study the prevalence of ticks was higher in goats than in sheep with prevalence of (37.6% in sheep and 46% in goat).that statistically significant among species of small ruminants ($p<0.05$). Lower tick infestation prevalence in this study was observed in sheep and goats in comparison with Abunna *et al.* [31] who reported a higher prevalence of tick infestation in goat (89.9%) and sheep (87.5%) in Mieso district, Ethiopia. In this present study, the four tick genera, *Rhipicephalus*, *Boophilus*, *Amblyomma* and *Hyalomma*, were observed with the prevalence of 24.7%, 11.3%, 0.8%, and 0.8% in sheep and 32%, 2.7%, 2% and 9.3% in goats respectively.

This is higher than previous studies reported by Desalegn *et al.* [24] which was *Amblyoma* species (0.91%), *Boophilus* species (4.6%) and *Rhipicephalus* (1.6%) in sheep whereas *Amblyoma* species (8.4%), *Boophilus* species (2.7%) and *Rhipicephalus* (2.5%) in goats Around Kombolcha, North East Ethiopia. The higher proportion of tick among the ectoparasites could be due to various factors including the fact that ticks are easier to find compared to, for example, fleas which jump frequently.

In the study, lice infestation was recorded with the prevalence of (4%) in goats and (3.9%) in sheep; with no statistically significant difference in lice infestation among sheep and goats ($P>0.05$). *Damalina* species was higher in sheep (2.2%) and *Linognathus* species was more frequent 2.7% in goats. The overall prevalence of lice infestation in this study (3.9 % in sheep and 4 % in goats). This finding is in line to the report of Rahmeto *et al.* [24] with lice (1.3%) in sheep; lice (6.1%) in goats, in Selected Districts of Tigray Region, Ethiopia, but it was higher than the previous prevalence reports of 0.0% in sheep and 0.5% in goats; and 2.0% in sheep and (1.5%) in goats reported in southern range land by Mohammed [32]; in central Ethiopia by Yalow *et al.* [33] Respectively. And lower than 7.5% in sheep and 5.13% in goats; in western Ethiopia, by Sertse and Wossene [23] 39.8% in sheep and 29.20% in goats by Sertse [34]: in northern part of the country. Lice infestation prevalence differences observed between the different studies may be partly attributed to differences in agro-climate and season of study, since there is strong seasonal cycle in louse numbers [35]. The management and health care of sheep and goats in the study areas could also be another factor.

In this study, an overall prevalence of 1.3% mange mite infestation was observed. Out of which 2.2% and 0.0% in sheep and in goats was recorded respectively. *Psoroptes* mites were recovered from sheep only. In contrast, the findings reported by Teshome [36], was with higher prevalence of mange mite in goats than in sheep that (5.7%) in goats and (2.1%) in sheep from around Kombolcha, North East Ethiopia and 4.3% in goats and 2.1% in sheep from Sidama zone respectively. Thus, the present study showed statistically insignificant in the occurrence of mange mite infestation of sheep and goats ($P>0.05$).

In the present study, the total prevalence of sheep ked (*Melophagus ovinus*) was 1.0% in sheep; no sheep keds was observed in goats. The result was much lower compare with prevalence reported by Mulugeta *et al.* [37]; Yesehak [38] and Sertse, and Wossene, [23], that reported the prevalence of 12.5%, 19.1%, 3.07%, in sheep, in three Selected Agro-ecological sites of Tigray Region, at Sebeta tannery, and in south western parts of Ethiopia respectively. Sertse [34] reported that 12.5% of the sheep examined were positive for sheep ked. Furthermore, Kassaye and Kebede [1] reported a higher overall prevalence of sheep keds (11.67%) in Tigray Region, Tigray, Ethiopia. The variation in the infestation rates might be due to the agro-ecological variations among the study areas and the type of sheep breeds that are kept. *Melophagus ovinus* is highly populated or attains peak level during the wet season, but the present study was conducted in the long dry season which would contribute to a lower rate of observation. Analysis of seasonal densities of sheep ked by Legg *et al.* [27] also indicated that sheep ked populations are mainly seen in colder, wetter areas and the infestation may be lost when the sheep are moved to hot and dry areas.

In the present study, two flea species were identified namely: *Ctenocephalides felis* and *Ctenocephalides canis*. There was no significant difference ($P>0.05$) for the occurrence of flea species between sheep and goats. Similarly, a study by Yacob *et al.* [25] in

Wolaita reported that there was no significant difference in flea prevalence between sheep and goat. In the present study relatively high flea prevalence was encountered in the goats than in sheep with 5.2% in sheep and 6% in goats in contrast to high flea prevalence in sheep than in goats reported by Tadesse *et al.* [39] in Kombolcha, which reported a total prevalence of 8.57% in sheep and 1.51% in goat; and Dawit *et al.* [30] at Bahir Dar Veterinary Clinic, Northwest Ethiopia, reported a total flea prevalence of 13.2% in sheep and 11.3% in goats. The general flea infestation in this present study was statistically significant ($P < 0.05$) which is higher in young than adult small ruminants. The higher prevalence of flea infestation in the younger animals might be associated to the shorter hair and thinner skin in which the flea can easily access the skin and penetrate it without difficulty. It has been observed that kids and lambs are more severely affected by fleas.

With regard to age, ectoparasite prevalence was significantly higher in young (63.1%) than adults (43.8%) reported by Dawit *et al.* [30] at Bahir Dar Veterinary Clinic, Northwest Ethiopia. The overall ectoparasites prevalence in the current study was 44.6% in adults and 8.9% in young animals from which 43.7% in adult and 8.2% in young sheep, and 46% in adult and 0.1% in young goats. The prevalence in adult animals was comparable but in young animals was lower with the report of Sertse [34] who reported an overall prevalence of ectoparasites 42.0 % and 54.2%, in young and adult sheep, and 60.1% and 54.2% in young and adult goats respectively in Selected Sites of Amhara Regional State. In this study the occurrence of ectoparasitic infestation was higher in adults than in young sheep and goats that was statistically significant ($P < 0.05$). The higher prevalence in adult animals could be attributed to their contact to other animals whether the same species or not but young animals have not contact with others as those of adults.

The current study showed that sex of the small ruminant shown significant association with the prevalence of the ectoparasites ($P < 0.05$). The prevalence of tick was (12.3% in male and 28.6% in female), lice (1.6% in male and 2.5% in female), flea (2.9% in male and 2.6% in female), mite (1.3% in female only) and sheep ked (1.0% in female only). In contrast to the result of the current study a report by Tewodros *et al.* [40] indicted that the prevalence of tick was higher in males than females; and also higher prevalence's of lice, fleas, mites, and sheep keds than the present study, with tick (23.0% in male and 18.9% in female), lice (54.8% in male and 54.6% in female), flea (34.6% in male and 36.0% in female), mite (10.6% in male and 5.7% in female) and sheep ked (18.2% in male and 13.9% in female) in and around Gondar town.

According to the status of body condition, the infestation rate of tick (29.1%), flea (3.9%) and lice (3.4%) in poor body condition small ruminants were higher compared to good body conditioned for tick (11.8%), flea (1.6%) and lice (0.5%). However, there was no statistical significant difference among body condition categories ($P > 0.05$) (Table 5). This finding is similar with Mulugeta *et al.* [22] and Sertse and Wossene [23].

CONCLUSION AND RECOMMENDATIONS

This study was conducted to identify the major ectoparasites and their prevalence on small ruminants. The most important ectoparasites identified were tick, lice, mange mite, flea and sheep ked. Ticks were the most abundant ectoparasites in the study area followed by flea, lice, mite and sheep ked. From animals examined more than half of sheep and goats were found infested with ectoparasites. Hence, this has great impact on small ruminant productivity which in turn affects the country's economy. Lack of awareness about the significance of the problems among owners for control schemes have contributed to the wide spread nature of ectoparasites in the area. In view of the significance of skin and hide production as main source of foreign currency to the country and the ever increasing demands of livestock market, the high prevalence of ectoparasites prevailing in sheep and goats in the area require serious attention to minimize the effect of the problem.

Based on the above conclusion the following recommendations are forwarded:

- Creation of awareness about the importance and prevention of ectoparasites among smallholder animal producing farmers.
- Strategic treatment of small ruminants with insecticides should be practiced in the study area to minimize the burden of ectoparasites on the health of small ruminants.

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