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Prevalence of Ectoparasites on Small Ruminants in and Around Gondar Town

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Abstract: A cross sectional study was conducted from October, 2011 to March, 2012 in and around Gondar town to determine the prevalence and to identify ecto-parasites on small ruminants. A total of 384 small ruminants; sheep (n=273) and goats (n=111) were included in the study. The overall ectoparasite prevalence showed that 301 (78.38%) small ruminants were infested by single or mixed ectoparasites. The most common ectoparasites encountered in order of their predominance were lice (54.6%), flea (35.7), tick (20%), sheep ked (10.6%) and mite (7%). No statistical significant difference ($P>0.05$) were found between the species of small ruminants and ectoparasites infestations. However, species of small ruminants was significantly associated with sheep ked ($p<0.05$). The infestation rate of ectoparasites was not statistically different between sex, body condition and age in the whole population of small ruminants. Nevertheless, the analysis showed as if there was statistically significant difference ($P<0.05$) in the prevalence of tick with age of small ruminants while it was relatively higher in adult (28.3%) than young (20.4%). Therefore, to reduce high prevalence of ectoparasites and their impacts on the productivity in small ruminants, appropriate and strategic control measure by creating awareness about the importance and control of ectoparasites for farmers is needed.

Key words: Infestation % Gondar town % Prevalence % Sheep % Goat % Parasites

INTRODUCTION

Ethiopia has a population of about 44 million cattle, 23 million sheep and 23 million goats however, the economic gains from these animals remain insignificant when it is compared to their huge number [1].

Ectoparasites commonly ticks, mites, lice and ked are important parasites because of their disease transmission, blood feeding habit and skin damage in most of the live stock population [2]. Ectoparasites of small ruminants cause blood loss and very heavy infestations result with severe anaemia. Moreover, they are the most important vectors of protozoan, bacterial, viral and rickettsial diseases [3]. All ectoparasites cause intense irritation to the skin, the extent depending on the parasite involved. Infested animals scratch, rub and bite

the affected areas and this end up with skin damage [3]. Their end result may be mortality, decreased productivity and reproduction, downgrading and rejection of skins. External parasites are problem in both extensive and intensive livestock production systems [4].

The problem created by ectoparasites is believed to be high. Hence, it would be essential to have up to date information on the importance of the prevalence of ectoparasites in various areas to provide an option to develop and implement a cost effective and ecologically important control strategies in the country. Therefore, the main objectives of this study were to determine the prevalence of ectoparasites on small ruminants in and around Gondar town and identify ectoparasites and associated risk factors involved in small ruminants in the study area.

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MATERIALS AND METHODS

Study Area: A cross sectional study was conducted from October, 2011 to March, 2012 in Gondar city, the capital of North Gondar zone in Amhara regional state. It is located 750 km northwest of the capital city, Addis Ababa. It is situated between 12°36'N and 33°28'E at an altitude of about 2300 m above sea level (m.a.s.l) with an average temperature of 20°C and an average annual rainfall of 1800 mm. Being a highland area, the city is spread on different mountains, slopes and in valleys and has three small rivers, many streams and a lake. The city has a population of 186,077 [5]. According to Zone Office of Agriculture and Rural Development, the population size of Gondar town in 2008 is about 112,249 out of which 60,883 are males and 51,366 are females [6]. The livestock population in the area comprises of cattle (8,202), goat (22,590), sheep (2,695), horse (1,065) and donkey (9,001).

Study Animals: A total of 384 animals (goats and sheep) were randomly selected from the area and examined for the presence of ectoparasites. Before clinical examination, the age and body condition of each selected animals were recorded. According to ESGPIP [7], the ages for both species were categorized into three categories.

Study Design and Sample Size Determination: A cross sectional survey was conducted in order to assess the prevalence of external parasite of small ruminants. Simple random sampling method is used for sampling and using 95% confidence interval and 0.05 desired level of precision, the sample size will be determined by the formula given by Thrusfield [8].

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

Where,

n = Required sample size

P_{exp} = Expected prevalence

d = Required precision

To calculate the total sample size, the following parameters will be used: 95% Level of Confidence (CL), 5% desired level of precision and with the assumption of 50% expected prevalence of ectoparasites in small ruminants, the sample sizes were determined as, n = 384.

Study Method: The explanatory variables considered were age, sex, body condition and species of animal. Each individual was visually examined for the presence of ectoparasites and the skin scraping and the ectoparasites itself were collected for the presence of microscopic parasites determined for the presence of ectoparasites at the time of examination or data collection through clinical examination. Animals were selected for the study by handling animals that were presented to veterinary clinic for different reasons and around from Gondar where the sheep and goat found in different local areas. Then select the sheep and goat from the flock by using simple randomizing method.

Data Analysis: Data obtained in the study was entered into a computer on Microsoft Excel spread sheet. The frequencies of ectoparasites were compared with variables and expressed in percentage and subjected to P value and chi-square (P²) test using SPSS version 15.

RESULTS

A total of 384 small ruminants were examined to determine the prevalence of ectoparasite infestation in and around Gondar town. Of these, 301 (78.38%) were infested by one or more ectoparasites and the different ectoparasites identified were ticks, 58 (21.2%) in sheep and 19 (17.1%) in goats; lice, 157 (57%) in sheep and 53 (48.1%) in goats; flea, 103 (37.7%) in sheep and 34 (30.6%) in goats; mites, 18 (65.9%) in sheep and 9 (8.1%) in goats and sheep ked, 55 (20.1%) in sheep (Table 2).

The overall prevalence of ectoparasites from a total of sheep (273) and goats (111); 68% male and 60.28% female; 65.61% male and 21.75% female were infested by ectoparasites, respectively (Table 1).

The overall prevalence of tick (21.2%), Lice (57%), Flea (37.7%) and Sheep ked (20.1%) in sheep were higher when compared to ectoparasites of goat tick (17.1%), lice (48%) and Flea (30.6%) and unlike in case of mange mite. However, there was no statistical significant variation (P > 0.05) between the two species level infestation for ectoparasites unlike in case of sheep ked (Table 2).

With regard to age wise comparison, among the 384 animals examined the high prevalence lice (56%), flea (36.4%) and sheep ked in adult; tick (28.3%) in young and mange mite (9.4%) in lamb was observed. Furthermore, tick infestation among the three age categories were statistically significant (P < 0.05) (Table 3).

Table 1: Overall prevalence of ectoparasites on sheep and goat

Species	Sex		Total
	Female	Male	
Sheep	170(60.28%)	51(68%)	221(80.95%)
Goat	61(21.78%)	19(65.61%)	80(72.07%)
Total	231(82.5%)	70(67.3%)	301(78.38%)

Table 2: Prevalence of ectoparasites distribution by species of small ruminant

Species	Ectoparasites				
	Tick	Lice	Mite	Flea	Sheep ked
Sheep	58(21.2%)	157(57%)	18(6.59%)	103(37.7%)	55(20.1%)
Goat	19(17.1%)	53(48.1%)	9(8.1%)	34(30.6%)	-
Total	77(20%)	210(54.6%)	27(7.0%)	137(35.7%)	55(20.1%)
P ² (p-value)	0.839(0.360)	3.034(0.82)	0.277(0.599)	1.733(0.188)	273.76(0.00)

Table 3: Age distribution prevalence of ectoparasites

Age	Ectoparasites				
	Tick	Lice	Mite	Flea	Sheep ked
Adult	54(28.3%)	148(56%)	19(7.2%)	96(36.4%)	38(14.4)
Lamb and ked	4(7.5%)	27(50.9%)	5(9.4%)	18(33.9%)	8(12%)
Young	19(20%)	35(52.2%)	3(4.4%)	23(34.3%)	9(13.4%)
Total	77(20%)	210(54.6%)	27(7%)	137(35.7%)	55(20.1%)
P ² (p value)	8.08(0.018)	0.663(0.718)	1.148(0.56)	0.175(0.916)	0.070(0.96)

Table 4: Prevalence of external parasites of small ruminants by body condition

Ectparasites	Body condition			P ²	p value
	Poor	Good	Total		
Tick	41(20.9%)	36(19.9%)	77(20%)	0.187	0.667
Lice	111(56.6%)	99(52.6%)	210(54.6%)	0.611	0.434
Mite	11(5.6%)	16(8.5%)	27(7%)	1.233	0.267
Flea	72(36.6%)	65(34.5%)	137(35.7%)	0.195	0.659
Sheep ked	28(14.2%)	27(14.3%)	55(20.1%)	000	0.983

Table 5: Prevalence of ectoparasites with regard to sex of small ruminants

Sex	Ectoparasites				
	Tick	Lice	Mite	Flea	Sheep ked
Female	53(18.9%)	153(54.64%)	16(5.7%)	101(36%)	39(13.9%)
Male	24(23%)	57(54.8%)	11(10.57%)	36(34.6%)	16(18.2%)
Total	77(20%)	210(54.6%)	27(7%)	137(35.7%)	55(20.1%)
P ² (p-value)	0.814 (0.367)	0.001(0.977)	2.743(0.098)	0.70(0.791)	0.131(0.717)

Table 6: Prevalence of ectoparasites at genus level on sheep and goat.

Ectoparasites		Prevalence		
		Sheep (n=273)	Goat (n=111)	Total
Tick	<i>Boophilus</i>	29(10.6%)	5(4.4%)	34(8.88%)
	<i>Amblyomma</i>	18(6.5%)	9(8.1%)	27(7.03%)
	<i>Hyalomma</i>	13(4.76%)	3(2.7%)	16(4.16%)
Lice	<i>Damalina</i>	92(33.69%)	29(26.12%)	121(31.51%)
	<i>Linognatus</i>	65(23.8%)	24(21.62%)	89(23.17%)
Mange mite	<i>Demodex</i>	15(5.49%)	7(6.3%)	22(5.73%)
Flea Sheep ked	<i>Sarcoptes</i>	3(1.09%)	2(1.8%)	5(0.13%)
	<i>Ctenocephalides</i>	103(37.72%)	34(30.63%)	137(35.67%)
	<i>Melophagus Ovinus</i>	55(20.14%)	-	55(14.72%)

The infestation rate of ticks (20.9%), lice (56.6%) and flea (36.7%) are higher in poor body condition small ruminants compared to good body conditioned for tick (20%), lice (52.6%) and flea (34.5%) unlike in case of mange mite and sheep ked. However, there was no statistical significant difference among body condition categories ($P>0.05$) (Table 4).

The prevalence of tick (23%), mite (5.7%), sheep ked (18.2%) and lice (54.64%), infestation was higher in male compared to tick (18.9%), mite (2.86%) and sheep ked (13.9%) in female; unlike in case of flea (36%), the infestation was recorded in both the sexes. There was no statistically significant difference between sexes ($P>0.05$) with regard to the prevalence (Table 5).

An overall prevalence of ectoparasites was observed in the two small ruminant species at genera level of ectoparasites. In sheep *Boophilus* (10.6%) was the abundant followed by *Ambyloma* (6.5%) and *Hyalomma* (4.76%). while in goats the same genera of tick were encountered with the prevalence of 8.1%, 4.5% and 2.7% on *Ambylomma*, *Boophilus* and *Hyalomma*, respectively.

The identified genera of lice infesting in sheep and goats in common were *Damilina* and *Linognatus*. In sheep prevalence of 33.69% and 23.8% was observed, respectively. While in goats the respective prevalence was 26.12% and 21.62%. The infestation rate of *Damilina* is higher than that of *Linognatus* both in sheep and goat.

The prevalence of mange mite on sheep showed that two genera of mange mite was identified; *Demodex* (5.49%) and *Sarcoptes* (1.09%) while on goats the same genera of mange mite were encountered with the prevalence of 6.3% and 1.8% in *Demodex* and *Sarcoptes*, respectively. The overall prevalence of *Cetenocephalidia* was 37.63% and 30.63% in sheep and goats, respectively (Table 6).

DISCUSSION

The prevalence of ectoparasites in and around Gondar town was relatively high. The overall prevalence of small ruminant ectoparasites (78.3%) was markedly higher than the prevalence reported from in and around Wolaita Sodo, Southern Ethiopia (73.3%) by Tadesse *et al.* [9].

The current study has shown that 80.97% of the sheep and 72.07% of the goats examined were found to be infested by at least single or mixed external parasites. The higher prevalence of ectoparasites in study area could be due to the fact that sheep and goats could have frequent exposure to the same communal grazing land that favored the frequent contact and management system of

animals, this result is higher than the report of Tefera [10] with a prevalence of 50.5% of sheep and 56.4% of goats. Similarly, Mulugeta *et al.* [11] reported 55.5% and 58% in sheep and goats, respectively in Tigray region and Sertese and Wosene [12] reported about 50.5% and 56.4% prevalence of external parasites, respectively in sheep and goats in different agro climatic zones of eastern Amhara region of Ethiopia. But it's lower than the report of Bekele *et al.* [13] with prevalence of 99.38% and 96.92% in sheep and goats, respectively in Wolmera district of Oromia region central Ethiopia.

In this study, three genera of ticks (*Boophilus*, *Ambylomma* and *Hyalomma*) were identified which made a total prevalence of 21.2% and 17.1% in sheep and goats, respectively. This was in agreement with Teshome [14] with the prevalence of 23.8% in sheep and 16% in goats which were reported from the Sidama Zone in Southern Ethiopia. In addition, high prevalence rate of ticks in small ruminants was reported by Yacob *et al.* [15] in and around Wolaita sodd, Southern Ethiopia with the prevalence of (68% in sheep and 19% in goats) and Abebe *et al.* [16] with prevalence of 40% and 58.8% in sheep and goats in selected districts of Tigray region, Ethiopia. *Boophilus* was found 29 (10.6%) and 5(4.5%) in sheep and goats, respectively followed by *Ambylomma* 18(6.5%) and 9(8.1%) respectively and *Hylomma* 13(4.76) and 3(2.7%) in sheep and goats, respectively.

The overall prevalence of lice obtained in this study area (57.5% in sheep and 48.1% in goats) was higher than observations made in southern range land 0% in sheep and 1.55% in goats [17], but lower than the prevalence reported by Abdulhamid [18] in and around Kombolcha (14.2%), Tefera [10] in Amahara region (39.8% in sheep and 29.2% in goats) and Yisehak [19] at Sebata (89.5%) in fresh sheep skin examinations. The genera of lice identified on sheep and goats in the study areas was, *Damilina* which was the highest observed ectoparasites with the prevalence of 33.69% and 29.16% on sheep and goats, respectively. *Linognatus* was the second genera of lice identified in the study area with the prevalence of 23.8 on sheep and 21.62% on goats.

In small ruminants, two mange mite genera were identified. These were, *Demodex* and *Sarcoptes*. The first one is commonly detected in sheep and goats with a prevalence of 5.49% and 6.3%, respectively. This result is closely in agreement with Tadesse *et al.* [20] with the prevalence of 6.58% in sheep and 1.51% in goats. The Prevalence of mange mite obtained in this study area were lower than other researches done in different parts of country, 7.4 % by Assegid [20] and higher than 1.86% [21].

The prevalence rate of flea obtained in this study area was (35.7%). This result is higher than other works which were done by Bekele [13], Abebe *et al.* [16], Tadesse *et al.* [9] and Yacob *et al.* [15] who reported lower prevalence rates than the present study in Wolmera District Oromia Region, Selected Districts of Tigray Region, Ethiopia, in and around Kombolcha and in and around Wolaita Soddo, Southern Ethiopia districts, respectively.

The prevalence of ectoparasites recorded in the current study in age groups of small ruminants associated with tick infestation in adult, young and lamb/ked were 20.4%, 28.3% and 7.5%, respectively and there was statistically significant association with the prevalence of tick infestation on small ruminants which was dissimilar to the previous study of Yacob *et al.* [15] in which the prevalence of ectoparasites 15% and 53% in young and adult respectively and Tefera [10] with the infestation rate of 51.05% and 54.2% in young and adult age. There is no significant difference ($P>0.05$) in lice, mange, flea and sheep ked infestation on small ruminants. This finding is supported by previous studies which were conducted in and around Wolaita Soddo, Southern Ethiopia by Yacob *et al.* [15] and Sertse [12] in selected sites of Amhara regional state and their impact on the tanning industry.

The current study showed that sex of small ruminants did not show significant association with the prevalence of the ectoparasites ($p>0.05$). The prevalence of tick (23% in male and 18.9% in female), lice (54.8% in male and 54.64% in female), flea (34.6% in male and 36% in female), mite (10.57% in male and 5.7% in female) and sheep ked (18.2% in male and 13.9% in female). This is collaborated with those reported by Abebe *et al.*, (2011) and Kassaye and Kebede [22]. However, dissimilar to the previous study of Yacob *et al.* [15] and Hussen [23]. The prevalence of ectoparasites regarding to sex high prevalence observed in male. This is due to the area of people use one male for many flocks of sheep and goats in the areas, due to this the males has opportunity to frequent contact with infested sheep and goat.

The absence of association between body condition ($P>0.05$) and prevalence agrees with previous reports [27]. This could be due to the fact that loss of body condition in the study animals could result from other factors, such as seasonal change of the forage and pasture and the presence of other concurrent disease. However, the prevalence of different ectoparasites like tick, lice and flea

was high infested in poor body condition than that of good body condition small ruminants. This finding is similar with Mulugeta *et al.* [11] and Sertse and Wossene [12].

CONCLUSION AND RECOMMENDATION

This study was conducted to identify the major ectoparasites and their prevalence on the small ruminants. The most important ectoparasites identified were tick, lice, mange mite and sheep ked. Lice were the most abundant ectoparasites in the study area followed by flea, tick, mite and sheep ked. The infestations of ectoparasites are important affecting the health and productivity of small ruminants in and around Gondar town. 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 goat in the area require serious attention to minimize the effect of the problem.

Based on the above conclusion the following recommendations are forwarded:

- C Strategic treatment of small ruminants with insecticides should be practiced in the study area to minimize the impact of ectoparasites on the health of animals.
- C Awareness creation for the local farmers about the control of ectoparasites is essential.
- C Newly introduced animals should be treated before they are introduced in the herd or in to the farm.
- C Better small ruminant management practices should be implemented to minimize transmission of the disease and increase the productivity of small ruminants.
- C Further detail study should be done to assess the seasonal dynamicity and major ectoparasite borne disease in the study area.

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