

Study on the Prevalence of Ecto-Parasite on Sheep in Debre Birhan and its Surroundings, North Shoa, Ethiopia.

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Abstract

A cross sectional study was conducted in Debre-Birhan and its surroundings with the objective of determination of prevalence of ectoparasites in sheep and the associated potential risk factors. A total of 384 sheep of both sexes and different age groups were included in the study. Out of 384 sheep examined sample for ectoparasites, 258(67.19%) were infested with one or more ectoparasites. Lice infestation with the prevalence of 43.75% was the most dominant ecto-parasitic infestation followed by sheep ked 19.01% and tick infestation with (4.43%)(1). Statistically significant difference in prevalence was observed among the three ectoparasites ($P < 0.05$). *Damalina ovis* and *Linognathus* species were lice infestation in this study with the single prevalence of 2.6% for *Damalina ovis*, 1.56% for *Linognathus* species and 39.58% for the concurrent infestation of *Damalina ovis* and *Linognathus* species. The only two tick species identified were *Rhipicephalus camicassi* (3.65%) prevalence and *Boophilus decoloratus* (0.78%). Ecto parasites prevalence was evaluated by study sites (PAs), age group, breed, body condition and sex of animals and the prevalence difference was highly statistically significant for lice ($P = 0.000$) among the PAs, age groups, breed and body condition, for tick between breeds and for sheep ked between sex and age groups of animals but no statistically significant difference was observed among PAs for ticks species and sheep ked ($P > 0.05$). In view of the findings of the present study it is possible to conclude that the awareness of the local farmers on the way of ectoparasites transmission and impact on the production and productivity is low (2). In addition the tread of rearing different animal species together may favor the transmission of ectoparasites. Therefore, control programs should be designed and implemented with the participation of all stakeholders and there should be strong coordination between neighboring regions and/or districts with strict follow up and control.

Key words: Debre Berhan, ectoparasites, lice, prevalence, sheep, sheep ked, tick

Introduction

Ethiopia has the largest livestock population in the continent. There are approximately 41.3 million cattle, 46.9 million small ruminants, more than 1 million camels and 4.5 million equines, and 40 million chickens (Asnake et al., 2013). Ethiopia's resources of cattle, sheep and goats ranks first, third and second respectively in Africa (Leach, 1998). Because of this huge potential, Ethiopia is capable of supplying 16-18 million of skins and hides per year for the tanneries within the country (3). The Ethiopian skins and hides, especially the sheep skin is known in the world for the production of the finest leather in terms of its fine grain and compact structure. The quality wet-blue goat skins are known as "Bati-Genuine" and they have also a good reputation in the international market and receive the biggest attraction for the number of leather producing companies in the world (Tewodros et al., 2012).

Ecto-parasites are very common and widely distributed in all agro-ecological zones in Ethiopia (Yacob, 2014). Ectoparasites (lice, ked, mange mites and ticks) are cause mortality, decreased production and reproduction of sheep and goat, and also cause serious skin defects that end up with down grading of quality and rejection of skin (Amare et al., 2013)(4).

All ectoparasites cause intense irritation to the skin, the extent depending on the parasite involved. Infested sheep and goat scratch rub and bite the affected areas and this end up with skin damage (USAID, 2008).(5) Ectoparasites of sheep and goats cause blood loss and very heavy infestations result with severe anemia. Moreover, they are the most important vectors of protozoan, bacterial, viral and rickettsial diseases (Rhabari et al., 2009). All these contributed towards the extreme reduction of sheep and goat productivity (6). In Ethiopia there is limited information regarding the prevalence, risk factor and distribution of sheep and goat ecto-parasites.

Ectoparasites are one of the major hinder sheep and goat production in many parts of Ethiopia. Several studies from different parts of the Ethiopia showed that skin quality deterioration is very evident mainly due ectoparasites such as Lice, fleas, keds, mange mites and ticks are the major ectoparasites of sheep and goats in the country (Tadesse, 2005)(7). Ectoparasites are reported to cause 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 with the consequent socioeconomic implications (Radostits et al., 2007) (8). The occurrence and spread of skin diseases had been shown

to correlate with host factors, poor management, climatic factors, feed scarcity and inadequate veterinary service (Ayele et al, 2003).

Hence, knowing the current status of ecto-parasite and its associated risk factors is important to reducing economic losses by this parasite. To effectively control ecto-parasite problems and realize benefit from sheep resource, it is crucially important to know prevalence and associated risk factors of ecto-parasite (9). Furthermore, science-based interventions could be made available for policy makers and animal health extension personnel. There is no any study conducted previously in this area (10). Therefore, objective of this study was to determining the prevalence of ecto-parasite of sheep, and possible risk factors that play a role in precipitating such problems in Debre-birhan and its surroundings.

Material and Methods

The Study Area

The study was conducted in and around Debre-Birhan. Debre-Birhan town is located 130 Km away from the capital city (Addis Ababa) at 9041' N latitude and 39032' E longitude and the elevation is ranged from 2700 to 2800 meter above sea level. The area receives annual rain fall ranges from 814 to 1080 mm with about 70% rain falling between June and September(11). The annual average temperature of the town ranges between 40C in the coldest month (August) to 26°C in the hottest month (April) which is categorized under "dega" and tropical climate weather condition (12). (North Shoa Zone, Urban Agriculture office data, 2017).

Study Animals

A total of 384 Sheep from the study area were subjected to this study to determine the overall prevalence rate in area. All examined animals were local and cross breed of mixed age and sex groups (13).

Study Design

A cross-sectional study was conducted by selecting animals randomly to determine the prevalence of ecto-parasite in the study area (14).

Sampling Methods and Sample Size Determinations

Simple random sampling method was applied to take the samples and the sample frame was peasant association (PA) found within the study area. 4 PAs were randomly selected from the 12 PAs presented in the area. From the selected 4 peasant association the sample size was calculated by using 50% expected prevalence to get the sample size, because there were no previous prevalence studies in the area. By using Thrusfield (2007) formula: accordingly, the minimum sample size needed is 384(15).

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

Where, n = sample size

1.96 = the value of z at 95 % confidence interval

P_{exp} = minimum expected prevalence = 50%

d = Absolute precision = 5%

Sample collections and Laboratory examinations

The sample collection was performed by multiple fleece parting in the direction opposite to that in which hair or wool normally rests and visual inspection and palpation of the skin for parasites and lesions on all parts of the animal including the ears and the digits was conducted(16). Ectoparasites such as ticks, lice and sheep ked were collected by quality steel forceps and hand from their attachment site, put in to universal sample bottle and preserved in 70% alcohol as described in Urquhart *et al.*, (1996)(17). The collected sample was examined by stereomicroscope and identifications given by Walker *et al.*, (2003) for tick and Urquhart *et al.*, (1996) and Mandal (2006) for lice.

Data analysis

Data collected from laboratory result was stored on Microsoft (Ms) excel spread- sheet program and analysis was done using STATA 11.0 version software program (18). The total prevalence was calculated by dividing the number of positive animals by the total number of tested and logistic regression was employed to analyze the association of potential risk factor (Age, breed, sex, body condition and "neighborhood kebele") with the occurrence of Ectoparasites infestation(19).

Results

Overall prevalence of Ecto-parasite

Out of 384 sheep examined for ectoparasites, 258(67.2%) were infested with one or more ectoparasites. Lice infestation with the prevalence of 43.7% was the most dominant ectoparasites followed by sheep ked 19% and tick 4.4% infestation observed in the study area (20). The present finding indicated that statistically significant difference ($P < 0.05$) as shown (Table 1). The concurrent infection of *Damalina ovis* and *Linognathus* species were dominant lice infestation with the prevalence of 39.58% (21).

In the present finding only two tick species were identified these are *Rhipicephalus camicassi* and *Boophilus decoloratus*. The prevalence of *Rhipicephalus camicassi* and *Boophilus decoloratus* were 3.65% and 0.78% respectively (22).

The prevalence of ectoparasites in peasant associations

The prevalence of ectoparasites in peasant association were 12.4%, 18% and 16.2% for tick, lice and sheep ked respectively in Zangira; 1.4%, 61% and 25% for tick, lice and sheep ked respectively in Debre-Birhan; 2%, 43.4% and 21% for tick, lice and sheep ked respectively in Ataklt and 0.9%, 57.4% and 15.5% for tick, lice and sheep ked respectively in Genet kebele (23). The prevalence of ectoparasites were statistically significant for lice ($P = 0.000$) among the Pas but no statistically significant difference was observed among kebeles for tick and sheep ked ($P > 0.05$) (Table 2).

Table 1: The prevalence of ecto-parasite species on sheep

	Ectoparasite	Number positive	Prevalence
Tick species	Boophilus decoloratus	3	0.78%
	Rhipicephaluscamicassi	14	3.65%
	Total	17	4.43%
Lice species	Damalina ovis	10	2.60%
	Linognathus species	6	1.56%
	Damalina ovis and Linognathus species	152	39.58%
	Total	168	43.75%
Sheep Ked	Melophagus ovinus	73	19.01%
	Overall total	258	67.19%

Table 2: The prevalence of ecto-parasites in peasant associations

Ectoparasite	Zangira (n=105)	Debrebirhan(n=72)	Ataact (n=99)	Genet (n=108)
	Positive %	Positive %	Positive %	Positive %
Tick	13(12.4%)	1(1.4%)	2(2%)	1(0.9%)
Lice	19(18%)	44(61%)	43(43.4%)	62(57.4%)
Sheep ked	17(16.2%)	18(25%)	21(21%)	17(15.7%)

The prevalence of ectoparasites by sex

The prevalence of ectoparasites infestation were 3.68%, 39.3%, and 34.4% for tick, lice and sheep ked respectively for male sheep and 4.9%, 4.7%, and 7.6% for tick, lice and sheep ked respectively for female sheep. There was no statistically significant difference ($P>0.05$) between male and female for tick and lice but there were statistically significant difference for sheep ked between male and female (Table 3) (24).

The prevalence of ectoparasites by age groups

The prevalence of tick, lice and sheep ked were 5.3%, 25.5%, 9.6% for lamb (≤ 1 year); 5.6%, 21.7%, and 16% for young (1-2years); 2.4%, 61.8% and 37% for adult (2-5years) and 4.8%, 73.8% and 1.6% for old (>5 years) sheep respectively. There were no statistically significant difference in both tick and lice between lamb and young sheep ($P>0.05$) but there was statistically significant difference between adult and old sheep ($P<0.05$) (25). The prevalence of sheep ked showed statistically significant difference among the four age groups ($P=0.000$) (Table 4).

Table 3: The prevalence of ecto-parasites by sex basis

Ectoparasite	Female (n=221)	Male (n=163)
	No. Positive (prevalence)	No. Positive (prevalence)
Tick	6(3.68%)	11(4.9%)
Lice	64(39.3%)	104(47%)
Sheep ked	56(34.4%)	17(7.6%)

Table 4: The prevalence of ecto-parasites by age groups

Ectoparasite	<1year	1-2 Year	2-5 year	Above 5 year
	(n=94)	(n=106)	(n=123)	(n= 61)
	Positive %	Positive %	Positive %	Positive %
Tick	5(5.3%)	6(5.66%)	3(2.4%)	3(4.8%)
Lice	24(25.5%)	23(21.7%)	76(61.8%)	45(73.8%)
Sheep ked	9(9.6%)	17(16%)	46(37%)	1(1.6%)

The prevalence of ecto-parasite by breed basis

The prevalence of tick, lice and sheep ked were 10.8%, 15.7% and 18% for cross breed (Awassi X Menze) and 2.6%, 51.5% and 19% for local breed (Menze) respectively. Tick and lice showed statistically significant difference ($P < 0.05$) in breed (26). The prevalence of sheep ked was not statistically significant difference in pure and cross breed ($P > 0.05$) as shown (Table 5).

The Prevalence of ecto-parasite by body condition

The prevalence of Tick, lice and sheep ked were 4.49%, 64% and 20.22% for poor body condition and 4.4%, 37.62% and 18.64% for good body condition respectively (27). There were no statistically significant difference ($P > 0.05$) in poor and good body conditions for tick and sheep ked, whereas there were statistically significant difference for lice in body conditions ($p = 0.000$) (Table 6).

Table 5: The prevalence of ecto-parasites by breeds

Ectoparasite	Cross breed (Awassi x Menze) (n=83)	Menze breed (n=301)
	Positive (%)	Positive (%)
Tick	9(10.8%)	8(2.65%)
Lice	13(15.7%)	155(51.5%)
Sheep ked	15(18%)	58(19%)

Table 6: The prevalence of ecto-parasites by body conditions

Ectoparasite	Body condition	
	Poor (n=89)	Good (n=295)
	No. Positive (prevalence)	No. Positive (prevalence)
Tick	4(4.49%)	13(4.4%)
Lice	57 (64%)	111(37.62%)

Discussion

The results presented in this study revealed as an overall prevalence of ecto-parasites in the study area was 67.19%. The finding of the current study is comparable with the previous reports from different parts of Ethiopia, Yacob *et al.* (2008) in and around Wolita Sodo, Southern Ethiopia report were 68.7% (28). The present study result relatively lower compared to other studies conducted in different parts of Ethiopia, Tewodros *et al.* (2012) were 80.95%, Dereje and Beksisa (2018) were 76.6%, Hailegebrael *et al.* (2017) were 88.24% and Tadesse *et al.*, (2011) were 73.3%, Bekele *et al.* (2011) were 99.38%. This variation in prevalence of ectoparasites might be due to differences in environmental factors, management system and level of veterinary service in the area (29). The prevalence of the present finding relatively higher compared to Hailegebrael *et al.* (2016) 57.43%, Sisay *et al.* (2013) 44.9%, Deferes and Geresu (2016) (2016) 55.21%, Tefera (2004) 50.5%, Mulugeta *et al.* (2010) 55.5%, Sertese and Wsene (2007) 50.5%. The higher prevalence of ectoparasites in the present study area might be due to the fact that animals could have frequent exposure to the same communal grazing land that favored the frequent contact and management system of animals (30).

Lice were the leading ecto-parasite recorded in sheep followed by sheep ked and ticks. The loss of body condition could be the direct effect of the parasites or under nutrition might have exposed the animals for heavier infestations (31).

Lice infestations were higher ectoparasites with a prevalence of 43.75% in the study area and this in agreement with 39.8% prevalence reported by Tefera and Abebe (2007). Whereas Yacob *et al.* (2008) reported 6.6% prevalence in Adama, Hafez (2001) reported 2% prevalence in central Ethiopia and Numery (2001) reported 14.2% prevalence in Kombolcha were lower than the present study (32). This difference might be associated with differences in agro-climate, season of the study, management system and health care of animals in the areas. Lice infestation may indicate underlying problems in malnutrition and chronic disease (Wall and Shearer, 1997) (33).

In this study, the prevalence of lice was significantly higher in old and adult than young and lambs and similar finding was report by Tefera and Abebe (2007). The most probable for the difference might be adult and old sheep have a heavier fleece (hair) than young and lamb, which provides a habitat, which is readily colonized by lice, and *Damalina* is susceptible to high temperature (Urquhart *et al.*, 1996). According to Kettle (1995), *D. ovis* requires both suitable temperature (33–39°C), and fiber of appropriate diameter to which eggs can be attached.

Menze breed was infested more than cross breed by lice in this study (51.5% and 15.7% respectively) and this might be due to the number of animals examined or might be the sample size difference in both breeds (Menze breed 301, cross breed 83) or it might be due to hair size of the breed but it needs further investigation (34).

In the present study, the prevalence of lice infestation was significantly higher in animals of poor body condition than those of good body conditions. This difference might be due to difference of the animal resistances. The animals in poor body condition do not groom themselves and leave the lice undisturbed (Urquhart *et al.*, 1996).

Sheep ked (*Melophagus ovinus*) was the second most important ectoparasites observed on sheep accounting for an overall prevalence of 19.0% and this was higher than that of Tefera and Abebe (2007) who reported 12.5% prevalence. This could most probably be due to the cool and foggy weather conditions of the study area, as Kettle (1995) and Radistits *et al* (1994) stated sheep ked restricted to cooler highland areas.

The prevalence of sheep ked was significantly higher in males (34.4%) than females (7.6%) and this might be due to hair length as most rams have heavy and long hairs than females.

The average prevalence of tick infestation was 4.42% in the present study and this was comparable to Yacob *et al.* (2008) reported 4.77% prevalence from Adama. Teshome, (2002) reported 23.8% prevalence, Abunna *et al.* (2009) and Zelalem (1994) reported 87.5% and 65.6% tick prevalence respectively from Miesso and Dire Dawa, were higher prevalence reported compared to the present study. Hafez (2001) and Tefera and Abebe (2007) reported 0.93% and 3.4% respectively were lower prevalence compared to the present study. The difference in prevalence might be due to the environmental condition or difference in agro-ecology.

Conclusion and Recommendation

The overall ecto-parasite prevalence in this study was 67.19%. Ecto-parasites are one of the most important skin diseases in small ruminants. The most important ecto-parasite identified in this study's was lice, sheep keds and tick. Lice were the most abundant ecto-parasite which followed by sheep keds and tick. Ectoparasites are among the major causes of sheep production constraints and quality deteriorations of exported skin in the Ethiopia. In view of the findings of the present study it is possible to conclude that the awareness of the local farmers on the way of ectoparasites transmission and impact on the production and productivity is low. In addition the trend of rearing different animal species together may favor the transmission of ectoparasites. Therefore, control programs should be designed and implemented with the participation of all stakeholders and there should be strong coordination between neighboring regions and/or districts with strict follow up and control.

Conflict of Interests

The authors have not declared any conflict of interests.

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